CHESAPEAKE
BAY JOURNAL

September 2020 Volume 30 Number 6

Independent environmental news for the Chesapeake region

Missed again?

Another Chesapeake cleanup goal may be out of reach PAGE 12

HIKE IN RARE HABITAT

Discover the harsh beauty of serpentine barrens PAGE 32

DIVERSITY & INCLUSION

Bay Program leadership commits to taking action PAGE 17

SALMON FARM ON ITS WAY?

An salmon farm is proposed for the Eastern Shore PAGE 18

Bay Journal | P.O. Box 222 | Jacobus, PA 17407-0222

NONPROFIT ORG
U.S. POSTATE
PAID
PERMIT 280
LANC., PA 17604

CONTENTS

NEWS

7 ‘Sunny day’ flooding on the rise along the Chesapeake
8 Report: Third of PA waterways impaired by pollution
9 Microplastics found in Susquehanna smallmouth bass
10 MD county protects forests with new laws for ‘no net loss’
11 Latinx *promotores* lead the way for environmental action
12 Are 2025 Bay cleanup goals out of reach?
16 Scientists find ‘forever chemicals’ in freshwater fish
17 ‘Great first steps’: Bay leadership commits to diversity
18 Land-based salmon farm pitched for MD Eastern Shore
20 VA City seeks conservation solution for flood-prone properties
22 Shad recovery efforts not paying off, study shows
23 Gas fracking under fire in Pennsylvania
25 Menhaden policy will be tied to striped bass population
26 Project approval moves proposed MD gas pipeline forward
28 Natural gas projects meet complications, trend down in VA
29 Will the rusty crayfish get its claws on more local waters?
30 Birds’ return to Hampton Roads island defies expectations

TRAVEL

32 Harsh beauty: Take a walk in serpentine barrens
34 Leave your tracks on the Blue Ridge Railway Trail

FORUM

38 Equity & justice: aspirations for the environmental movement
39 Wind farm off Ocean City would fulfill energy plan, create jobs
40 COVID-19 invites us to rethink our food choices
41 **Chesapeake Born** | Growth and the lesson of COVID-19

QUIZZES | EVENTS | RESOURCES

42 **Bulletin Board** | Volunteer | Events | Programs | Resources
45 **Chesapeake Challenge** | Northern pufferfish & striped burrfish

COLUMNS

46 **Steward’s Corner** | Elevating the ‘green’ workforce
47 **On the Wing** | Flight of the red-winged blackbird
48 **Bay Naturalist** | Want more mussels?

CORRECTIONS

In *Chesapeake restoration scrutinized for lack of diversity* (July-August 2020), the *Bay Journal* incorrectly stated that there are no people of color on the Chesapeake Conservancy staff.

In the same issue, the bird on page 36 was misidentified.
It is a barn swallow.

The *Bay Journal* regrets the errors.

ON THE COVER

Farmland lies next to the Choptank River, a Maryland tributary to the Chesapeake Bay. (Dave Harp)

Save the Bay without losing farms

It’s highly unlikely the region will meet its 2025 cleanup goals for the Chesapeake Bay. Some states might reach their individual goals, but probably not by implementing the plans they submitted last year.

States have been doing a great job controlling wastewater. Those that had large proportions of their nitrogen “loads” coming from wastewater treatment plants were able to make significant headway. Those that primarily had to rely on reductions from agriculture made much less progress.

In coming years, most states will be in the same boat. The majority of nitrogen reductions will have to come from farmland, which have historically been difficult to achieve. It will require a greatly ramped-up implementation of runoff control practices, from streamside buffers to stream fencing to cover crops, across millions of acres of farmland. That, in turn, requires cost-share incentive payments and technical assistance to be made available at rates never before seen.

At the same time, farmers are often facing market demand for more production, sometimes even as prices drop. That can mean more nutrients around the watershed, without farmers having any additional income (or time) to help put runoff control practices in place.

Pennsylvania is far behind, and there is plenty of blame to cast its way, especially for its lack of funding. But its lack of progress also illustrates the difficulty the region has in reducing farm runoff. According to computer models, nitrogen runoff from its farmlands increased 2% in the last decade.

But other states aren’t doing much better. In the last 10 years, Maryland reduced its nitrogen load from agriculture just 3%. Delaware reduced it 2%, Virginia less than 1%, and it increased less than 1% in West Virginia. New York had the highest rate of reductions, 12%, but that was in large part due to dairy farms going out of business.

It is hoped a way can be figured out to reduce runoff that doesn’t rely on farms going out of business, but it’s unclear whether the Bay Program has figured out what that is, even though it’s known for three decades that agriculture is the largest source of nutrients polluting the Bay.

The Bay Program knows how to achieve its agricultureal goals in a computer model, but it’s less clear whether that translates into something that can be implemented in the real world, at least with existing programs. At some point, the region may have to grapple with whether its agricultural goals are achievable — or how to overhaul its approaches to make them more realistic for farmers and the Bay. ■

— Karl Blankenship

BY THE numbers

11,684
Miles of shoreline along the Chesapeake Bay and its tidal rivers

18 million
People living in the Bay watershed

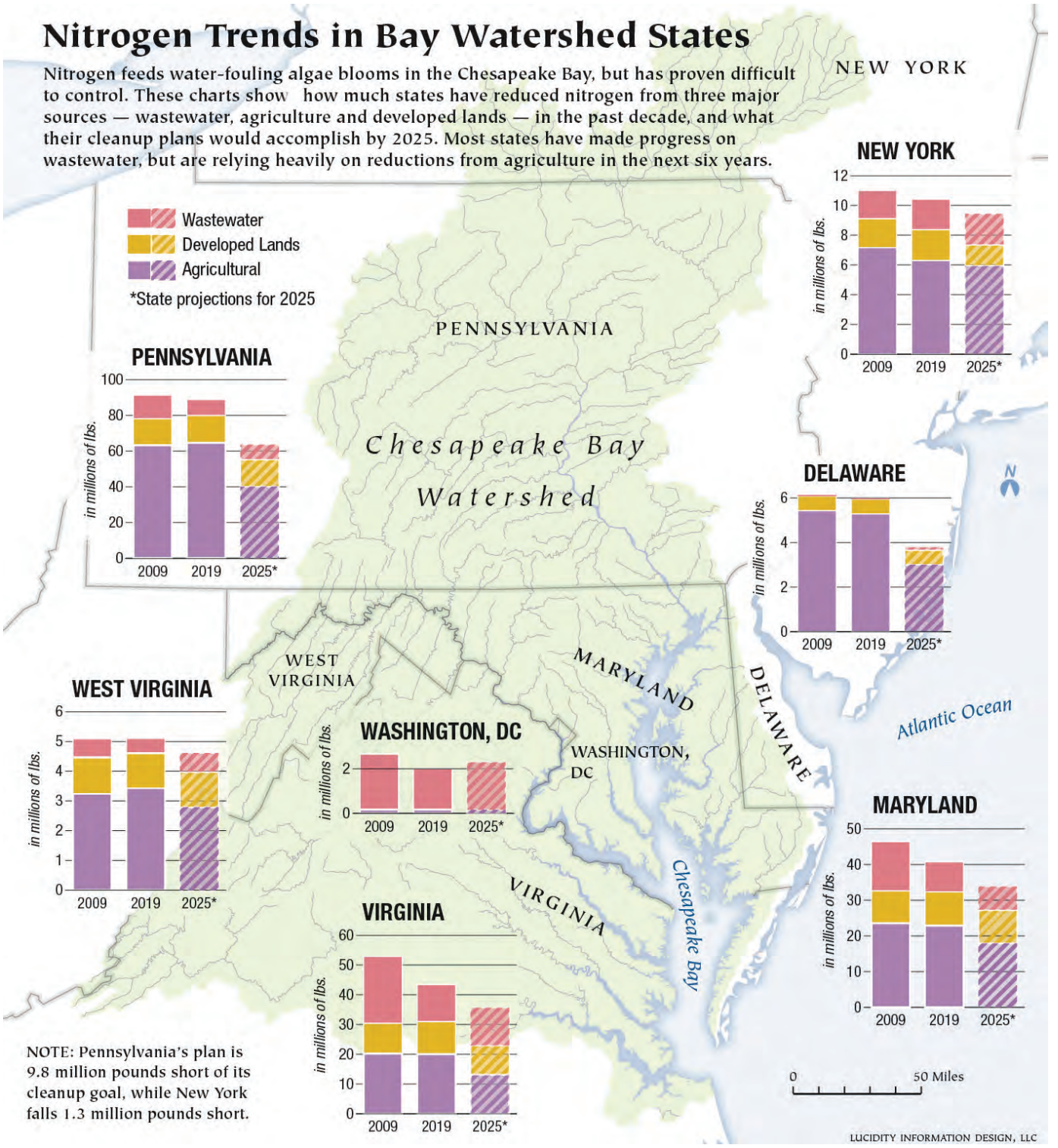
4
Major river systems in Virginia that flow into the Bay

21
Feet of average depth in the Chesapeake Bay and its tidal rivers

11.5 million
Pounds of nitrogen pollution to be reduced from Lancaster County, PA

8.4 million
Pounds of nitrogen to be reduced from the entire state of Maryland

58 percent
Portion of Chesapeake Bay watershed that is forested



LOOKING BACK

25 years ago

Canada geese numbers plummet

Surveys in Quebec, Canada, where Canada geese breed in the summer, found a shocking decline in their numbers. Only 40,000 were counted, down from 90,000 the previous year and 118,000 observed in 1988. That will mean fewer wintering birds on the Eastern Shore, which hosts the largest population of the birds when they fly south. ■

—Bay Journal, September 1995

20 years ago

Fish ladder opens Susquehanna to shad

A fish ladder was completed at the York Haven Dam in Pennsylvania, the last of four major hydroelectric facilities on the lower Susquehanna River to help migrating shad return to historic spawning grounds. It allowed 4,673 shad to get past the dam, though the goal is to get 2 million upstream. ■

—Bay Journal, September 2000

15 years ago

Falls Church, VA, green roof wins award

A 4,700-square-foot roof atop Yorktown Square Condominiums in Falls Church, VA, won the North American Green Roofs for Healthy Cities Award. The project highlights the growing interest in green roofs in the region as a means to help control stormwater runoff. ■

—Bay Journal, September 2005

10 years ago

Soft-shell clams populations hit new low

Populations of soft-shell clams hit an all-time low in the Bay. Harvests peaked at nearly 700,000 bushels in the early 1960s, but Maryland harvests have fallen to zero. Biologists say poor water quality, loss of habit, harvest and disease have contributed to their demise. ■

—Bay Journal, September 2010

ABOUT US

The *Chesapeake Bay Journal* is published by Bay Journal Media, an independent nonprofit news organization dedicated to producing journalism that informs the public about environmental issues in the Chesapeake Bay watershed. The Bay Journal is available in print and by email and is distributed free of charge, reaching approximately 100,000 readers each month. The print edition is published ten times a year, and bundles are available for distribution at offices, libraries, schools, etc. Material may be reproduced, with permission and attribution.

Bay Journal Media also operates the Bay Journal News Service, which distributes *Bay Journal* articles and op-eds about the Chesapeake Bay and regional environmental issues to more than 400 newspapers in the region.

Publication is made possible by grants, reader donations and advertising revenue.

Views expressed in the *Bay Journal* do not necessarily represent those of any funding agency, organization, donor or advertiser. Policies on editorial independence, gift acceptance and advertising are available at bayjournal.com/about.

STAFF

BOARD OF DIRECTORS

SCIENCE ADVISORY COMMITTEE

ADVERTISING

WE'RE JUST A CLICK AWAY

Like us on FaceBook:
Chesapeake Bay Journal

Send us a Tweet:
@ChesBayJournal

Visit us online:

CONTACT US

by mail:
The Bay Journal | 619 Oakwood Drive | Seven Valleys, PA 17360-9395

by phone:
717-428-2819

by email:
kblankenship@bayjournal.com

BAYJOURNAL.COM

BAY JOURNAL NOTEBOOK

Photographer Dave Harp fends off mosquitos while capturing images of a Chesapeake Bay marsh. (Bill Thompson)

Showcasing *Bay Journal* talent

If you know the *Bay Journal,* then you also know our photographer Dave Harp — through his stunning images. This fall, you can view more of Dave's work by taking a road trip or making a virtual visit to the Chesapeake Bay Maritime Museum in St. Michael's, MD, where a new exhibit celebrates 40 years of his photography. *Where Land and Water Meet: The Chesapeake Bay Photography of David W. Harp* will be on view Sept. 25, 2020– Sept. 20, 2021. The *Bay Journal* is helping to sponsor the exhibit, and you'll find a closer look at Dave, his career and the exhibit in our October issue.

Staff writer Whitney Pipkin has become known for her investigations of microplastics in the Bay and its rivers. Along with reporting for the *Bay Journal*, Whitney researched and wrote *Microplastics: The grand reach of our tiny plastics problem* for the Abell Foundation and was recently featured as a guest speaker on the topic on Baltimore radio station WYPR. You can still hear the recorded interview by visiting wypr.org and locating the Aug. 19 program for *On the Record*.

We're also pleased to announce that one of our board members, Donald Boesch, received the prestigious Sustained Achievement Award from the Renewable Natural Resources Foundation. The award recognizes a long-term contribution and commitment to the conservation and protection of natural resources. Don, the retired president of the University of Maryland Center for Environmental Science, is well-known in the Chesapeake region and beyond for his leadership in the field

Others affiliated with the *Bay Journal* have also received various awards from the foundation in the past, including our founding editor Karl Blankenship, who won the Excellence in Journalism Award. Associate Editor Tim Wheeler also won the Excellence in Journalism Award during his earlier years at the *Baltimore Sun,* and Bill Matuszeski, former director of the Chesapeake Bay Program and previously a *Bay Journal* columnist, won its Sustained Achievement Award.

We're grateful that the *Bay Journal* continues to draw such talent to its staff and board of directors. We hope you appreciate their work as much as we do! ■

— Lara Lutz
Managing Editor

NEWS briefs | LOCAL REGIONAL NATIONAL

EPA seeks to expand role of cost-benefit analysis

The U.S. Environmental Protection Agency in June proposed a plan that would make it harder to justify future Clean Air Act regulations.

The plan would change the terms for forecasting the costs and benefits expected from adopting significant new rules. The agency already routinely conducts those analyses, but the proposed new approach would expand the definition of "significant" rules to those that would "disproportionately affect an industry, group or area," according to an official summary.

It would also require separate reporting of the public health and welfare benefits specific to the objective of the relevant Clean Air Act provision.

Among other changes, the proposal would bar the agency from relying on health or environmental "co-benefits" to justify new rules, said EPA Administrator Andrew Wheeler. While the agency would still count such co-benefits, he said, "it just means that they cannot be the express rationale for a regulation." The agency hopes to finalize the rule by December.

In its comments on the rule filed in August, the Chesapeake Bay Foundation said it could result in significantly weaker clean air safeguards that would undermine ongoing efforts to restore the Chesapeake Bay and improve air quality in national parks. Much of the air emissions fall onto the land where they can be washed into the Bay, contributing nitrogen and other pollutants.

"Minimizing co-benefits would deliver a devastating one-two punch to the Chesapeake Bay by undercutting efforts to restore the watershed and accelerating the damage climate change is already doing," said CBF Interim Vice President of Environmental Protection and Restoration Alison Prost.

Wheeler has said the proposal is the kickoff to an agencywide overhaul that will eventually extend to cost-benefit analyses for rulemaking under the Clean Water Act and other major environmental statutes. ■

National Park Service & Corazón Latino launch partnership

The National Park Service Chesapeake Bay Office and Corazón Latino have teamed up to engage Latinx communities with the Bay region's special places.

The collaboration aims to develop culturally relevant and linguistically appropriate materials and experiences for Latinx communities at sites within the service's Chesapeake Bay Gateways Network, which includes more than 300 cultural, historical, natural and recreational sites across the Bay watershed.

"We are thrilled to begin a collaborative partnership with the National Park Service in the Chesapeake Bay region to help Chesapeake partners engage surrounding communities to create more inclusive parks where families can connect with nature, recreate, improve their health and become natural resources stewards for our public lands," said Felipe Benítez, Executive Director of Corazón Latino

For the first year of the partnership, the Park Service is providing $163,125, which Corazón Latino is matching with an additional $86,934 of non-federal resources. In collaboration with the NPS, Corazón Latino will use the funding to:

- Learn about the range of Latinx communities, cultures, customs and networks in the Bay watershed.
- Connect with national, regional and local grassroots Latinx organizations.
- Deploy cultural competency training and develop an outreach program to support organizations working to engage Latinx communities in recreation, education and stewardship.
- Develop a Spanish-language version of the FindYourChesapeake website.
- Host events with Bay organizations to better connect with local and regional Latinx communities. ■

PA program to promote streamside buffers

The Pennsylvania Department of Conservation and Natural Resources in July announced its Buffer My Stream program aimed at encouraging 10,000 landowners with streams on their property to improve water quality and lessen erosion by planting native trees and shrubs along the water's edge.

"Streamside buffers are a natural way for agricultural and residential landowners to create cleaner water and improve the stewardship of their land. Not all eligible landowners are aware of their value — and the purpose of this outreach is to bridge that gap," said Cindy Adams Dunn, the state's natural resources secretary.

The Buffer My Stream webpage provides information about the benefits of streamside buffers, along with simple next steps to learn

See **BRIEFS**, *page 6*

briefs

From page 5

more and get help.

"We want to make it easy for landowners to understand the benefits of streamside buffers and connect them with funding and experts available to guide them through the process," Dunn said.

The DCNR is committing $1.5 million to streamside buffer plantings this year. The overall effort to increase streamside buffers in Pennsyvlania involves partners from nonprofit organizations and all levels of government to plant 86,000 acres of buffers.

"While the efforts that are being taken to slow down the impacts of COVID-19 prevented some partner and volunteer plantings this spring, we are looking to the fall – which also is a good time for planting trees and shrubs – with all of the necessary social distancing and safety measures in place," Dunn said.

Outreach is taking place to residential and rural landowners in Adams, Franklin, Huntingdon, Lancaster and York counties to encourage them to register for free assistance and funding to help plant native trees and shrubs on their properties.

Landowners are encouraged to contact the DCNR for help by calling 717-705-2820 or using the contact form on the Buffer My Stream website.

New technology could help Maryland increase its share of the blue crab market. (Dave Harp)

University of MD awarded $300,000 for blue crab research

The University of Maryland will receive $299,963 in federal funding for research into a new processing technology that could enhance the competitiveness of the domestic blue crab industry.

The blue crab industry has faced increasing competition from imported products, especially Venezuelan fresh pre-cooked crab, which has a longer shelf life. That has caused the Maryland seafood industry to lose market share. The university will explore a new high-pressure processing technology that could extend shelf life of domestic crab products, while improving food safety and expanding market strategies among the seafood industry.

The funding comes from the 2020 Saltonstall-Kennedy Competitive Grants Program through the National Oceanic Atmospheric Administration. U.S. Sens. Ben Cardin and Chris Van Hollen and Rep. Steny H. Hoyer, all of Maryland, advocated for the funds.

"Few things are as iconic as the Chesapeake Bay blue crab, and its harvest is a cornerstone of Maryland's local economies," the lawmakers said. "This grant will expand the competitiveness of domestically produced crab meat in the face of intense foreign competition, and will help unlock new markets for an important Maryland industry," the lawmakers said. ■

Rare sinkhole ponds part of VA's newest natural area preserve

A new preserve in Virginia's Shenandoah Valley now protects globally rare sinkhole ponds and a variety of rare plants and animals. The Lyndhurst Ponds Natural Area Preserve, a 350-acre site in Augusta County, is the 65th addition to the Virginia's preserve system, a network of lands permanently protected to benefit biodiversity and significant natural communities.

"Augusta, Rockingham and Page counties are the only places in the world where these pond natural communities are known to exist, making them some of Virginia's most significant natural heritage resources in need of conservation," said Jason Bulluck, director of the natural heritage program at the state Department of Conservation and Recreation.

DCR acquired Lyndhurst Ponds in June with funds from the DuPont Natural Resource Damage Assessment and Restoration settlement.

This is DCR's fourth project protecting sinkhole ponds with the settlement funds, which are intended to mitigate for historic negative impacts to habitats on land and in water in the South River watershed.

Virginia and the U.S. Fish and Wildlife Service are trustees of the DuPont settlement funds. "By permanently protecting these sinkhole ponds and forests — which are near the former DuPont facility — we take another step toward restoring the waters, wildlife and lands of this area from decades of harm, and, in turn, benefiting the surrounding communities," said USFWS Regional Director Wendi Weber.

Shenandoah Valley sinkhole ponds are characterized by fluctuating water levels throughout the year. Each pond is different and can support small pockets of diverse plants and animals.

The property was formerly used for cattle grazing and was part of the extensive land holdings of Waynesboro Nurseries and the Quillen family. ■

‘Sunny day’ flooding on the rise along the Chesapeake

Climate change driving sea levels higher

By Timothy B. Wheeler

Those who live near the water around the Chesapeake Bay probably know this already, but now it’s official: Last year saw a lot more “sunny day” flooding than there used to be, according to a report issued in July by the National Oceanic and Atmospheric Administration.

Sunny day flooding, also called high tide flooding, is unrelated to rainfall. Driven by rising sea level, the floods that decades ago happened only during a storm now occur more often: when the moon is full or winds shift. While the frequency of such events varies from year to year, the NOAA report warns that it’s only getting worse as climate change drives sea level higher.

“This is the new normal. It’s a floodier future,” said William Sweet, a NOAA oceanographer and lead author of the report.

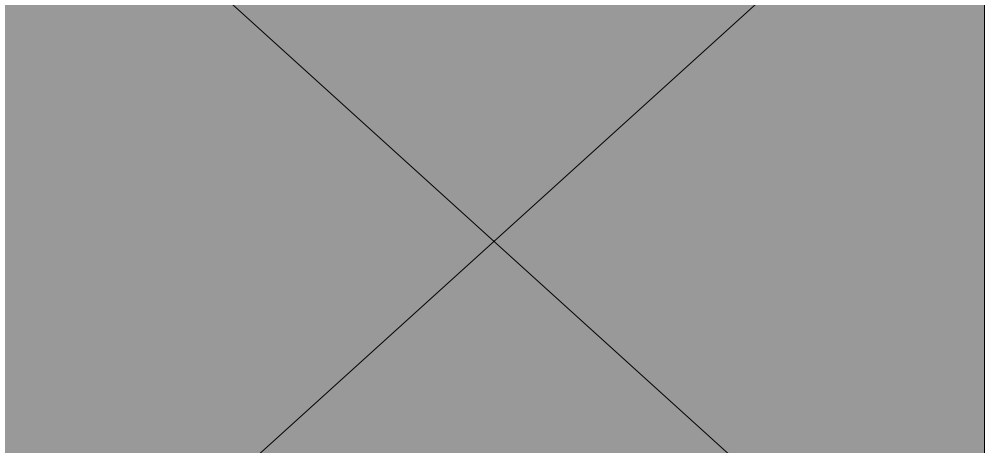
Sunny day flooding inundated the nation’s coastal communities a median of four days in 2019. That’s a bit below the 2018 record of five days. But the trend over time, the report’s authors said, is on the rise.

Such “nuisance flooding,” as it’s sometimes called, occurs when water rises 1.75– 2 feet above the daily average high tide, covering streets or bubbling up from storm drains. The high water can block roads, damage buildings and public infrastructure, and poison low-lying cropland with salt.

Sunny day flooding is accelerating at 75% of the locations the agency monitors along the East and Gulf coasts, the report says. Nineteen places in those regions last year broke or tied previous records. Six were in Maryland and Virginia:

- Cambridge, MD: 11 days
- Solomons Island, MD: 11 days
- Tolchester Beach, MD: 17 days
- Windmill Point, VA: 17 days
- Annapolis, MD: 18 days
- Lewisetta, VA: 20 days

Sweet, who lives in Annapolis, said he sees the trend first-hand, with new tidal flooding records regularly being set in the Bay. Annapolis and Lewisetta, for instance, both set new daily highs in 2018. In comparison, Annapolis averaged just two days of high tide flooding 20 years ago.



Sea level rise is leading to more flooding and higher tides in some Chesapeake watershed communities. Here, high tide impacts a road in Cambridge, MD. (Dave Harp)

The problem is worse along the East and Gulf coasts than on the West Coast, Sweet said. Sea level is rising faster along the East and Gulf coastlines, he noted, and the wide continental shelf off each enables winds to push water levels higher.

While the East Coast, in general, is prone to tidal flooding from northeast winds blowing water against the shore, Sweet said, the Chesapeake is even more vulnerable because winds from the south can also push water up the Bay.

Over the next few decades, NOAA says high tide flooding is bound to worsen. Of the nine Bay communities featured in the NOAA report, the agency foresees sunny day flooding hitting them as many as 20–25 days by 2030 and up to 120–170 days by 2050. ■

Report: Third of PA waterways impaired by pollution

On plus side, 26 waterways were restored since 2016

By Ad Crable

One of every 3 miles of streams and rivers in Pennsylvania has impaired water quality, according to a draft report detailing the state's latest assessment. The number of impaired stream miles has grown by 5,568 miles since the last assessment two years ago.

Of the 85,146 miles of streams and rivers that have been tested, 25,468 miles failed to meet standards for water supplies, recreation, aquatic life or fish consumption. That's 30% of all stream miles in the state. One in every 8 miles of streams and rivers are considered unsafe for recreation. Plus, nearly half of the acres of public lakes in the state have fish that are not safe to eat, according to the report.

The state is required under the federal Clean Water Act to conduct the assessment every other year and list restoration actions for approval by the U.S. Environmental Protection Agency. The reports also help identify priorities for restoration.

The 2020 report reviews 1,700 additional miles of streams than the last report.

The report identifies the top three sources of water pollution leading to impairment as agricultural runoff (5,765 miles), abandoned mine runoff (5,559 miles) and stormwater (3,206 miles). Twenty-eight streams in the state that are impaired for use by aquatic life have been made a top priority for restoration. Agriculture runoff is to blame for all but two, according to the assessment. One is impaired because of acid mine drainage and the other from urban runoff.

On the plus side, 26 streams, rivers or lakes have been fully restored for aquatic life since 2016, according to the report. That includes the Conestoga River and various tributaries to the West Branch of the Susquehanna River.

Approximately 99% of all streams and rivers in Pennsylvania have now been assessed. An interactive status map is available at depgis.state.pa.us/IRViewer2020. To view the draft report, visit depgis.state.pa.us/2020_Integrated_Report. ■

The Conestoga River in Lancaster County, PA, meets standards for aquatic life but remains impaired for recreation because of pathogens in the water from urban runoff and overflows of sewage-tainted stormwater. (Ad Crable)

Microplastics found in Susquehanna smallmouth bass

Scientists scramble to learn their effects on fishes' health

By Ad Crable

Increasingly, as enormous flotillas of plastic waste drifting through the ocean continue to make news, the world is learning that it is awash in plastic. It's even showing up in the Antarctic and in all manner of water organisms, from tiny zooplankton to whales.

Still, there was plenty of shock value when the stomachs of 89 smallmouth bass sampled from the mainstem of the Susquehanna River in Pennsylvania in 2019 each contained an average of 29 pieces of microplastics — tiny bits of plastic about the size of a grain of rice or smaller.

When students from Susquehanna University picked apart the stomachs of the Susquehanna's prized gamefish, they found the usual crayfish, insects, hellgrammites and smaller fish — even bullfrogs and a chipmunk. But also filling the guts were bits of clear and colored plastic.

The most common microplastics pulled from the fish innards were microscopic fibers, which could come from synthetic clothing, twine, plastic straws, tarps, diapers, wipes, fabrics or cigarette butts.

Other types of microplastics included foam from food containers and cups; industrial pellets; film from plastic grocery bags, bottles and candy wrappers; and jagged fragments of plastic.

The microplastics, eaten by smallmouths mistaking them for food, had drifted into the fish's gills or were already inside ingested prey.

A microplastic fiber found in the stomach of a smallmouth bass in the Susquehanna River. (Tommy Bluj/Susquehanna University)

Microplastics often come from larger pieces of plastic that break down over time into microscopic pieces. They are found in waterways and aquatic animals and are also transported by air. (Dave Harp)

"When I saw the numbers, it was staggering," said John Zaktansky, the Middle Susquehanna Riverkeeper.

The Susquehanna University study, which had the cooperation of the Pennsylvania Fish and Boat Commission and state Department of Environmental Protection, called the findings of so many microplastics inside the bass "alarming."

Where did all of those bits of plastic come from? The Susquehanna study did not attempt to track down local sources.

In general, microplastics come from bits breaking off from larger plastics as the items slowly degrade in water, a process that can take over hundreds or thousands of years. They reach the water in many ways. Some travel by way of sewage treatment plants, which are not designed to remove microplastics. According to the state-federal Chesapeake Bay Program, there are 516 major sewage plants in the Bay region, and a study found that each releases an average of 4 million microplastics a day.

Stormwater runoff, which carries plastic bottles and other debris, is another source. So is farmland runoff and direct littering from people on waterways.

Microplastics are also being whisked up in the air, where they may travel long distances before falling back to earth or washed out by rain. In a study published in the June edition of *Science*, researchers sampled the air and rain at 11 national parks and protected areas in the western United States over a period of 14 months and found an amount of microplastics equivalent to 120 million plastic water bottles.

In August, a study by researchers at Arizona State University announced the first evidence that microplastics are found in human organs. The scientists analyzed 47 tissue samples from kidneys, lung and livers and found microplastics in each one.

Not so shocked by the plastic in the Susquehanna fish was John Arway, former director of the Fish and Boat Commission who had long sought — unsuccessfully — to have the Susquehanna River officially declared impaired because of a declining and sick smallmouth population.

Plastics, he noted, have become ubiquitous both on land and water. "It's just an artifact of society now. And fish will eat just about anything they can capture."

One obvious question is: Is all of that plastic floating around harming the Susquehanna's smallmouths or other fish and organisms in the Chesapeake Bay drainage? After all, fish don't digest plastic, and any toxic substances within or absorbed by the plastic may accumulate inside the fish. At the very least, it may give fish a false sense that they are full, inhibiting them from eating enough.

The jury is still out on whether fish and other organisms are harmed by microplastics, though scientists are scrambling to do the research. Most microplastics studies to date involve saltwater rather than freshwater ecosystems.

Both the DEP and Fish and Boat Commission declined to comment on the findings. Spokesmen for both said they had not yet read the full study. "We are interested in the results if the findings reveal a threat to aquatic life," said the commission's Mike Parker.

Jonathan Niles, who headed the smallmouth study and is director of Susquehanna University's Freshwater Research Institute, certainly would like to know more about the potential for harm.

"Anything that is unnatural is cause for concern," he said. "We don't want things like that accumulating in our fish. From an ecologist's standpoint, it's really sad."

A 2017 study in the Potomac River around Washington, DC, found microplastics accumulating in underwater grasses. In 2014, they were found in 59 of 60 water samples taken from the Patapsco, Magothy, Rhode and Corsica rivers. From 2017–18, the U.S. Geological Survey found microplastics in two streams in Virginia, two in DC and the Susquehanna River.

In April 2019, these and other studies led to a gathering of concerned scientists, government officials and environmental groups at a workshop on microplastics research in the Bay region.

Participants concluded that "microplastics are ubiquitous throughout nontidal waters in the Chesapeake Bay watershed" and that microplastics "pose a serious risk to successful restoration of the Chesapeake Bay watershed."

The Bay Program's Scientific and Technical Advisory concluded there was sufficient information to show that plastic pollution was harming "ecosystem health and aesthetics" and drafted five "urgent" recommendations that it asked the Bay Program and participating states to adopt immediately.

In June, the Bay Program launched a Plastic Pollution Action Team, which is working on establishing a full ecological risk assessment of microplastics in the Bay watershed. A first effort may focus on effects of microplastics on striped bass in the Potomac because it has a lot of freshwater and saltwater habitats, and multiple possible pollution sources. ■

MD county protects forests with new laws for 'no net loss'

Conservation advocates hope strong measures in Frederick County will be picked up by others

By Timothy B. Wheeler

One of Maryland's fastest growing counties has moved to halt the loss of its woodlands to development, adopting what environmentalists are hailing as the strongest forest protections in the state.

The Frederick County Council unanimously approved a pair of measures in late July and August that go well beyond Maryland's statewide forest conservation law. The seven-member council agreed to require an acre-for-acre replanting elsewhere whenever wooded areas get bulldozed for new housing, stores, offices or other buildings.

Then in early August, the council amended the county's zoning ordinance to stress that developers must identify and avoid or minimize impacts to historic and sensitive environmental resources "to the maximum extent practicable." The new law also bars developers from counting forested acreage when figuring how many homes or other structures could be built on a given site.

"This really puts Frederick County at the [head] of the pack when it comes to county level forest protections," said Ben Alexandro, water program director for the Maryland League of Conservation Voters. "With these two bills combined, it's not only a no net loss [policy] but also really trying to protect the best and most high-value forests in Frederick County from being chopped down in the first place."

Frederick County, where the population grew about 11% from 2010 to 2019, is the third Maryland county in the Chesapeake Bay watershed to strengthen local forest conservation laws in the past year. Anne Arundel and Howard counties, also among the state's fastest growing, adopted measures last fall that proponents say should slow but not halt their loss of forestland.

Statewide, Maryland is still about 40% forested. Under the state's forest conservation law, first passed in 1991 and amended several times since, the loss of woodlands has slowed. But activists say the state is still not protecting its largest and most ecologically valuable wooded tracts. They've failed so far to persuade state lawmakers to act, though, and instead embarked on a campaign to press the case county by county.

"The trees and other vegetation that make up forests are natural water and air filters, provide habitat for animals, shade streams and create healthy soils," said Erik Fisher, assistant Maryland director for the Chesapeake Bay Foundation. "To protect our natural resources for future generations, we must replant forested land at least at the rate we're clearing it, and that's what will now happen in Frederick County."

The Frederick County forest conservation measure actually reinstates a short-lived law enacted in 2008 that required developers to replace any woods they cleared. During the few years before that mandate was repealed, the county actually gained 41 acres of forest, according to county figures. But it has lost nearly 500 acres of forest since 2012, at the rate of about 70 acres a year.

> *"To protect our natural resources for future generations, we must replant forested land at least at the rate we're clearing it."*
>
> — Erik Fisher
> Chesapeake Bay Foundation

The two bills were pushed by County Executive Jan Gardner, who as an elected county commissioner got the first no net loss requirement adopted.

"The goal of these initiatives is to not only prevent the loss of forest cover in Frederick County but to be forward thinking to preserve our forests, our environmentally sensitive areas and our cultural and historic amenities," she said in a letter to the council. "These proposals will go a long way to ensure that we protect the beauty, rich history and the environment of our county for future generations."

With Frederick County Council meetings taking place online because of the pandemic, the public hearing July 7 on the two bills drew only a handful of speakers, nearly all in support. An aide said the county also received more than 260 emails and other messages supporting the bills.

Tree seedlings in protective tubes stand beside an older forest in Frederick County, MD. (Ben Alexandro)

"I think we need to do more to preserve forest as well as to add to forests," said Kimberly Stewart, owner of a horse farm in the southwestern part of the county, at the hearing. "I'm on well water," she added, "and worry about water quality."

The only person speaking against either measure at the hearing was Eric Soter, representing the Frederick County Building Industry Association. He voiced a number of concerns about the tree replacement requirement and also about the zoning bill, which he contended would reduce the density of development allowed in the county's designated growth areas. He warned of a "longer term effect on land consumption" and a reduction in the supply of new affordable housing.

Gardner disagreed, saying a staff review didn't project that the legislation would force development outside any targeted growth areas. And she noted that neighboring Carroll County has maintained a similar no net forest loss requirement for years.

The forest conservation measure passed July 21. The zoning ordinance change got postponed until Aug. 4 amid debate over whether two pending rezoning applications should be exempted from the new limits on developing forestland. One of the applications would put up to 600 homes on a partially wooded 160-acre tract by Lake Linganore, which furnishes drinking water to the city of Frederick. The council opted not to exempt the projects, but scheduled hearings on them before the new zoning law is to take effect. That means those rezoning requests won't be subject to the additional requirements and limitations.

Council member Kai Hagen, who sponsored both bills on Gardner's behalf, said he hopes Frederick County's forest conservation legislation will have "a rippling effect beyond the county, as other counties and the state evaluate what they can do better."

Modest improvements in forest conservation are in the works in two other Maryland localities.

The Baltimore City Council is weighing expanding protections for forest "patches" too small to be protected by state law. About 20% of the city's urban forests are outside of municipal parks, distributed across thousands of privately owned parcels of a fifth-acre or less. The measure awaiting final approval in September would require replanting when as little as 5,000 square feet of forest are cleared, while the state law only covers disturbances of 20,000 square feet or more.

The Montgomery County Council, meanwhile, is considering changes to its regulations that include extending from two years to five years the length of time that replanted trees must be maintained by developers. Activists say that would improve the survival of replacement trees. They are pressing the council to consider more substantial reforms in the near future. ■

Latinx *promotores* lead the way for environmental action

Program has trained more than 100 residents to become advocates for their communities

By Jeremy Cox

Candida Garcia had never been involved in environmental causes. But over the past four years, she has founded a community garden, grilled local officials about air quality, campaigned for statewide bans on plastic bags and straws and successfully lobbied her county to purchase electric school buses.

Garcia chalks up her transformation to a leadership program tailored to a demographic that the White-dominated environmental movement has historically overlooked: the Latinx community.

Including Garcia's inaugural class of 2016, Chispa Maryland has produced more than 100 graduates from its *Promotores* program. Over the course of six to eight weekly classes, they are given the basics of environmental justice, advocacy and community organizing — with the hope of creating a generation of grassroots "promoters."

Garcia and her fellow *promotores* are finding that their work has never been more difficult or urgent. During one of the most imperative moments in its short history, the program may be the prototype that shows green groups in the Chesapeake Bay region and elsewhere how to diversify their membership, said Ramon Palencia-Calvo, director of Maryland's Chispa.

Candida Garcia works at the Rosa Parks Elementary School community garden, which science teachers have used as a living classroom. (Maryland LCV Education Fund)

"I think there's an understanding among environmental groups that we need to expand our reach beyond the typical audience — the White middle-class person who has disposable time and income to volunteer for an environmental cause," he said. "We want to create a movement that represents the entire population of Maryland."

Nearly 90% of leadership positions in environmental groups nationwide were held by White people as of 2014, according to a widely cited study. Hispanics and Latinos occupied fewer than 3% of those positions.

Due to racist housing policies, their communities, though, tend to bear more environmental burdens, suffering from poorer air quality, greater impacts from climate change and more toxic contamination.

"In order to make real change, we needed to build power in those communities that are overburdened by pollution and are underserved," Palencia-Calvo said.

Chispa, meaning "spark" in Spanish, was created by the Maryland League of Conservation Voters in 2014. It was the fourth state-based LCV organization to have its own Latinx-geared program after New Mexico, Colorado and Arizona. LCV affiliates in Connecticut and Nevada launched programs the following year, bringing the total to six nationwide.

Palencia-Calvo, a former fellow at the Worldwatch Institute, has been overseeing the Maryland program from its earliest days. He never worried about finding a receptive audience. Polls routinely show that Hispanics are concerned about global warming and are apt to believe it is caused by humans. They also show a strong commitment to a host of other environmental issues.

So, he and his team started knocking on doors, beginning in Langley Park in Prince George's County. About three-quarters of the community's nearly 20,000 residents are Hispanic. Their housing is often plagued by mold and lead-based paint. The outdoors offers little reprieve because the air is fouled by the area's heavy traffic.

Four years later, about 30 of Chispa's *promotores* reside in the densely populated nook just inside the northeastern corner of the District of Columbia's Capital Beltway. Garcia was one of the first.

Candida Garcia and students from Rosa Parks Elementary School in Prince George's County, MD, teamed up to create the school's community garden. (Maryland LCV Education Fund)

Speaking in Spanish with Palencia-Calvo acting as a translator, she said concerns about the health of her four children triggered her interest in the environment. Could one of her son's severe asthma attacks be linked to bad air quality or her aging home? How could she find out if her drinking water was safe?

She and other Chispa participants gathered with their families in the evenings at the local community center. Childcare wasn't a problem because Chispa had educational activities waiting for them. Everyone brought a dish to share.

Chispa staff conducted most of the training, but some sessions featured experts from other environmental groups. After 40 hours of training — the total has since been shortened to 24 hours — Garcia received her graduation certificate. She swelled with pride. *"Muy feliz"* (very happy) is how she describes the feeling today.

Then, Garcia got to work. With financial support from the Chesapeake Bay Trust, she organized a community garden at Rosa Parks Elementary in Hyattsville. It was designed as a "therapy space," where families could enjoy a rare opportunity to be together, she said. They grew tomatoes, peppers and other staples, which were distributed among some of the school's low-income families. For the science teachers, it became a living classroom.

Because of the pandemic, the garden was left fallow this year, but Garcia's other efforts continue to bear fruit. In 2017, Chispa Maryland launched a "Clean Buses for Healthy Ninos" campaign, seeking to steer some of the state's $75 million Volkswagen settlement money toward zero-emission, electric school buses. Garcia was on the campaign's front lines, writing a blog post and talking to elected officials.

Last September, the Maryland Department of the Environment invested $2.5 million of that funding in an electric– and propane-bus pilot program in four counties, including Prince George's.

The *Promotores* classes have been put on hold this year because of the pandemic, but Chispa leaders hope to restart the program once it's safe for groups to gather again.

This year's seemingly unending battle with COVID-19 has plunged Garcia and Palencia-Calvo into territory that would be unfamiliar for many green-focused groups. Garcia, a board member with the Langley Park Civic Association, partnered with Chispa to apply for a grant from LCV's COVID-19 fund. The association was awarded $20,000, which will be disbursed to families who have suffered financially because of the pandemic. Chispa and the civic association collected an additional $15,000 through community fundraising efforts.

The community has given much to the green movement over the years. Now, it's time to give back, Garcia said.

"Environmentalism is about the health of the families and the people that we love," she said. ■

Missed again?

As Bay states aim for 2025 cleanup targets, many are still far off the mark, especially in agriculture, stormwater

By Karl Blankenship

It's been 10 years since the Chesapeake Bay watershed was put on a "pollution diet." And while there's been some belt tightening since then, the regional effort to reduce nutrient pollution in order to restore a healthy Bay has fared about as well as many other diets: It is far from meeting its 2025 goal.

Officials in Bay states say it is too early to throw in the towel. "Our work is certainly cut out for us," said Ben Grumbles, Maryland environment secretary. "And there are significant headwinds."

Indeed, the numbers paint a grim picture.

Nitrogen is the main source of the Bay's woes and the prime target of the cleanup effort. Over time, there has been some progress: In the last 34 years, the region has averaged 2.4 million pounds of nitrogen reductions a year.

But the job ahead is much harder. In the next six years, the pace must more than triple to nearly 8.7 million pounds a year — a rate it has never attained.

Most of the problem, by far, is in Pennsylvania, which is lagging behind. Although it doesn't border the Bay, Pennsylvania contributes more than two-fifths of its nitrogen, and must control more of the nutrient than all of the other states combined to reach its goal. Its shortfall alone would ensure that much of the Bay would not meet clean water goals.

Other states and the Chesapeake Bay Foundation are threatening to sue the U.S. Environmental Protection Agency to make it press for more action from the Keystone State.

But other states have major challenges, too, and will struggle to implement their cleanup plans as written. The only exceptions are the District of Columbia and West Virginia, which have already met their goals. None of the others are on track to meet their 2025 nitrogen goal, according to recent data.

Not only will states need to pick up the pace, they will have to get most of their pollution reductions from sources where all have struggled — agriculture and stormwater.

The overwhelming majority of nitrogen reductions since the diet went into effect was achieved by upgrading wastewater treatment plants. Stormwater has been increasing, according to computer models. And agriculture — the largest source of nutrients to the Bay — produced less than 1 percent of the reductions during the last decade, according to computer models, though most states contend that underestimates their efforts. Nonetheless, agriculture is being counted on for 84% of nitrogen reductions in the next six years.

This would require governments and farmers to plant streamside buffers, fence livestock out of streams, build manure storage facilities and install other runoff control measures at a pace far beyond what they have achieved to date. And that would require far more public dollars.

"You can do the math in your head," said Ann Swanson, executive director of the Chesapeake Bay Commission, which represents state legislatures. "Let's face it, this job is bigger and more complex than anything we imagined."

Ramping up efforts will be even more difficult, state officials acknowledge, because the installation of nutrient control practices has been slowed by the COVID-19 pandemic.

Pending budget cuts at the state and local level are likely to produce further headwinds. Many local governments have already delayed or canceled new stormwater control measures.

Wheat is harvested along the Choptank River in Talbot County, MD. Almost all of the states are lagging in meeting nutrient reduction goals in the agricultural sector. (Dave Harp)

Going on a diet

The region agreed in 1983 to work together to restore the health of the nation's largest and most productive estuary — a place where fresh– and saltwater mix. The EPA, states and the District of Columbia formed the Chesapeake Bay Program to oversee the effort.

Within a few years, the program determined the main problem was too much of the nutrients nitrogen and phosphorus.

Nutrients are essential to fuel algae growth, the base of the Chesapeake's food web. But when there are more than can be consumed by fish, oysters and others, they form blooms that block sunlight needed by underwater grass beds, a critical habitat for crabs, fish and waterfowl.

When the algae die, they sink to the bottom and are decomposed in a process that removes oxygen from the water, causing "dead zones," which are off-limits, and often lethal, to aquatic life.

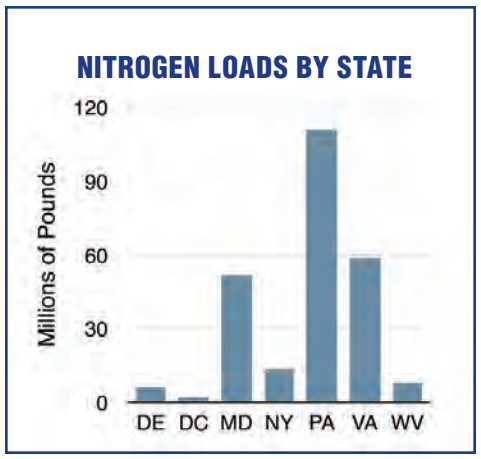
The states began working in the mid-1980s to control nutrients entering the Bay, with mixed results. Progress has been made with phosphorus, thanks to phosphate detergent bans and efforts to reduce erosion on farmland (phosphorus tends to bind with sediment), though it still requires more effort to control in the next six years.

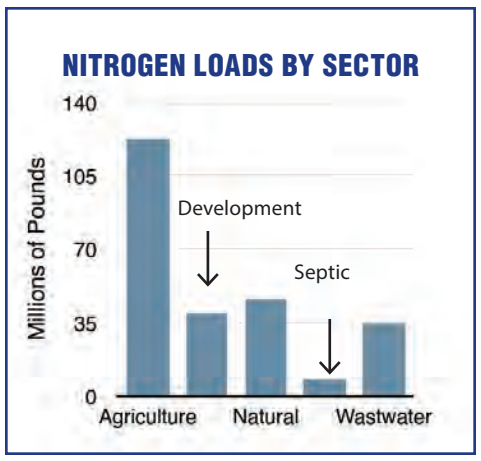
Progress has been more difficult with nitrogen, which also tends to have a greater impact on Bay water quality. It more easily runs off the land, and it sinks through the soil and reaches streams through groundwater.

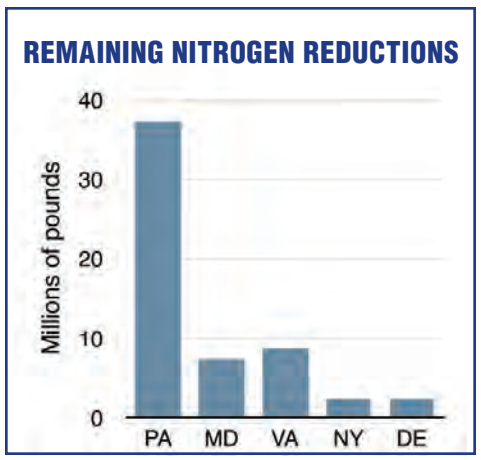
Since the 1980s, computer models have shown that the region needs to reduce the amount of nutrients entering the Bay by roughly 40% to restore "healthy" water quality.

The Bay Program set goals to accomplish that for 2000 and then again for 2010. Although progress was made, they missed both by a wide mark.

The states and EPA then worked to develop the so-called "pollution diet" — the Chesapeake Bay Total Maximum Daily Load — which established the maximum amount of nutrients each state could send to the







These charts display estimated nitrogen loads to the Chesapeake by state, by major source sector, and how much further each state must go to reach its 2025 goal. These estimates, and other numbers in this report, were produced with the latest version of the Bay Program's Chesapeake Assessment Scenario Tool model (CAST-19). The major source sectors included are:

- *Agricultural, which includes all farm activities from pastures to crops to animal feeding operations.*
- *Developed land, which includes regulated stormwater systems as well as runoff from developed areas outside those covered by permits.*
- *Natural, which includes forests, wetlands and other undeveloped areas.*
- *Septic, which includes septic and other on-lot systems.*
- *Wastewater, which is mainly wastewater treatment plants but also includes industries and combined sewer overflows.*

Bay in order to clear its water and end dead zones. The deadline for actions to achieve those reductions was set for 2025.

States agreed to write plans saying how those goals would be achieved and established two-year milestones to keep them on track. Unlike earlier voluntary goals, if states fall behind under the TMDL the EPA can take a variety of actions, ranging from withholding grant money to taking over state permitting programs. It has rarely done so.

A challenging path ahead

Like many diets, the first pounds of reductions were relatively easy. They were accomplished by technology upgrades at wastewater treatment plants. But most plants in the watershed are now upgraded, leaving little potential for additional reductions.

Shedding the remaining pounds will be more difficult.

Reducing nutrients from farmland and stormwater in developed areas is a greater challenge because runoff is more dispersed, requiring many control actions spread over huge areas. Stormwater controls are by far the most expensive, and get less emphasis in state plans, even though models suggest nitrogen runoff from stormwater is increasing. States are counting on them for less than 5 percent of the reductions by 2025.

New state cleanup plans completed last year emphasize agriculture because it generates the largest amount of nitrogen and is generally less costly to control. But it still needs money, time and labor that many farmers don't have, so partnerships with conservation districts, governments and nonprofits are critical and often can't keep up with demand.

Working with farmers to install streamside buffers, plant nutrient-absorbing cover crops or build manure storage facilities typically requires one-on-one meetings, and technical and financial support — not to mention willing landowners because such practices are voluntary.

The U.S. Department of Agriculture, the largest funding source for those activities in the Bay watershed, doesn't provide enough for the ramped-up activity called for in state plans. That means states would need to come up with tens, or hundreds, of millions of additional dollars.

Jeff Corbin, who served in senior Bay-related posts in both Virginia and the EPA, noted that the region has made progress, and Bay water quality has shown improvement. But, he said, the Bay Program will need to acknowledge that the overall 2025 goal will be missed, though some states might reach their individual targets.

"Just because we start reassessing whether

Excess nutrients in the water lead to algae blooms, which when they die and decay, deplete water of oxygen. (Dave Harp)

2025 can be done, that is not a failure," Corbin said. "There's been huge progress made. I just think we need to have a very robust, very honest discussion of what 2025 is going to look like and what we need to do to get back on track.

"I think part of that is going to be extending the deadline for certain sectors and certain states, which I don't think is a bad thing as long as the enforceability of this plan is going to stay in place and we know we are going to get there at some point," he said.

State roundup: Pollution reductions

Here's an update on where states stand on their share of the pollution diet.

It's based on recent reviews by the EPA, the Chesapeake Bay Foundation and data from the Bay Program computer model, which tracks cleanup progress. States annually report their cleanup actions, such as the wastewater treatment plant upgrades or runoff control measures installed on farms or developed lands. That data are fed into the model to estimate the amount nutrient reductions achieved each year.

PA Nitrogen Loads to the Bay

Estimated 2019 Load: 110.4 million lbs.
2025 Cleanup Target: 73.17 million lbs.
2025 State Plan: 83.29 million lbs.
State plan does not achieve cleanup goal

PENNSYLVANIA

Pennsylvania is far off track to meet its goals. Since 2010, it reduced its nitrogen load just 2.5%, from 113.2 million pounds to 110.4 million pounds. Its latest cleanup plan, completed last year, would reduce that to 83.3 million pounds. But the state's goal is 73.1 million.

The plan also identified an annual funding gap of $324 million — and that shortfall only covers a plan that was still 9.8 million pounds short of its goal.

As in most other states, wastewater plant upgrades are responsible for almost all of its nitrogen reductions in the past decade. But those plants account for only 8% of the state's nitrogen load and cannot be squeezed much more.

Fertilizer and manure runoff from the state's 33,000 farms in the Bay watershed — which covers half the state — are the largest source of nitrogen. The state is counting on them for a 93% reduction by 2025.

Plus, instead of trending down, the Bay Program's computer models suggest farm runoff increased about 2% percent since 2010.

State officials contend those numbers do not reflect reality. They say many measures are not included, such as wetland mitigation projects, reclamation of abandoned mine lands and controls that farmers installed on their own but did not report.

Harry Campbell, director of science policy and advocacy in CBF's Pennsylvania office, said some studies do suggest there could be a substantial undercounting of pollution controls. But, he said, more work is needed to determine how far that would go in closing the gap.

That highlights a key problem: lack of

See **TARGET,** *page 14*

TARGET *from page 13*

money. The Republican-controlled General Assembly has squeezed environmental programs for a decade, leaving them underfunded and understaffed.

As a result, the state lacks money to track pollution-control measures and lacks enough staff to help farmers install them. Even if the state suddenly had funding for farm conservation programs, many contend it would not have the ability to spend it.

"You have to address the system, and that requires people, programs, permits, outreach education and, in many cases, direct assistance for implementation," Campbell said.

Another problem: The state hasn't been able to enforce rules it already has on the books. Farms are supposed to have erosion control and manure management plans, but no one knew if they actually did.

The state has spent more than two years surveying farms representing 10% of the agricultural acreage to determine whether they have plans (most do). This year, a second phase of the program is to determine whether the plans are being implemented.

Pennsylvania also has more runoff from developed land than any other state. While it was successful in getting municipalities to submit plans to address the problem, it lacks the staff to review them.

The state does get high marks for working with local governments and stakeholder groups in writing county-specific cleanup plans. Those plans reflect a consensus of what is doable in the counties — if funded.

"What we see with our partners is a lot of energy and a lot of desire for us to clean up our waterways," said Pat McDonnell, Pennsylvania environment secretary. "People are very engaged."

But the plans completed so far, which include Lancaster County, by far the state's largest source of nutrients, still fall short of goals. The state aims to have plans completed for all counties by the end of 2021.

Campbell praised the county planning process, which was more extensive than any other state. But, he added, "the plan is only as good as it's implemented, and the commonwealth needs to invest. … It's been the persistent theme throughout this entire endeavor: the lack of investments in these plans."

The EPA has asked the state to identify funding sources that could support the ramped-up efforts it is planning for the next two years. During that time, the state says it will more than triple the number of forest buffers, double the number of grass buffers and achieve a tenfold increase in cover crop acreage.

Help could be coming. State Sen. Gene Yaw, majority chair of the Senate Environmental Resources and Energy Committee, is working on legislation that would, for the first time, create and fund a state program to provide conservation assistance for farmers.

An overwhelmed manhole cover spews rainwater during a thunderstorm in Cambridge, MD. (Dave Harp)

Still, McDonnell said, momentum is building. "We've seen a lot of interest, a lot of energy within our agricultural community and other partners, wanting to move faster."

VA Nitrogen Loads to the Bay

Estimated 2019 Load: 58.35 million lbs.
2025 Cleanup Target: 55.72 million lbs.
2025 State Plan: 49.57 million lbs.
State plan exceeds goal to help offset climate change impacts and because nutrient controls in lower rivers have less impact on the Bay.

VIRGINIA

Virginia is largely on track to meet its nitrogen goal because of its success in reducing discharges from wastewater treatment plants, which were slashed 45%, or 10 million pounds, in the past decade.

The state plans to get the majority of its remaining nitrogen reductions from agriculture. That would require a huge acceleration of effort: In the last decade, model data shows the state had a net reduction of only 167,000 pounds of nitrogen from farms. Its plan calls for ramping that up to 7 million pounds over the next six years.

"We're not under any illusions that it's going to be easy, or that we're where we need to be right now," acknowledged Matt Strickler, state secretary of natural resources.

But he points to signs of newfound commitment, including the General Assembly's passage this year of a bill giving the state the authority to require farmers to complete nutrient management plans and fence livestock out of streams if adequate progress is not made by 2025.

That would require a huge acceleration. The state has installed only 9,688 acres of streambank fencing since efforts began more than a decade ago, but it plans to install them on 10,000 new acres this year and next, and reach 72,156 acres by 2025. A recent EPA review told Virgina to provide more details on how it will achieve huge increases for that and other runoff control practices.

"We're going to need a lot more money to make it happen," said Joe Wood, CBF's Virginia senior scientist. While the (Gov. Ralph) Northam administration has increased spending, "when you stack that up with what we think is needed to get to our actual goals, it's still a small number."

A recent assessment found that spending for agricultural conservation programs would need to increase more than fivefold, to $230 million, by the 2023–24 budget cycle.

Both the CBF and EPA flagged Virginia for falling behind on issuing stormwater permits, which include pollution reduction requirements. Some permits no longer coincide with the 2025 cleanup deadline, meaning full implementation is likely to be pushed back.

Wood said the state may meet its goal if wastewater treatment plants continue to overperform and offset shortfalls in agriculture and stormwater. "If we don't get more from wastewater, absolutely not," Woods said.

Strickler said the state is planning to require wastewater treatment upgrades that would ratchet down discharges at underperforming plants, particularly in the York and James rivers. "There's a way that we can meet our overall goals even if agriculture does fall short," he said.

But, he added, it was the state's intention to meet its goals for all sectors.

MD Nitrogen Loads to Bay

2019 Estimated Load: 52.02 million lbs.
2025 Cleanup Target: 45.78 million lbs.
2025 State Plan: 44.72 million lbs.
State plan exceeds target to help offset climate change impacts

MARYLAND

Maryland is close to being on track to meet its goals but that is largely the result of upgrades at wastewater treatment plants, which slashed discharges by 39%, or 5.4 million pounds, since 2010.

Agriculture, by far the state's largest contributor of nitrogen to the Bay, declined by 3%, or about 719,000 pounds during that time. The slow progress was due in part to growth in the agricultural sector, which offset the impact of conservation practices.

In the next six years, Maryland plans to reduce nitrogen from agriculture by almost 5 million pounds, and plans to get another 1.7 million from wastewater plants.

"We're largely on track but we have more work to do on urban stormwater and agriculture and climate change," said Ben Grumbles, secretary of the Maryland Department of the Environment. "And we fully acknowledge that."

Erik Fisher, CBF's Maryland assistant director, generally agreed. "The wastewater side has a long track record of success. We're pretty optimistic about that. The agricultural side, absolutely, is more of a challenge."

But he said, "farmers have demonstrated a commitment over the last 15 years and that gives us optimism."

Maryland also has a longstanding cost-share program with dedicated funding to support conservation actions on farms and has enacted laws to bolster its efforts, such as requiring livestock to be fenced out of streams.

Many conservation districts have said they don't have staff to meet the needed increase in technical support for farmers. Maryland is planning to reallocate up to 53 positions to provide more assistance.

Still, the recent EPA review said the state isn't on pace to meet goals for practices such as planting grass buffers along streams and installing animal waste management systems.

It is also behind in issuing new stormwater treatment permits, which can include pollution reduction requirements. While stormwater is a smaller contributor of nitrogen than agriculture or wastewater, it has been increasing since 2009, according to model estimates.

Many environmental groups expressed disappointment in the relatively small reductions set for stormwater — about 230,000 pounds by 2025. And that may not happen if it can be offset by wastewater treatment plants that exceed their goals.

Fisher said such offsets from wastewater plants should only be a temporary "bridge" until communities can achieve stormwater reductions on their own.

Grumbles though, sees nutrient trading and other market-based approaches as an important way to help finance future reduction activities.

Environmentalists would rather see the state increase natural filters such as trees and bioswales to control runoff. Such measures can help control flooding and provide other local benefits, Fisher said. "They beautify communities, they raise the value of communities. We need all of these benefits in addition to the nutrients that are addressed."

The state has upgraded 64 of its 67 largest wastewater plants; the last three are in the planning stage. It also has an incentive program encouraging plants to discharge less nitrogen than they are allowed.

"The wastewater sector has been a real workhorse for the state, and we hope it will continue to be," Grumbles said. "But we recognize that the key is going to be to have other sectors step up more."

DC Nitrogen Load to Bay

2019 Estimated Load: 2.05 million lbs.
2025 Cleanup Target: 2.42 million lbs.
District Plan: 2.31 million lbs.

DISTRICT OF COLUMBIA

The District has already achieved its 2025 target, mainly because of upgrades to the Blue Plains Advanced Wastewater Treatment Plant — by far the largest treatment plant in the region.

A new, massive underground tunnel that holds much of the District's stormwater until it can be treated has further reduced pollution, and construction of another tunnel is planned.

While the District has achieved its overall goal, it has not achieved its sub-goal for stormwater, though more work is under way. The EPA had no criticism of the District's plans.

NY Nitrogen Loads to Bay

2019 Estimated Load: 13.87 million lbs.
2025 Cleanup Target: 11.53 million lbs.
2025 State Plan: 12.53 million lbs.
State plan does not achieve cleanup goal

NEW YORK

New York has achieved just a 4% nitrogen reduction since 2009 and is not on pace to meet its goals. Further, its plan falls significantly short — 1.3 million pounds — of its goal. As a result, if there is a suit against the EPA to try to force action against Pennsylvania, it would also likely cover New York.

New York also had the steepest rate of decline in agricultural nitrogen runoff of any state — about 12%. But much of that was due to a sharp decline in dairy farming. A recent EPA review recommended that the state further ratchet down wastewater treatment plant discharges. Although the largest plants have been upgraded, they are still allowed to discharge a higher concentration of nitrogen than most other states.

Many communities are not covered by stormwater permitting programs. The EPA urged the state to explore expanding those programs.

The EPA also asked the state to detail how it would achieve the increase in nutrient reduction controls in urban areas. For instance, it only had 54 acres of developed land covered by bioretention controls in 2019, but calls for increasing that to 53,133 acres by 2025.

The EPA also asked for more detail about how it would achieve ambitious goals for farms.

DE Nitrogen Load to Bay

2019 Estimated Load: 6.7 million lbs.
2025 Cleanup Target: 4.55 million lbs.
2025 State Plan: 4.46 million lbs.

DELAWARE

The vast majority of the Delaware's nitrogen load comes from farms, and data show that declined only 2.6%, or about 140,000 pounds, in the last decade.

Steve Reinford captures methane gas from the manure from his 500 dairy cows to provide all the heat and electricity at his farm near Mifflintown, PA. He sells surplus electricity back to the power company. States will need to promote innovative strategies to meet their goals. (Dave Harp)

In part, that's because conservation measures taken by farmers were offset by more intensive agriculture activity, such as more production on crop land and increased numbers of animals.

Nonetheless, the state needs to reduce nitrogen runoff from agriculture by about 2.2 million pounds by 2025 — roughly a 16-fold increase over what it's achieved since 2010.

In a recent review, the EPA said the state failed to provide evidence that it had the capacity to install the practices needed to meet its 2025 goal.

WV Nitrogen Loads to the Bay

2019 Estimated Load: 8.07 million lbs.
2025 Cleanup Target: 8.22 million lbs.
2025 State Plan: 7.49 million lbs.

WEST VIRGINIA

West Virginia already has met its 2025 goals primarily because of a deal it struck years ago.

When the TMDL was originally written in 2010, the EPA granted West Virginia 200,000 pounds of phosphorus reduction credit, recognizing its distance from, and less impact on, the Bay. Rules in place at the time allowed the state to exchange that for nitrogen credits at a 10 to 1 ratio, thereby offsetting about 2 million pounds of nitrogen reductions. Although that ratio was later changed, the Bay Program allowed West Virginia to maintain a very similar reduction in 2017 which — when goals were recalculated using newer modeling in 2018 — resulted in the state achieving its goal.

Although the state has achieved its overall nitrogen goal, recent model estimates show nitrogen levels increasing in its agricultural sector.

The EPA review said the state is not on track to meet the goals it set for some measures to control that runoff, such as installing poultry waste management systems and establishing forest buffers along pastures. ■

‘Forever chemicals’ found in freshwater fish

Scientists find high levels of PFAS in smallmouth bass and water from Maryland’s Antietam Creek

By Timothy B. Wheeler

High levels of “forever chemicals” have been reported in freshwater fish and water from a Maryland creek, raising new questions about the extent and seriousness of these compounds’ contamination in the Chesapeake Bay watershed.

Per– and poly-fluoroalkyl substances, or PFAS, were found in the plasma of smallmouth bass taken in 2018 from Antietam Creek near where it flows into the Potomac River, according to Vicki Blazer, a biologist with the U.S. Geological Survey’s Leetown Science Center in Kearneysville, WV.

PFAS compounds also were detected — though at lower levels — in the plasma of the popular gamefish in three other locations: the South Branch of the Potomac in West Virginia and at two sites in the Susquehanna River in Pennsylvania.

PFAS are a group of more than 4,700 chemicals that have been used for decades in a wide variety of products, including non-stick cookware, stain– and water-repellant fabrics and fire-fighting foams. They are very persistent — hence their nickname — and have been found across the United States in groundwater and surface water, in fish and other foods, as well as in people’s bodies.

The extent of PFAS contamination reported in the six-state Chesapeake Bay watershed has been fairly limited — about 20 sites, many of them connected with military bases or airports where fire-fighting foam has been sprayed. But testing to date also has been limited, though Pennsylvania and Maryland are expanding their search for the compounds in drinking water supplies.

The USGS data are the first reports of PFAS contamination in finfish in the Bay watershed, though a 2002 study reported finding the compounds in oysters at the mouth of the Patuxent River. The Maryland Department of the Environment is checking for PFAS in oysters from that site and from the St. Mary’s River.

Animal studies have found that exposure to high levels of some PFAS can affect growth and development, reproduction, thyroid function and the immune system, as well as injure the liver. Just as they’ve been found in many people, PFAS also have been widely detected in wildlife and fish, where their effects on those animals are less well-known. But PFAS bioaccumulate, meaning they can build up in people who eat contaminated fish and wildlife.

Blazer said the levels measured in the Antietam Creek bass were high compared with what she’d seen in scientific literature. A Canadian lab commissioned by the USGS to analyze the blood plasma samples detected six different PFAS compounds. Levels of one — perfluorooactane sulfonate, or PFOS — measured as high as 574,000 parts per trillion. The average PFOS level among all 34 bass plasma samples was 381,000 parts per trillion.

PFAS levels in fish tend to be highest in their blood and livers, Blazer said, with much lower levels in their muscle or tissue, which is what’s typically converted for fillets.

“So what we’re eating tends to be lower [in PFAS] than in the plasma,” the USGS scientist said.

“We don’t know what it means to the fish yet,” she added. But it’s become one more possible factor in the health problems she’s been studying for more than a decade in the watershed’s smallmouth bass, including abnormal sexual organs, skin lesions, die-offs and poor reproduction.

Research suggests several factors could be involved in the species’ declining abundance in the watershed, including abnormally high river flows during the spring spawning season. But Blazer and her team have identified other possible culprits, including bacteria, viruses, parasites and hormone-altering chemicals that can suppress a fish’s immune system.

“It does look like [PFAS] might be another risk factor for the immunosuppression we see,” Blazer said. She’s having plasma analyzed from fish collected in other years to see if they also show PFAS contamination.

Brent Walls, the Upper Potomac Riverkeeper, called the PFAS levels in bass plasma from Antietam Creek “astronomical” and “very troubling.” Anglers fishing for sport often release smallmouth bass, he said, but many also are consumed.

The riverkeeper said the USGS data prompted him to look for possible sources of PFAS in Antietam Creek. He hired a Pennsylvania laboratory to analyze water samples he collected from outfalls for wastewater treatment plants serving Hagerstown and Smithsburg. He also sampled water near the mouth of the creek for a comparison.

Vicki Blazer, fish biologist with the U.S. Geological Survey, removes kidney of euthanized fish collected from the South Branch of the Potomac River. The organ was to be analyzed to assess whether it was affecting the ability of the fish to fight off disease. Studies have found that PFAS can affect the immune system of lab animals. (Heather Walsh/USGS)

The lab detected a total of 11 different PFAS compounds at the three sampling sites. The lab measured a cumulative 138 parts per trillion in treated wastewater at Hagerstown, 82 parts per trillion at Smithsburg, and only 7 ppt at the creek’s mouth.

The U.S. Environmental Protection Agency does not regulate PFAS, though it has said it’s moving toward doing that for a handful of the compounds. It did set a “health advisory level” in 2016 for drinking water of 70 parts per trillion for two compounds, PFOS and PFOA, or perfluorooctanic acid.

Levels of PFOS and PFOA in the riverkeeper’s water samples did not exceed the EPA recommended level for drinking water. But Walls noted that PFAS can build up in animals and people if they ingest it repeatedly over time.

“There’s just a lot of unanswered questions about levels,” he said. “What’s the toxic level in drinking water? What’s the level in fish consumption? What’s good and what’s not good?”

He said he was also worried that contaminants might be in sewage sludge from wastewater plants, which gets spread as fertilizer on farm fields.

Walls said he had presented his and the USGS data to the Maryland Department of the Environment earlier this year but was frustrated by the agency’s lack of response to date.

A number of states, likewise frustrated by the EPA’s failure to regulate PFAS, have set or are considering setting much lower limits on PFAS in their drinking water. Pennsylvania is among them. With about 30 contaminated water supplies reported across the state already, the Department of Environmental Protection began testing for PFAS last year in about 400 other locations statewide where it believes contamination is possible.

MDE spokesman Jay Apperson said agency officials have reviewed the Antietam Creek information and hope to have a conference soon with the riverkeeper. Apperson said officials want to know more about how he collected the water samples and the basis for his conclusion about health risks associated with PFAS in fish blood.

Walls welcomes the scrutiny. “Everything was by the book ... our sampling program is pretty solid,” he said. Meanwhile, he said he hopes that Maryland officials will be prompted to do their own research and protect the public.

“It’s pretty much up to the states to start doing this, because the federal government is dragging their feet for sure,” he said. ■

‘Good first step’: Bay leadership commits to diversity

Deadlines set to create environmental justice board and present implementation plan

By Jeremy Cox

In 1619, a privateer ship sailed into the Chesapeake Bay, carrying a transatlantic shipment of human cargo from Africa. At Point Comfort in southeastern Virginia, the 20 or so Black occupants aboard the vessel were bartered for food.

Thus began the slave trade in English-ruled America.

Twenty score and one year later, as the watershed’s states and federal government work to restore the Bay’s ecological health, their efforts remain permeated by the racial wrongs that first sprouted on the estuary’s shores, environmental justice advocates say.

Amid nationwide racial protests and a pandemic that has exacerbated longstanding inequalities, state and federal leaders in the Bay restoration effort took a major step Aug. 18 toward healing that divide.

The Chesapeake Executive Council formally adopted a plan that for the first time in the program’s nearly 40-year history that outlines actions to improve diversity among its leadership and end environmental inequities.

The policy was unanimously signed by the council’s membership: the governors of Maryland, Virginia, Pennsylvania, Delaware, New York and West Virginia; the mayor of the District of Columbia; the head of the Chesapeake Bay Commission, which consists of legislators from Bay states; and the administrator of the U.S. Environmental Protection Agency.

“This statement and the strategy it supports for the Bay partnership are great first steps,” said Virginia Gov. Ralph Northam. “We must build equity into all our restoration work and make sure that all people, not just a privileged few, reap the benefits of our efforts.”

The move comes six years after the multi-state and federal Chesapeake Bay Program approved a “diversity outcome,” which outlined goals in broad brushstrokes. In the new statement, the participants pledge to:

- Improve diversity, equity, inclusion and justice with their organizational structures and policies.
- Hire a workforce that reflects the diversity of watershed’s population. (People of color represent 35% of the region. But they account for just 14% of the people who work for or with the Bay Program, surveys show.)
- Promote an office culture of inclusion and empower new voices.
- Strive to include federally recognized Indian tribes into restoration efforts.
- Develop lasting relationships with organizations that are led by and serve people of color.
- Ensure that scientific and restoration efforts are fairly distributed across various communities.
- Continue to learn about justice-related issues and share best practices.

The statement is “voluntary and not a contract or an assistance agreement,” according to the final draft signed during the annual Executive Council meeting.

The meeting was the first to be held virtually in the organization’s history. Representatives from each state took turns reading statements supporting the diversity measure. Northam and Maryland Gov. Larry Hogan were the only state governors to participate directly; the rest dispatched subordinates.

The lack of diversity among the Bay’s upper leadership echelon was reflected in the lineup of speakers during the council meeting. Nearly all were White and male.

Janice Underwood, Virginia’s chief diversity, equity and inclusion officer, used her time before her webcam to praise the Bay’s leaders for taking a “good first step.”

“It is fair to say your actions set the bar high for other watershed restoration efforts,” said Underwood, who is Black.

A policy signed last month by the program’s Principals’ Staff Committee calls for action toward creating an environmental justice board within three months and presenting a proposed implementation plan for the diversity initiative within six months. Those deadlines give the agreement “teeth,” Underwood said.

“Now, we need to see that these teeth bite into the inequities that have long existed in the conservation space,” she said.

Minutes after the meeting ended, advocates in Maryland pressed Hogan to tackle what they said are failures by the state’s environmental agency to address environmental justice. Their two dozen proposals include restructuring the Maryland Commission on Environmental Justice and Sustainable Communities and directing the Maryland Department of the Environment to create an environmental justice plan.

Janice Underwood, Virginia’s chief diversity, equity and inclusion officer, shown here in a 2019 photo, said the plans to address diversity, inclusion and environmental justice in the Chesapeake Bay Program will set the bar high for other watershed restoration efforts. (Jack Mayer / Office of Gov. Ralph Northam)

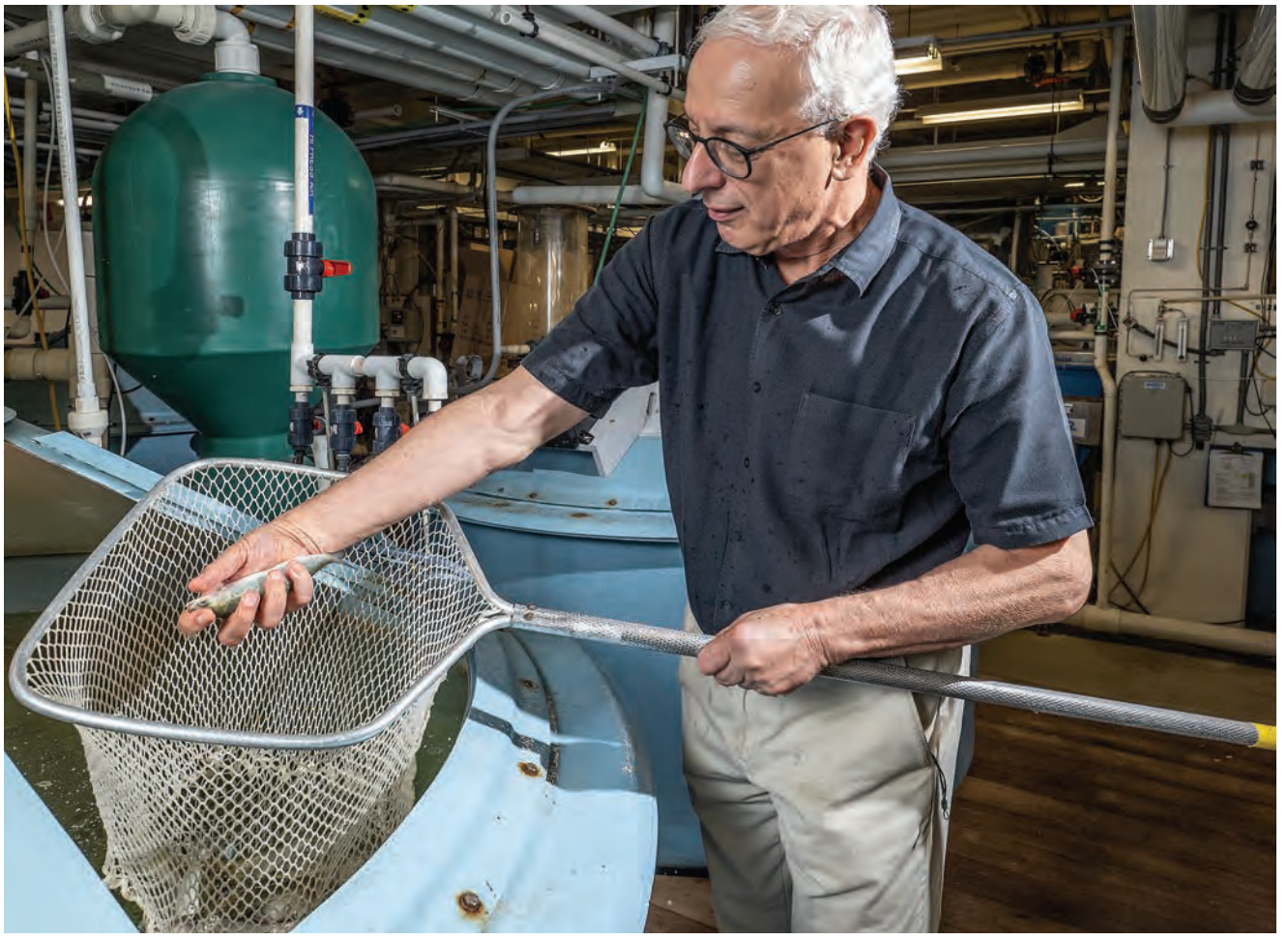
Among the group’s top supporters: Sacoby Wilson, a professor at the University of Maryland’s Institute for Applied Environmental Health; Leila Borrero Krouse of the CATA Farmworkers Support Committee; Fred Tutman, the Patuxent Riverkeeper; and David Reed, an attorney with the Chesapeake Legal Allliance.

The virtual Executive Council gathering came amid mounting pressure against Pennsylvania, which critics accuse of falling behind on its cleanup promises. The watershed’s largest organization dedicated to the Bay cleanup rebuked the council after its meeting for not prodding the state to action.

“Pennsylvania’s plan to meet the goals that all agreed on is woefully inadequate and implementation is seriously off-track,” William C. Baker, the Chesapeake Bay Foundation’s president, said in a statement. “With only five years to go until the 2025 [cleanup] deadline, Bay restoration efforts are now in jeopardy. Unless the Commonwealth finds a way to meet its commitments, the investments that the other Bay states are making will improve local water quality, but the Bay will not be restored.”

In other business Aug. 18, Hogan handed over the chairmanship of the council to Northam.

“Over my past three years as chair, we have worked together to implement real, bipartisan, common sense solutions to the challenges facing the Chesapeake Bay, and the results speak for themselves,” Hogan said in a statement. “Maryland remains fully committed to this historic partnership as we continue making strides to preserve this national treasure.” ■



Yonathan Zohar, head of the Aquaculture Research Center at the University System of Maryland's Institute of Marine and Environmental Technology, shows salmon being raised in tanks in Baltimore. The institute has agreed to work with the Norwegian company on its venture. (Dave Harp)

Norwegian company pitches land-based salmon farm on MD's Eastern Shore

'First true green aquaculture project in the world': AquaCon chairman

Timothy B. Wheeler & Jeremy Cox

The Chesapeake Bay is known to many for the seafood it produces: blue crabs, oysters and striped bass.

In a few years, though, the Bay region could become a major producer of an even more popular seafood that doesn't come from the Chesapeake. A Norwegian company, AquaCon, has unveiled plans to raise salmon on Maryland's Eastern Shore.

AquaCon executives intend to build a $300 million indoor salmon farm on the outskirts of Federalsburg in Caroline County. By 2024, they aim to harvest 3 million fish a year weighing 14,000 metric tons — an amount on par with Maryland's annual commercial crab catch.

If that goes as planned, the company expects to build two more land-based salmon farms on the Shore over the next six or seven years, bringing production up to 42,000 tons annually. That's more than the Baywide landings of any fish or shellfish, except for menhaden, and more valuable commercially.

AquaCon's announcement comes amid a rush by mostly European aquaculture companies to supply Americans with farmed salmon. Another Norwegian company is preparing for its first full harvest later this year from a facility south of Miami, and plans have been announced to build big indoor salmon farms in Maine and on the West Coast. Two small U.S.-based salmon operations in the Midwest also are moving to expand production.

It's not hard to see why. Next to shrimp, salmon are Americans' favorite seafood. They each eat more than 2.5 pounds of it annually, according to the National Fisheries Institute. Experts think that appetite could double over the next decade. And right now, more than 90% of the salmon consumed in the United States is imported. Most is Atlantic salmon produced by aquaculture operations in Norway, Chile, Scotland and Canada.

Atlantic salmon, which can grow to 30 inches and weigh 12 pounds, once spawned in every East Coast river from New York north into Canada. But fishing so depleted the stock in U.S. waters that the fishery was shut down in 1948. It's never recovered, and the species is listed as endangered.

Traditionally, most imported salmon has been raised to market size in open sea pens. But that has several environmental downsides. For example, growers have used antibiotics, pesticides and other chemicals to fend off sea lice, a major problem, along with other parasites and diseases.

Also, uneaten food and fish waste increase nutrient levels in open water, which can deprive aquatic life of the dissolved oxygen it needs to thrive and survive.

In recent years, facing increased production costs and more regulatory limits on open water aquaculture, salmon farmers have begun trying land-based aquaculture, using recirculating technology that's been utilized for years to raise other fish in tanks.

AquaCon executives say their technology will keep their salmon free of parasites and diseases without drugs or chemicals. It will also prevent water quality impacts, they say, by treating and reusing nearly all of the water in which the fish swim.

"This is really the first true green aquaculture project in the world," said Henrik Tangen, AquaCon's chairman. "That's what we're trying to achieve here."

Tangen said he and the company's top executives are mindful of the need to minimize environmental impacts in the Chesapeake Bay watershed.

"We know we are in an environment where we need to be cautious of any natural resources we are using," he said.

'Biodigester' technology

"There is a huge opportunity here for domestic production," said Yonathan Zohar, head of the Aquaculture Research Center at the University System of Maryland's Institute of Marine and Environmental Technology.

To Zohar, the AquaCon venture is the fulfillment of a dream. He's spent nearly three decades working to make fish farming more productive and sustainable, raising small batches of striped bass, salmon and tuna, among others, in tanks. But until now it hasn't brought large-scale aquaculture to Maryland.

"Now we believe the technology is finally mature," Zohar said, "and able to be scaled up in a way that is economically feasible and … environmentally responsible."

The AquaCon team chose to build on the Eastern Shore because of its proximity to mid-Atlantic markets, but the institute's nearby expertise helped cement that decision. Executives say they have a formal partnership set up to work with the institute as plans move forward.

At the institute's Baltimore laboratory, the sludge that settles on the tank bottoms from uneaten food and fish waste is siphoned off into an anaerobic digester, converting 70% of it into methane gas.

Tangen said AquaCon plans to treat its sludge using Zohar's "biodigester" technology. The company also wants the institute's help to develop a more sustainable diet for its salmon — one including algal oils and protein from insects. Another rap against traditional aquaculture is it requires harvesting a lot of wild fish to feed the farmed ones.

AquaCon's salmon-rearing facility would have one of the largest building footprints on the Delmarva Peninsula. Containing 25 acres of space under a single roof, the facility will be roughly the combined size of six Walmart Supercenters.

As to the site, AquaCon is moving to purchase a 200-acre farm just outside Federalsburg. The property, currently

composed of chicken houses and cornfields, will be annexed by the town to get access to its sewer lines, if the company gets its way.

The salmon will spend their lives swimming in circles in a complex of 127 tanks. Mimicking their natural life cycle, which involves migrating from rivers to the ocean and back, the fish will start out in freshwater tanks and finish their grow-out in tanks with salinity levels similar to the Mid Bay's. Salmon can reach market size (about 11 pounds) in about two years that way, faster than if raised in sea pens.

The water in the tanks will be recycled after being treated to filter out ammonia, using technology that reuses more than 99% of it, company executives said.

"Our objective is to optimize the water usage so we don't have any waste," said Bob Rauch, the project's Easton-based engineering consultant.

The handling of wastewater

The Federalsburg facility will still need a vast quantity of freshwater initially to fill its tanks – 49 million gallons, enough for 74 Olympic swimming pools. After that, the operation and processing of harvested fish will only require about 70,000 gallons a day from an onsite well to replace what is lost through its waste treatment systems.

The chicken farm currently operating there is permitted to pump more than 10 times that amount, according to Rauch. But at times, AquaCon may need to double or even triple the current well's permitted withdrawal rate. Company executives say they believe there is ample groundwater to do that, but would require approval from the Maryland Department of the Environment.

AquaCon hopes to pipe 70,000 gallons of treated wastewater daily from its operation to Federalsburg's municipal wastewater treatment plant. That facility can process up to 750,000 gallons per day but now uses only about half of that capacity to serve the community's 2,800 residents.

Lawrence DiRe, the town manager, said that the developers haven't formally submitted any plans to the town. But if they jibe with what has been publicly presented so far, the wastewater plant should have no problem handling the additional flow, he said.

Federalsburg's wastewater plant discharges into Marshyhope Creek, about 15 miles upstream from where it drains into the Nanticoke River, a Bay tributary. In 1996, the MDE declared the Marshyhope impaired by nutrient pollution, pointing to the overfertilized cropland that abuts much of its course.

Despite the nutrient problems, scientists and fishermen have discovered that the creek and the Nanticoke River harbor a spawning population of endangered Atlantic sturgeon. The state is conducting a tagging study to monitor the rare, prehistoric-looking fish.

Rauch said environmentalists have expressed concern that the aquaculture complex might upset the waterway's ecological balance, harming the sturgeon. He vowed the company would take any actions required by environmental regulators to ensure that doesn't happen.

Federalsburg's wastewater plant itself has a spotty regulatory history, though, with a handful of violations the last three years, including exceeding discharge limits on phosphorus and *E. coli* bacteria. The town manager said the plant was run then by an outside contractor, but the town has since taken over.

AquaCon may need to dispose of additional wastewater if it has to purge its fish of a muddy flavor that can plague tank-reared salmon. Tangen said that the technology they plan to use should avoid that problem. But if needed, Rauch said the facility would seek MDE permission to spray the extra treated wastewater onto the land the company is acquiring.

Farmed salmon traditionally have been raised to market size in open sea pens. Parasites, disease and regulatory limits have fueled a shift to land-based aquaculture, particularly to supply a growing U.S. demand for the fish. (Dave Harp)

AquaCon's Tangen noted other "green" features of its project, including the installation of solar panels on the sprawling roof and the methane its waste digester will generate, which could be burned or sold to generate power. And by locating in Maryland, he said, the company will be reducing carbon dioxide emissions used to get its salmon to U.S. consumers, compared with those shipped in from abroad.

Company executives have met with state environmental regulators to explain their plans. MDE Secretary Ben Grumbles wrote AquaCon's Tangen in June that he is "very encouraged" by the company's plans and "welcomes the opportunity to support projects that are environmentally responsible and sustainable."

The amount of groundwater requested by the company is "within a reasonable range,"Grumbles added, though testing would have to confirm it.

The MDE also would need to approve the company's plans to control stormwater pollution, and agency spokesman Jay Apperson said an air pollution permit tied to the anaerobic digestion operation may also be required.

Can it succeed?

AquaCon's Federalsburg operation is expected to create about 150 jobs, company officials said. Although it would be located in the Shore's only land-locked county, it's a good fit for the predominantly agricultural region, said Debbie Bowden, Caroline County's economic development director.

"Anything that grows is in our DNA," Bowden said. "With the cutting edge technology of the aquaculture … it creates an opportunity for more jobs and more economic activity."

Whether it all comes together remains to be seen. While there's a lot of buzz around land-based salmon operations, industry experts say they have yet to prove they can reliably turn a profit and compete with traditional openwater fish farming.

All of the salmon facilities announced in the United States call for massive injections of capital, and experts predict some won't be able to get off the ground. They also warn that glitches in the water purification systems could cause large numbers of fish to die; a large indoor salmon farm in Denmark experienced a big die-off earlier this year. And recirculating systems require a lot of energy to run.

What's needed is a "major success story," said Brian Vinci, director of the Freshwater Institute, an arm of the Conservation Fund that works to make aquaculture more environmentally responsible. The institute's laboratory in Shepherdstown, WV, has been raising a small batch of salmon in recirculating tanks for years to refine the technology.

"We need someone to show that, at this massive scale … they can succeed biologically and can succeed economically," Vinci said during a recent webinar, "and can do it while maintaining all the sustainability benefits."

AquaCon's executive team believes it can do that. First, though, they need to come up with $300 million to build the Federalsburg plant, and $1 billion for all three facilities. This is the first such operation for the company, which was only formed last year.

But Tangen is confident they'll attract enough investors, because the firm's management team has decades of experience in financing, designing, building and operating aquaculture facilities in Norway and around the world.

Above all, he said, they're aiming to develop an operation that can produce "American Salmon" — their brand name — with a reputation for environmental responsibility.

"We'd like to have a product that people relate to in a positive way," he said, "that is something they want to give their children and something they believe … to be a sustainable type of production and product itself. ■

City seeks conservation solution for flood-prone properties

Pilot project seeks agreement allowing Chesapeake, VA, to turn over FEMA-acquired parcels to a land trust

By Tamara Dietrich

Mary-Carson Stiff of Wetlands Watch examines a fringe of phragmites in Chesapeake, VA, that stands between an open space parcel and Mains Creek. Five parcels in the neighborhood are the focus of a feasibility study for transferring ownership of the land from the city to a land trust. (Tamara Dietrich)

As climate change fuels flooding all over the country, one coping strategy is managed retreat: Local governments use federal funds to buy up waterlogged properties at fair market value, throwing distressed owners a financial lifeline and repurposing that land to help mitigate the impacts of recurrent flooding.

But what becomes of those properties once communities acquire them? Who oversees them? What's the cost to local taxpayers to mow, maintain and manage them in perpetuity?

The burden can be so daunting that many municipalities have ditched their efforts to acquire flood-prone properties altogether, even if the Federal Emergency Management Agency foots the bill.

"There are communities that have outright abandoned their acquisition efforts because they don't want to be landlords of open parcels and because of the administrative burden to monitor the parcels, to report on them to FEMA and certainly to mow them, if mowing is required," said Mary-Carson Stiff, policy director at Wetlands Watch in Norfolk.

But now the city of Chesapeake is partnering with Wetlands Watch and Living River Trust on a pilot project that, if successful, could offer municipalities a guide on how to transfer FEMA-acquired properties to a land trust devoted to conservation use.

Typically, a land trust works with willing landowners who grant conservation easements to help protect and conserve their properties forever, said John Harbin, administrator of Living River Trust in Norfolk. The owners retain the property but outline the terms of the agreement in a legal document called an easement. But this pilot project is exploring how to completely transfer ownership of these properties to the land trust.

"Because they were acquired using these FEMA funds," Harbin said, "they are restricted in what they can be used for in the future — restoration of natural wetland functions, reforestation of properties, other kinds of passive recreation uses."

That means the FEMA requirement and mission of the land trust are similar. But while the concept sounds straightforward, it's actually quite tricky to achieve within FEMA's byzantine regulatory framework. Project partners say no municipality has managed it so far. "The city of Chesapeake is not alone in its efforts to think outside the box for how these parcels can be managed, and one of the reasons we think the pilot [project] is so important is that it gets at this very issue," Stiff said.

"There are communities everywhere across the country that have completed some form of government buyout, and what happens to the open parcels is of great importance to all communities that have participated in acquisition."

It's important to Chesapeake in particular because the city has been buying up flood-prone properties with FEMA money since 2007. It has acquired more land via that route than any other municipality in the state.

"Last I heard, we were top dog," said Robb Braidwood, Chesapeake's deputy coordinator of emergency management.

The city has purchased 38 parcels so far with more than $11.5 million in FEMA flood and hazard mitigation grants and was just approved for six more. Most are roughly half-acre pocket parcels interspersed throughout neighborhoods. For now, these are maintained as open spaces.

But there are downsides to owning the land, Braidwood said: Each parcel costs the city more than $2,000 a year just to mow. There's also the burden of cleaning up chronic dumping and administering the program.

"We've always been trying to wrestle with how we can transition from that long-term cost into something else," Braidwood said. "We've looked at reforestation of the properties, and that's never popular with adjacent homeowners because they think it'll bring animals or vermin. FEMA is very restrictive about what you can do with the property, so you can't put in, like, a playground."

So when Stiff approached him with the land trust idea, it felt like a great fit and a creative approach to a problem. The hurdle, he said, is getting FEMA "to agree to let this happen."

"Philosophically, they would agree with it and the concept," Braidwood said. "It's the bureaucratic side — is this allowable under the code of federal regulations? That's why we have to work with FEMA very closely on this."

Five of the parcels are contiguous, fronting Mains Creek, a tidal tributary to the Southern Branch Elizabeth River. Because contiguous parcels are better for conservation use, these properties, totaling nearly 3 acres, are the focus of the pilot project.

"Generally speaking, compatible uses include restoration of the properties, wetland creation or enhancement," Harbin said. "I believe you can use passive recreational uses like a community garden or a trail or maybe a water-access point. But, essentially, you can't develop the property again."

Buying out risk

Using FEMA funds to buy up floodplain properties isn't just a coastal phenomenon. Some landlocked regions that suffer devastating riverine floods leverage the grants even more aggressively than Hampton Roads.

"It's very popular in places like Houston and in the Midwest," Braidwood said. "Absolutely, they outgun us. In Houston, for example, they'll

submit grants or they'll buy 200-plus homes at one time. They're very aggressive. And Iowa — they'll come in and buy a whole town because the properties are so much cheaper."

FEMA offers several grant programs. Some pay to elevate a home, which is a popular choice in Tidewater cities like Norfolk and Gloucester. Others will buy a home and either move it — rarely done — or replace it with a new build that's floodplain-compliant.

Chesapeake typically uses grants to buy a home outright, with FEMA covering either 100% or 75% of the cost (and the state picking up 20% and the homeowner 5%) to turn it into permanent open space.

"If you [just] elevate a house to 10 feet, I'll show you an 11-foot flood the next year," Braidwood said. "So, for us, acquisition is the only way to go, because we buy out that risk forever."

For property owners, selling is entirely voluntary. But there are caveats. Grant amounts are capped at around $276,000, so pricier waterfront homes won't qualify. And the property must experience recurrent flooding and be enrolled in the National Flood Insurance Program, which offers cut-rate premiums heavily subsidized by federal taxpayers.

For the insurance program, buying flood-plagued properties is cheaper in the long run than paying claims on the same properties over and over again.

The insurance program is "completely upside-down — like, billions of dollars in the hole," Braidwood said. "These [buyouts] are designed to try to buy down risk so that the program can become solvent again."

Finding property owners who are eager to sell comes in predicable cycles.

"When we haven't had a hurricane in a while, that's when we get the least amount of applications," Braidwood said. "The second we get a bad hurricane, our applications the next year go up exponentially. …You rarely hear from somebody that flooded out just once."

The city finds owners through word of mouth, town halls and postings on the city's website. Wending through federal red tape to acquire a property can take a year or two.

Because of the grant cap, cities with costlier homes in floodplains have less incentive to participate in direct acquisition programs. Such programs are also very hard for local governments to administer. Local leaders can be leery about buying homes, razing them and removing them from the local tax base.

Communities seek guidance

After Hurricane Isabel ravaged Hampton Roads in 2003, the Gloucester County Board of Supervisors supported a new program to buy out flood-prone homes with FEMA funds, said Anne Ducey-Ortiz, director of the county's planning, zoning and environmental programs.

By 2014, Gloucester had bought 33 parcels. Then came a shift in board membership and a new aversion to losing taxable real estate. So supervisors changed course and opted to help owners elevate flood-prone homes rather than buy them to tear down.

"So we just kind of stopped," Ducey-Ortiz said. "We didn't really have the bigger picture of the benefits: Wetlands provide a great buffer for houses in terms of mitigating storm surges and providing a place for the water to go, as well as providing habitat. And the marshes tend to be great places for small critters to kind of hide until they grow up."

Gloucester's acquisition program was also undercut early on by developers who gobbled up waterfront properties at better prices than FEMA was offering. Developers then built upscale elevated homes — leaving some of the worst land for the buyouts.

> *"...this larger idea of just preserving land for preserving land's sake is really not something local governments historically have done."*
>
> — Anne Ducey-Ortiz
> Gloucester County, VA

But elevated homes can't eliminate one longstanding consequence of floods that continues to plague the Chesapeake Bay and regional restoration efforts: leaky septic systems.

"[The homes] are all built to the latest standards with building codes, and they do have certain flood-proofing," Ducey-Ortiz said. "But that is my argument for acquisition — you can raise the house, but they're all on septic. You can't raise the septic system. So every time it floods, that's raw sewage going out into the Bay."

Gloucester's acquisition efforts also faltered because there was no comprehensive plan in place for the buyout properties and no consensus over which county agency would maintain them — as in Chesapeake, the open parcels are often targets for illegal dumping.

"We've been constantly trying to think of a good use of these properties, above just sitting there," Ducey-Ortiz said. Her own visions of developing a park or getting the Virginia Institute of Marine Science in Gloucester Point to use the land for a research lab fell through for lack of funding.

John Harbin of Living River Trust stands on a site where homeowners who experienced repetitive flooding were bought out by the city of Chesapeake, VA, using FEMA grants. The homes were removed, and Harbin is working with Chesapeake officials to see if the property can be turned over to the land trust to be managed for conservation purposes. (Tamara Dietrich)

Chesapeake's land trust project might just provide badly needed guidance for programs like Gloucester's, she said.

"If there was a better program, or even if it became part of a wildlife management area or something, it could be better managed," Ducey-Ortiz said. "Trying to have local governments do that — they're just not equipped for it. They're equipped for parks and rec. It's what we do; we take care of our people. So this larger idea of just preserving land for preserving land's sake is really not something local governments historically have done."

A successful pilot project could also help inform course corrections for development and adaptation in Hampton Roads, a recognized global hot spot for sea level rise.

"As sea level rise continues to impact our communities, we have to figure out ways to adapt to that, and this is a really good option," Harbin said. "Maybe one day a neighborhood that was once there will not be there, and it'll be a community green space or it'll be a wetland restoration project or it'll be a nature park or some sort of use that was always probably better-suited for that piece of land. But we weren't always so wise when we were developing 20, 30, 40 years ago." ■

A road that once accessed several homes in Chesapeake, VA, is blocked off and overgrown while the city and conservation partners explore options for managing the land. (Tamara Dietrich)

Shad recovery efforts not paying off, study shows

Dams block 40% of historic range while voracious invasives take toll on young

By Jeremy Cox

The American shad's Atlantic population remains at a historic low, despite long-standing commercial fishing bans in several states and millions of dollars invested in restoring the fish's habitat.

That sober news comes from the most comprehensive survey yet of the species' status on the East Coast and the first of any kind in 13 years. The sprawling assessment by the Atlantic States Marine Fisheries Commission designates the shad population as "depleted" from Maine to Florida.

"There should be a lot more shad than there are out there," said Michael Bailey, a U.S. Fish and Wildlife Service scientist and one of the assessment's authors.

In the Chesapeake Bay region, the study suggests that the rate of death among adult shad — a key measure of a population's health — is "unsustainable" in the Potomac River but "sustainable" in the Rappahannock and York.

Once one of the largest commercial fisheries along the coast and around the Bay, shad catches have bottomed out at about 1% of their late-1800s levels. Although the shad fishery has all but disappeared in the Chesapeake, scientists contend that the species serves a critical ecological role in the estuary as a vital link in its food chain.

But shad are an anadromous species, meaning they spawn in freshwater rivers but spend most of their adult lives in the ocean before returning to their native river to reproduce when they are 4 or 5 years old. Because shad rely on so many different habitats, they face a barrage of challenges through all stages of life.

The species' continued struggles are mostly blamed on the amount of potential habitat blocked by dam construction, a loss of about 40% of its historic range. But shad also face threats from climate change, polluted water, deadly run-ins with hydroelectric turbine blades and getting eaten by larger fish.

The Marine Fisheries Commission, which regulates migratory fish in state waters along the Eastern seaboard, is grappling with whether more actions are needed to buoy the stock. The commission's shad management board tasked a scientific panel Aug. 4 with recommending potential measures.

Fishery managers have been pulling regulatory levers for decades to help shad rebound but with little progress to show for it.

Commercial landings plummeted from about 50 million pounds at the beginning of the 1900s to 3.8 million coastwide by 1980. That year, Maryland imposed a moratorium on shad fishing. The Potomac River's regulators followed suit in 1989; Virginia closed its rivers to shad fishing in 1994.

Ocean catches have been largely prohibited since 2005, but the new assessment finds no evidence that the action has breathed new life into the population.

While fishing was cut back, massive efforts were undertaken to boost the population. Pennsylvania, Virginia, Maryland and Delaware launched hatchery operations to rear shad for release in their rivers. Hundreds of millions of larval shad "fry" have been stocked in recent decades.

Meanwhile, major efforts were made to reopen historic spawning areas to fish returning from the sea each spring. Since the early 1990s, tens of millions of dollars have been spent opening more than 1,000 miles of Bay tributaries to migrating shad. Where possible, dams have been removed, but most of the reopening has been achieved through the construction of fish passages.

Research has shown that shad use those constructed passages at relatively low rates.

Although scientists have made significant strides in monitoring shad, they were unable to assess for the 1,200-page report whether the coastwide population's adult death rate is sustainable. At a smaller scale, they were confident enough to make a call for eight of the 23 river systems they studied — with three being declared as unsustainable (the Connecticut, Delaware and Potomac) and five as sustainable (the Hudson, Rappahannock, York and Neuse as well as Albemarle Sound).

Some fishery experts were caught off guard by the report's bleak assessment of the Potomac population. By 2014, shad abundance there had surpassed the goal set by the Chesapeake Bay Program, the federal and multi-state effort that manages the restoration of the estuary.

Millions of dollars have been spent to restore the American shad's Atlantic population. (Dave Harp)

After gaining in size until as late as 2005, the Potomac shad stock has leveled off, according to the Marine Fisheries Commission report. Fishery scientists aren't sure why that is happening, but they think young shad might be being eaten by the region's rising numbers of invasive species, such as blue catfish and snakeheads.

"Predators can have a disproportionately large impact on year class success when fish populations are at such low levels, as is currently the case," wrote a scientific panel tasked with reviewing the assessment.

Scientists suspect that the Potomac's shad troubles may lie elsewhere — in the Atlantic. Larger fish may be eating them at sea. They also may be falling victim to bycatch — commercial fishing that unintentionally kills fish other than the targeted species.

Uncertainty is a common theme in the report. For instance, while adult mortality is monitored, there is "almost no information" collected about young shad, Bailey said. That knowledge gap prevented the report's authors from determining whether the fish's coastwide death rate is at acceptable levels. They tied their "depleted" characterization to a sharp decline in coastwide landings since the 1950s and a lack of clear evidence of a rebound.

The fish tend to return to spawn in the rivers where they hatched, but those individual populations are thought to become mingled at sea. The sea connection will become increasingly vital as climate change warms the ocean, prompting shad to either die off in lower latitudes or "hopscotch" their way northward toward more-hospitable waters, said Karin Limburg, an ecologist at the State University of New York in S pyracuse.

One of the biggest steps that fishery managers can take is to open the Susquehanna River to shad migration, even if it means "taking down" the Conowingo Dam, she said. The existing passages at the dam and elsewhere aren't moving enough fish upstream. The river hosts the largest untapped spawning ground for the fish on the East Coast. The dam's owner, Exelon Corp., is working on a deal that would allow the company to continue operating it for the next 50 years. ■

A natural gas fracking site in Susquehanna County, PA, overlooks bucolic farmland. (Dave Harp/2009)

Natural gas fracking under fire in PA

State grand jury finds that state failed to protect health, environment

By Ad Crable

In a blistering report on Pennsylvania's 12-year experience with hydraulic fracturing for natural gas, a special statewide grand jury said public health and the environment have suffered and the state's environmental and health agencies, rather than acting as watchdogs, had a "culture of inadequate oversight."

"When it comes to fracking, Pennsylvania failed," said Pennsylvania Attorney General Josh Shapiro, who convened the Investigating Statewide Grand Jury that listened to scores of witnesses and reports of investigators over two years.

Shapiro said the state Department of Environmental Protection's leadership has been "too cozy" with the hydraulic fracturing or "fracking" industry and the hands-off attitude was passed down to boots-on-the-ground inspectors.

"Regulators were supposed to prevent abuse by big corporations and level the playing field. But they didn't," Shapiro said at a June press conference in the state capital to release the 243-page report.

The grand jury, who listened to testimony from 30 current and former DEP employees with another 25 interviewed by attorney general investigators, decried the "revolving door" practice of the gas industry hiring away agency regulators. "If DEP employees know there may be a big paycheck waiting for them on an operator's payroll, they may be reluctant, consciously or otherwise, to bring to bear the full force of the law," the grand jury said.

The body also recommended that the attorney general's office be granted the power to pursue criminal cases against gas companies because the DEP is not adequately doing that.

So far, as a result of the grand jury investigation, the attorney general has charged four gas companies or subcontractors with pollution violations. Range Resources, one of the first gas drillers to set up shop in Pennsylvania, pleaded no contest to charges of negligent oversight of its well sites in various parts of the state. Cabot Oil & Gas, another of the biggest players in the state, was charged with 15 environmental crimes, including the discharge of industrial wastes and unlawful conduct.

The jury also criticized the track record of the state Department of Health, notably for still concluding that, after 12 years, the health effects of fracking are still "inconclusive." One former agency official said gas-related health complaints were shunted "into a proverbial black hole."

The agency "did not collect data and do their jobs," Shapiro said.

The Marcellus Shale gas boom in Pennsylvania has catapulted the state into the nation's second-largest source of natural gas. Fracking has had support to varying degrees from three governors, as well as solid backing in the General Assembly.

Call for action

Fracking involves drilling thousands of feet underground to reach previously inaccessible gas deposits. Water mixed with sand and chemicals is injected at great force to break up shale and release the trapped gas.

A well pad, along with other needed components such as an impoundment for wastewater, blenders, tanks and trucks are usually spread over about 5 acres.

In Pennsylvania, since 2008, about 12,400 gas-fracking wells have popped up in about half of the state, in the northeastern, northcentral and southwestern parts.

A majority of the wells have been on private land, but considerable drilling also is occurring under state lands. For example, the state has leased 673,000 acres in state forests and parks for fracking related activities. When Gov. Tom Wolf took office in 2015, one of his first acts was to ban any more state lands from being leased.

The Pennsylvania Game Commission, which is an independent state agency, has leased approximately 150,000 acres of game lands for fracking. Currently, 15 gas wells are in operation on, under or adjacent to state game lands and 930 acres of surface land have been altered.

Environmental groups and anti-fracking activists have fought against this "unconventional gas drilling," citing health issues, air pollution, pipeline dangers, forest fragmentation, wastewater disposal and stream pollution.

During the investigation, the grand jury listened to 75 families who described living near drilling sites. They spoke of drinking well water turning into black sludge and children and adults having breathing problems, sores and stomach ailments. Farmers said livestock would become sick, sterile or even die. Some families spoke of pets becoming violently ill.

Others claimed air pollution was generated from nearby fracking sites. Parents testified that their children would wake up at night with severe nosebleeds and that windows had to stay shut.

"The public was harmed, plain and simple," said Shapiro, who observed that the grand jury was given unprecedented access to health claims and that all sides of the fracking issue were heard during the probe.

The grand jury made eight recommendations to correct what they saw as failures of oversight and to protect Pennsylvanians:

- Conduct a comprehensive study of the effects of living near a well.
- Increase fivefold the setback distance of drilling sites from buildings.
- Require fracking companies to reveal all chemicals used in underground fracturing.
- Increase the regulation of pipelines that gather gas and transport it to transmission pipelines.
- Add up air pollution from all of the sources at a well site. The report said that emissions from various functions at a well

See **FRACKING**, *page 24*

FRACKING *from page 23*

site are treated individually. If they were considered as one source — and should be because they are located close together — requirements for air pollution control would kick in.

- Require the safer transportation of fracking waste.
- Prohibit DEP employees from going to work for the fracking industry immediately after leaving the agency.
- Allow the state attorney general's office to investigate possible crimes by gas and oil companies rather than leaving it up to referrals from the DEP and county district attorneys.

Criticism & praise

Both the DEP and the fracking industry have pushed back against the grand jury's findings and recommendations, dismissing the effort as sorely lacking in the understanding of current regulations and relying on unproven claims.

In a 56-page rebuke that the DEP insisted be added to the grand jury report, the agency said that the document "fails as an expose of a government agency ignoring its statutory duties and constitutional obligations" and "also fails as a meaningful tool for improving the regulation of the unconventional gas industry."

The DEP said grand jurors were clearly hampered by not being given clear and accurate information on current regulations. The result, though well-intentioned, does the public a disservice, the DEP said.

The agency said it rose to meet a unique challenge with the advent of hydraulic fracturing for natural gas. Improvements have been made, based on science, and currently, "the oversight of this industry now in place is comprehensive, responsive and protective."

The gas industry was even harsher in its criticism.

The Marcellus Shale Coalition said the report "exhibits a jarring lack of reality as to how shale gas development occurs in Pennsylvania" and "an equally disturbing ignorance as to the laws and regulations which govern shale gas development."

Many of the concerns and recommendations of the grand jury have already been addressed, the industry group said.

Pointedly, it was suggested that no member of the grand jury or Attorney General Shapiro had ever visited a well site or gas pipeline.

Gov. Wolf's office blamed many of the grand jury's concerns on his Republican predecessor, Tom Corbett, who accelerated fracking expansion in the state. The Wolf administration has worked aggressively to address the regulatory failures and now has in place rules "to hold natural gas companies to some of the most stringent environmental standards anywhere in the country in order to protect public health and the environment," a spokesman said.

The Department of Health defended itself, saying, it too, has had to get rid of earlier barriers to transparency and even a former directive not to discuss complaints about fracking.

The agency noted that it has committed nearly $4 million for two new studies to see if fracking is causing cancers in children in western Pennsylvania, and it has set up an oil and natural gas registry that allows people to submit public health complaints.

A hydraulic fracturing well pad in Pennsylvania. After a two-year statewide grand jury investigation, state Attorney General Josh Shapiro concluded, "The public was harmed, plain and simple." (PA Department of Environmental Protection)

An aerial view of a natural gas fracking well in Pennsylvania. About 12,400 wells have been sunk on public and private land in Pennsylvania since drilling into Marcellus Shale began in 2008. (PA Department of Environmental Protection)

But environmental groups who have fought against fracking for more than a decade were predictably pleased with the findings and felt vindication.

"This industry has blatantly run afoul of our laws, disrespected our communities and destroyed our natural resources," said PennFuture president Jacquelyn Bonomo. She called the grand jury's recommendations "a welcomed step in the right direction."

The Clean Air Council said, "The grand jury's report reveals the tragic consequences of our state's hands-off approach to fracking."

Addressing Wolf and the DEP, EarthWorks said, "More than a decade into the fracking boom, they must finally reckon with the truth that so many have spoken for so long." The group called for a freeze on oil and gas operations until safeguards are put in place.

The Better Path Coalition, a statewide coalition of groups advocating for renewable energy in Pennsylvania, went even further, calling for the resignations of the current secretaries of the DEP and Health, and for the state to declare a fracking ban.

Most of the grand jury's recommendations would require initiative from state legislators. Though headline grabbing, it remains to be seen if the grand jury's concerns will gain traction in the General Assembly.

Some key legislators quickly criticized the report. State Sen. Gene Yaw, majority chair of the Senate Environmental Resources and Energy Committee, said Pennsylvania has overregulated the fracking industry and the attorney general has rehashed claims that were repudiated years ago. "Pennsylvania's natural gas industry is one of the most regulated in the nation," he said. "It is absolutely embarrassing for a state, which is a world leader, to have such a short-sighted and myopic view of an industry of international importance."

Yaw's counterpart in the state House, Greg Vitali, called the report "problematic" and defended the DEP.

But in southern New York and northeastern Pennsylvania, the findings could bear on a debate on whether to continue to ban drilling. Since 2011, a de facto drilling moratorium has been in place by the Delaware River Basin Commission. But a group of Pennsylvania landowners have sued the commission, saying it exceeded its authority. The landowners seek a reversal of the moratorium.

In late 2014, the state of New York banned fracking, citing health reasons. Gov. Andrew Cuomo recently asked the legislature to make the ban permanent.

In 2017, Maryland became the first state in which a state legislature banned fracking. In April 2020, Virginia legislators and Gov. Ralph Northam banned fracking east of Interstate 95. ■

Menhaden policy will be tied to striped bass population

Move is first to consider predators-prey relationships when setting harvest levels

By Karl Blankenship

Many fish, birds and marine mammals feed on menhaden. Fishery managers recently agreed to factor that in when setting harvest limits. (Dave Harp)

East Coast fishery managers have agreed to tie future menhaden population levels to the number needed to support a robust striped bass population — a first step toward recognizing the ecological role of the small bait fish.

The action, made by a unanimous vote, was described by conservation groups as "landmark" and "historic" because it was the first time the Atlantic States Marine Fisheries Commission has explicitly recognized the value of leaving fish uncaught to serve as food for predators.

The exact impact won't be known until October, when the commission, which regulates migratory species in state waters, will set menhaden harvest levels for the coming year. Changes along the coast and in the Chesapeake Bay are not likely to be significant, because a pair of recent assessments found the menhaden stock to be robust.

But populations of menhaden and their predators fluctuate over time, and the commission's action means its future decisions will take into account whether enough menhaden are available to support the fish, marine mammals and birds that feed on them.

"With managers committed to leaving enough menhaden in the ocean to provide forage for predators like striped bass and humpback whales, a new chapter now begins for ecosystems from Maine to Florida," said Joseph Gordon, director for the Pew Charitable Trust's campaign to protect marine life on the East Coast.

Controversy over menhaden management has simmered for years. Measured by their collective weight, the annual menhaden harvest is the largest of any species along the coast and in the Bay. Although the population is considered to be in good shape, conservation groups have long contended that such analyses don't fully account for menhaden's importance as a food source for everything from dolphins to osprey.

The new "ecological reference points" essentially set a goal of maintaining menhaden at levels adequate to support a robust striped bass population. That was based on computer modeling that showed striped bass were the species most sensitive to menhaden abundance. Over time, as new and better information becomes available about interactions among species, the action clears the way to manage the abundance of menhaden, and potentially other "forage" fish, to help achieve and maintain population goals set for other species.

Conversely, if many predators become abundant at the same time, managers may eventually need to consider curbing their numbers to allow for a sustainable population of menhaden, Atlantic herring and other fish that serve as their food.

Omega Protein, which operates a menhaden fishing fleet out of Reedville, VA, and is by far the largest harvester of the fish in the Bay and along the coast, issued a statement endorsing the commission's decision. But it also emphasized that managing interactions between predators and prey is not a one-way street and must expand the focus beyond menhaden.

"It is now the responsibility of the commission to accurately estimate the populations of both menhaden and its predators and then make fair and equitable management decisions based upon the model's findings," the company said.

Indeed, establishing the right amount of menhaden to protect from harvest could be challenging and a source of future debate. For instance, menhaden are currently relatively abundant, but striped bass numbers are low. One commission member wondered about the purpose of leaving "excess" menhaden in the water to support a striped bass population that doesn't exist.

Matt Cieri, a scientist with the Maine Department of Marine Resources who chaired the commission's ecosystem reference point workgroup, acknowledged the action will place a new level of complexity on management decisions.

But, he added, the ecosystem approach will help ensure that low menhaden abundance does not hinder other efforts, such as new catch restrictions, from rebuilding the striped bass population. "It is sort of a chicken and egg argument," Cieri said. "You may not have the striped bass to consume the menhaden, but if you don't have the menhaden then you won't have the striped bass to rebuild."

Cieri and others cautioned that simply ensuring more menhaden are left in the water will not by itself restore species that are at low levels and overfished.

"This is not the cure-all for all fisheries management problems," said Spud Woodward, chair of the commission's Menhaden Management Board. "[But] it is a step in the right direction."

The commission is expected to take the next step this fall when it begins translating the new policy into a catch limit.

"I don't think anyone is expecting a huge management change as the result" of the new ecological reference points, said Chris Moore, an ecosystem scientist with the Chesapeake Bay Foundation.

And because the new policy addresses menhaden coastwide, it likely will not immediately affect Bay catches, which are already subject to their own harvest cap. But leaving more of the fish uncaught, Moore said, could mean more menhaden in the Bay, which is an important nursery area.

"I hope there is a biological response and that we end up with more in the Chesapeake," Moore said. ■

Wicomico County Councilman Josh Hastings sides against a project that would provide Somerset County with natural gas. He worries it will endanger water quality. (Dave Harp)

University, prison project approval moves Eastern Shore gas pipeline forward

Foes say deal will compel MD to issue permits for long-sought energy source

By Jeremy Cox

With only a handful of large employers and Maryland's highest poverty rate, Somerset County has come up empty for years in its efforts to attract a natural gas pipeline, which county officials view as the key to unlocking its economic potential.

Now, though, a pipeline is just a few regulatory steps away from construction in the county. What changed? Not the private sector. The county's economic activity is as sluggish as ever. What's new is a lucrative public lifeline — a 20-year contract to supply natural gas-fired energy to two huge state-owned enterprises: a historically Black university and a state prison.

The state's financial interests in the Del-Mar Energy Pathway pipeline top the list of questions being raised by environmental groups about the Eastern Shore project.

"I don't think driving down the utility bills at a state penitentiary is a compelling enough benefit to put my family at risk or to put at risk the waters that my grandfather tonged oysters in," Robin Cockey, an attorney and former Salisbury city councilman, said at a recent hearing on the pipeline.

The project also has drawn scrutiny for potential environmental damage to wetlands and streams during construction, the possibility of the pipeline leaking and its reliance on gas obtained from controversial hydraulic fracturing.

The project aims to bury a 10-inch pipe from near downtown Salisbury in Wicomico County southward to the community of Eden just beyond the Somerset boundary; the second phase will extend the pipe past Princess Anne, where it will serve the University of Maryland Eastern Shore, to the Eastern Correctional Institution in Westover. Most of the work will take place in the existing right-of-way along Route 13 and a rail line — which, the project's advocates say, should reduce harm to the environment.

"I'd love to be able to see a future where we have energy that is produced that doesn't harm or kill people," said Josh Hastings, a Wicomico County Council member. "I do not want a future with more chemical inundation on our society."

The 19-mile conduit will be the first natural gas link in Somerset County, one of only three Maryland counties that lack access to the fuel source. Smaller branches will eventually carry gas to hundreds, if not thousands, of homes and businesses along the route, including in the county seat of Princess Anne.

"We need this for economic growth. It's just hard to compete with counites that have natural gas, because they can offer their companies a much cheaper product to run their business," said Randy Laird, a representative on the Board of County Commissioners.

A deal beneficial to both sides?

Eastern Shore Natural Gas, a subsidiary of Delaware-based Chesapeake Utilities, won approval for the project last December from the Federal Energy Regulatory Commission. Decisions loom in the coming months on two key governmental authorizations: a wetlands-disturbance license from the Maryland Department of the Environment and a franchise agreement from the Maryland Public Service Commission. The company hopes to have gas flowing to the two Somerset facilities by late 2021.

For ESNG, however, the project comes amid gathering storm clouds in the industry. In July, Dominion Energy and Duke Energy announced the cancellation of the Atlantic Coast Pipeline, which had been proposed to run 600 miles through West Virginia, Virginia and North Carolina. The two energy giants cited its increasingly shaky financial prospects and a spider's web of legal challenges thrown up in their path.

In another huge setback for the industry, North Carolina's environmental regulator denied a water-quality certification for the expansion of the Mountain Valley Pipeline. Other major pipeline projects across the country have faced similar legal and economic blows. And Chesapeake Energy Corp., an Oklahoma-based oil and gas producer not affiliated with Chesapeake Utilities, recently filed for bankruptcy.

Dean Holden, Chesapeake Utilities' manager of business development and sales, said he doesn't foresee those headwinds affecting the Del-Mar pipeline. "We find the footprints we are in and adjacent to are consistently asking for expansion," he said.

For their part, Somerset leaders have been asking for nearly two decades. The lack of natural gas access smothers the county's growth, said Danny Thompson, executive director of the Somerset County Economic Development Commission.

He pointed to the case of one company, with several locations over a broad geographic area, that canceled plans to invest $4 million and hire up to 10 new employees at its Somerset site because of its high energy costs. If that company, which Thompson declined to identify, could replace its propane and fuel oil system with natural gas, it would save about $600,000 a year, he said.

Although some energy companies had shown interest in the rural county over the

years, Thompson said, "we never could really get to that tipping point." Now, with the prison and university guaranteed as customers, he added, "the business model is there to make this work."

ESNG officials argue that natural gas represents a far-cheaper energy option for the institutions. For more than 30 years, the correctional institution has gotten the lion's share of its electricity from a wood-fired boiler. The university has been relying on fuel oil. The pipeline company estimates that commercial and industrial customers that switch from heating oil to natural gas typically save more than $12,000 a year.

The promise of savings has partly fueled the state's pursuit of natural gas for its Somerset County institutions. In August 2019, the Maryland Energy Administration and the Maryland Environmental Service signed a contract with Chesapeake Utilities to convert both to natural gas. The Environmental Service is the independent state agency that oversees the heating and electrical systems at both facilities.

Although Environmental Service officials reached out to multiple vendors, Chesapeake Utilities was the sole bidder on the contract.

The proposed pipeline received another boost in July this year when the Maryland Board of Public Works unanimously approved paying contractors more than $500,000 to prepare the heating system at the correctional facility for the conversion. The board's three members are Gov. Larry Hogan, Comptroller Peter Franchot and State Treasurer Nancy Kopp.

"The project will spur regional economic development, creating jobs while bringing lower energy prices to the residents and businesses on the Eastern Shore," Hogan said. "We've been working very diligently to expand their alternative energy options, and there is immense support for this project."

Environmental questions

The pipeline needed to carry natural gas to the prison hasn't been fully permitted by the state, critics point out. Environmentalists and a trade group representing a competing energy source charge that the Board of Public Works vote puts undue pressure on the MDE to give its blessing to the wetlands permit.

The permit pertains only to the Salisbury-to-Eden portion of the pipeline. If approved, the nearly 7 miles of construction would temporarily disrupt about 200 linear feet of streams and 16,000 square feet of wetlands.

"Should MDE be permitted to deliberate on this critically important permit when two other intertwined state agencies have a vested interest in the outcome?" asked Ellen Valentino, a representative of two energy trade groups, in written comments to the MDE.

"It's definitely a cart-before-the-horse [situation]," said Anthony Field, Maryland campaign coordinator for the Chesapeake Climate Action Network.

Jay Apperson, MDE's spokesman, rejected the notion that the Maryland Environmental Services contract or Board of Public Works action ties regulators' hands. The agency will analyze the permit and make a recommendation to the Board of Public Works, which has the final say.

If the pipeline doesn't go forward, the state can cancel its contract with Chesapeake Utilities, said Tim Ford, who heads the projects division for the Environmental Service.

Pipeline advocates contend that the conversion will make the state greener, reducing carbon dioxide emissions 65% at the prison and 38% at the university. That has about the same impact as removing more than 11,000 cars from the road, according to ESNG's calculations.

> *"...We are appalled that the request for proposals put out by the state of Maryland to repower the university and prison foreclosed the possibility of clean energy by only requesting applications for fracked gas."*
>
> — Letter signed by 30 environmental groups

Pipeline extensions across the country, though, have come under fire for extending "fracked" gas to new markets — and the Del-Mar project is no exception. Under Hogan, Maryland has banned the controversial gas-harvesting technique within its borders. Environmentalists say it's hypocritical of the state to continue expanding access to natural gas.

"It defies our state's existing energy policy to bring the same public health risks to our residents by way of pipelines," a coalition of more than 30 environmental groups told the administration in a jointly signed letter recently. "We are appalled that the request for proposals put out by the state of Maryland to repower the university and prison foreclosed the possibility of clean energy by only requesting applications for fracked gas."

During their vote on the engineering contracts, Kopp and Franchot asked Hogan and his administration to investigate whether the pipeline can be barred from transporting gas from fracked sources. "I'm sure the PSC [Public Service Commission] will take a look," Hogan replied.

Chesapeake Utilities' Dean Holden said the company offers customers an option of subscribing to certain types of natural gas, including renewable sources. As part of the Somerset extension, Chesapeake Utilities plans to link its pipeline network to a biorefinery that will transform poultry manure into enough electricity to power up to 10,000 homes. CleanBay Renewables expects to begin construction on the plant later this year.

Environmentalists are also at odds with the pipeline company over the safety of natural gas pipelines. During the MDE's virtual hearing on the wetlands permit, a company engineer repeatedly assured critics that the risks to the environment and the public are low.

Leaks wouldn't contaminate the soil or groundwater because methane, natural gas' central ingredient, is lighter than air and would drift away, said Mark Parker, ESNG's engineering manager. Regarding accidents, he pointed out that the company has been operating hundreds of miles of pipeline since the 1950s with no reported "failures."

"I cannot speak to a forever scenario for you where nothing will ever happen," Parker told listeners. But "our [safety] procedures are federally mandated. We take them seriously." ■

The proposed Del-Mar Energy Pathway pipeline project will mostly follow U.S. Route 13 and the railroad to its east on Maryland's Lower Shore. (Dave Harp)

Natural gas projects meet complications, trend down in VA

Increasing legal battles and decreasing demand take toll on ventures' viabililty

By Jeremy Cox & Tamara Dietrich

In Virginia, the future of natural gas depends on a highly volatile present. Since June, one pipeline project has shut down, two others suddenly find themselves on shaky footing and the natural gas industry as a whole continues to reel from a series of setbacks. Here's what has happened and what might be next for the state.

Atlantic Coast Pipeline halted

Utility giants Dominion Energy and Duke Energy shocked the environmental community in early July when they abruptly canceled the highly contentious Atlantic Coast Pipeline.

The ACP was a massive $5.5 billion project announced in 2014 to convey fracked natural gas 600 miles from West Virginia's shale fields through central Virginia and into North Carolina.

The utilities had acquired easements along most of the route and laid more than 30 miles of pipe in West Virginia. In Virginia, they had clear-cut trees, but hadn't yet dug trenches or installed pipe.

From the start, the ACP battled stiff legal challenges — largely based on natural resources, public health and environmental justice concerns — that swelled the project's estimated cost to $8 billion. Ultimately, Dominion and Duke decided that ongoing delays, ballooning costs and persistent legal fights were just too much.

Mark Sabath, senior attorney at the Southern Environmental Law Center in Charlottesville, said the decision reflects a growing shift in Virginia and North Carolina away from fossil fuels.

In April, Gov. Ralph Northam signed the Virginia Clean Economy Act that, among other things, requires Dominion Energy Virginia to be 100% carbon-free by 2045.

"We didn't think the project was needed when it was originally proposed," Sabath said. "And it seemed less and less necessary over time."

Dominion said that pipe already in the ground will be "retired in place," but there are still legal agreements involving easements on more than 3,000 tracts along the route that the energy companies must figure out how to handle.

"We remain committed to environmental stewardship and will focus on closing out the project with the least environmental disturbance possible," said Dominion spokeswoman Ann E. Nallo.

Opposition digs in against MVP

The demise of the Atlantic Coast Pipeline eliminated a potential competitor for a different pipeline.

"It has to work in favor of Mountain Valley Pipeline," said Sreedhar Kona, a senior oil and gas analyst with Moody's Investors Service. "That is, if MVP gets completed."

In August, the North Carolina Department of Environmental Quality rejected a key water-quality permit for the pipeline's extension into the state.

The primary section of the pipeline will travel more than 300 miles from northwestern West Virginia to southern Virginia. Though outside the Bay watershed, the project has raised regional concerns over supporting the conveyance of gas harvested through the controversial technique of hydraulic fracturing, or fracking.

"Resistance to this project is statewide," said Jessica Sims of the Virginia Sierra Club.

The pipeline's developers were fined more than $2 million last year over environmental violations, and work has been largely halted since October 2019 while the U.S. Fish and Wildlife Service decides whether the project violates the Endangered Species Act.

Mountain Valley spokeswoman Natalie Cox didn't respond to questions about the pipeline submitted by the *Bay Journal.* But she provided a statement emphasizing that its developers chose a route that minimizes the impact to communities and are maintaining "high levels of environmental protection at all times." The project is "roughly 92% complete" and should begin service in early 2021, according to the statement.

Environmentalists concede that much of the work in West Virginia is done, but they say only about 15 of the 108 miles have been completed in Virginia, home to some of the route's most challenging terrain.

"They're trying to reassure investors, so they don't end up with the same fate as the Atlantic Coast Pipeline," said Russell Chisholm of the group Protect Our Water, Heritage, Rights.

Brown swaths in this 2018 photo mark the areas where trees were cut near Charlottesville, VA, to make way for the Atlantic Coast Pipeline, but the project has been cancelled. (Curtis Sheets)

Header Improvement hits snag

In southeastern Virginia, another pipeline is fighting its own headwinds.

The $346 million Header Improvement Project would add 24 miles of 30-inch pipe along segments of an existing route from Prince William County in Northern Virginia south to the city of Chesapeake. It would build two huge gas plants in Charles City County, expand a compressor station in Caroline County and build two more stations in Prince William and Chesapeake.

But the Virginia State Corporation Commission has declined to approve the project until its developer meets a host of conditions.

That company, Virginia Natural Gas, must show by the end of the year that it has firm financing to build the C4GT gas plant, which the HIP's new pipeline would service. It also must show it can recover the costs of the project during the period of its contract with C4GT and agree to a strict cap on costs to its customers.

"If [C4GT] becomes unprofitable, [it] may shut down, as many other merchant generators nationally have shut down," the SCC said. "So, it is imperative that VNG's other customers not be left 'holding the bag.'"

VNG also must provide more information to assuage concerns about multiple environmental justice issues.

In Charles City, for instance, residents say that air pollutants and particulates emitted by the C4GT and Chickahominy plants would harm Black and indigenous communities already burdened by a regional mega-landfill with a history of violations.

In Chesapeake, the compressor station would be built on the site of an existing metering and regulation station, within a mile of approximately 6,500 residents, 65% of whom are people of color and 31% low-income.

VNG spokesman Rick DelaHaya said the company will work with the state "to develop a model project that meets all regulations and meets our obligation to provide clean, safe, reliable and affordable natural gas for our customers."

Natural gas facing uphill battle

The plight of natural gas in Virginia presents a microcosm of the energy industry's troubles nationwide.

COVID-19 has squashed demand for oil and gas, triggering a 40% plunge in the energy sector. In June, Chesapeake Energy filed for bankruptcy protection. Exxon Mobile Corp. was removed from the Dow Jones Industrial Average two months later.

The grassroots opposition to pipelines is digging that financial hole deeper, industry analysts say.

"If we've seen anything, it's that the environmental groups are pretty well-funded and dug in," Kona said. "They've had some successes and they're very encouraged by that. And they're going to keep coming at them." ■

Will the rusty crayfish get its claws on more local waters?

Invasive crayfish disrupting aquatic systems in streams and rivers of the Chesapeake watershed

By Ad Crable

Crawdad, crawfish, crayfish. No matter what you call the crustaceans, the rusty crayfish, an interloper from the Ohio River watershed, has become one of the most destructive invasive species in the streams and rivers of Chesapeake Bay states.

It has been introduced mainly by anglers who use the rusty crayfish for bait and dump extras into streams. But the rusty crayfish has also reached the Bay watershed by way of aquarium lovers, aquaculture and even school classrooms.

The presence of these large, abnormally aggressive crayfish with large pincers and an indiscriminating appetite continues to expand, crowding out native crayfish and destroying underwater vegetation.

The rusty crayfish has been found in Maryland since 2007, Virginia since 2011, Pennsylvania since 1976, West Virginia since 1977 and New York since 1978. Both the Susquehanna and Potomac rivers have major infestations. It has not been found in the portion of Delaware that drains into the Bay.

Fish species have declined in many spots in Midwest states where the invasion began about 20 years earlier, as the crayfish consume fish eggs and destroy habitat.

Frustrating fishery managers, there is apparently no way to beat back the hordes. The use of chemicals would destroy any remaining native crayfish.

> *"Once they're in, you've lost the battle. The focus is on preventing them from getting there."*
>
> — Jay Kilian, MD Department of Natural Resources

"Across the board, the idea is once they're in, you've lost the battle. The focus is on preventing them from getting there," said Jay Kilian, a biologist with the Maryland Department of Natural Resources.

So fishery agencies have been forced to adopt a stop-the-spread fight. That translates into educating the public about the problem with the aim of preventing new waterways from becoming infested. In addition, most states have banned the sale and possession of rusty crayfish.

The threat is not overblown. In Maryland, which has nine native species of crayfish, the rusty is now the second-most prevalent crayfish, second only to virile crayfish, another invasive crayfish. In the mainstem of the Susquehanna, Pennsylvania's largest river, the rusty has completely booted out native crayfish that provide food for a variety of land and underwater predators, as well as creating tunnels that are needed by insects for habitat.

Virginia has only seen one infestation so far — in a creek in southwest Virginia — "but I kind of think it's just a matter of time before we find it somewhere else," said Brian Watson, aquatic resources biologist with the Virginia Department of Wildlife Resources.

"It's scary and impressive at the same time," said David Lieb, an invertebrate zoologist with the Pennsylvania Fish and Boat Commission. "They get in these novel environments, and they go crazy. There are spots where you're absolutely just stepping on them." Indeed, rusty crayfish can exceed 18 per square foot of streambed, compared with one per square foot for native species.

Added Kilian, "They are so good at overtaking native crayfish because they can just swamp a system. If you go into a stream and as you are walking you see crayfish move, you're walking in a stream that has been invaded by rusty crayfish."

The rusty is certainly built for takeover. About twice the size of many native crayfish, it grows to about 4 inches. Its pincers are large compared to its body size, giving rise to the nickname "little bronze lobster." Those menacing claws allow them to kick out small crayfish from hiding places and outcompete them for food, which they eat at about twice the volume of native crayfish. Also, once fully grown, the feisty crayfish can ward off bass and other fish, thus removing a key link in the food chain.

Researcher George Merovich holds a captured specimen of the nonnative rusty crayfish near the Juniata River in central Pennsylvania. (Stephanie Coster)

Like other crayfish, the rusty will eat nearly any plant or small animal, dead or alive. By eating algae, underwater vegetation, aquatic insects and fish eggs, crayfish are important movers of energy up the food chain, as they are eaten by predators on both land and under water.

But with a higher metabolism, rusty crayfish eat much more than native crayfish. In the case of aquatic vegetation, they pull up vast amounts by the roots, killing the plant. Entire sections of streams can become devoid of aquatic plants, reducing erosion control and robbing smaller game fish of needed shelter and food, and inviting invasive plants to take over.

"We have this pretty large crayfish, and my question is how much energy are they taking that can't grow other critters?" said George Merovich, an aquatic ecologist and associate professor at Juniata College in Pennsylvania, who has been studying the impacts of rusty crayfish in the upper Juniata River, a major tributary of the Susquehanna.

"You cannot lock up that much biomass and energy in one species. Others are affected, certainly," Kilian agreed.

Worse, rusty crayfish are forming hybrids with some native crayfish, perhaps passing on the worst traits of the aggressive invader or rendering native crayfish sterile.

Studies are just under way to see if rusty crayfish are harming smallmouth bass populations, which have suffered serious declines in many rivers in the Bay states. Merovich has not finished his research but suspects the consumption of insects by rusty crayfish is not affecting smallmouth diets. But crayfish mowing down vegetation could be removing shelter needed by juvenile bass to survive.

In the Midwest, rusty crayfish have been blamed for sharp declines of bass, northern pike and bluegill gamefish. The problems even extend to recreation, where they have overrun some lakes in Wisconsin and Minnesota so badly that they scare off swimmers.

There has been some talk about plucking rusties from infested waterways and encouraging the public to develop a taste for them, holding "crawfish boils" that are so popular in the South. But restrictions would have to be changed and markets developed. Quips Kilian, "When you eat crustaceans in Maryland, it's not crawdads."

Despite the ominous spread of rusty crayfish, there is some hope among wildlife managers. A majority of the waterways in each state are still free of the invaders. With increased bans and public awareness of the dangers of nonnative crayfish, there is an expectation that further introductions by humans are less likely than they were a decade ago.

"There is hope. We just need to not move rusty crayfish around," Lieb said.

And Kilian has one simple suggestion, aimed at anglers: "Don't dump your bait." ■

Migratory seabirds flocked to Fort Wool in the middle of the Hampton Roads waterway in Virginia this spring after they were displaced from their previous island home of nearly 40 years. (Jeremy Cox)

Birds' return to Hampton Roads island defies expectations

State biologists created new love nest at former Army site to attract displaced migratory birds

By Jeremy Cox

Facing a tight deadline and a global pandemic, state biologists swooped in this spring to preserve Virginia's largest colony of nesting seabirds.

They hauled in tons of white sand. They removed trees and brush that would have prevented the birds from keeping their customary 360-degree lookout. They played bird calls on a continuous loop. They put out decoys. And they waited.

But not for long. Within days, their office computer screens lit up with videos of royal terns displaying courtship behavior in the middle of the fresh blanket of sand. By July, the renovated island near the mouth of the Chesapeake Bay was teeming with flapping wings, eggs and newly hatched chicks.

"This is fantastic," said Becky Gwynn, a biologist with the Department of Wildlife Resources, as she looked out on the squawking masses during a recent visit. "We knew our timing was close when we received our marching orders from the governor's office on Valentine's Day."

Gov. Ralph Northam's administration stepped in to save the colony earlier this year after the U.S. Fish and Wildlife Service, citing a new in-house legal opinion, waived off protections that would have required the state to act. For conservationists, the upward trajectory of the birds displaced by a new highway tunnel demonstrates the ecological benefits of the federal environmental law that the Trump administration tried to circumvent.

"It's just great to have an opportunity to say 'well done,'" said Mike Parr, president of the American Bird Conservancy. "It looks like it worked as well as we could have hoped. Given all the COVID-19 challenges, the logistics and permitting, they did an amazing job with this."

Bridge work causes bird problems

Since the 1980s, a colony of more than 25,000 birds had nested on South Island, an artificial island constructed in 1957 in the middle of Hampton Roads near the mouth of the James River. The island is perched at the spot where the Hampton Roads Bridge Tunnel, part of Interstate 64, begins its descent beneath the waterway. Each day, thousands of cars and trucks stream across the span, a vital transportation link between Norfolk and Hampton.

As unlikely as the island seemed as a nesting spot, it had its advantages, biologists say. The surrounding waters offered a seemingly boundless supply of fish for feeding. Its swatches of sand and gravel were ideally suited for the birds' ground-level nests. Encircled by water, the land was free from raccoons, foxes and other potential predators. From April through August, the birds would arrive, make nests, raise young and leave.

None of the South Island species were listed as federally endangered or threatened, though the rarest of its inhabitants, the gull-billed tern, is considered threatened at the state level.

Because the colony's denizens are classified as migratory birds, they are protected by one of the nation's oldest environmental laws: the Migratory Bird Treaty Act of 1918. That last fact put the colony at the center of a nationwide environmental debate.

To ease traffic congestion, the Virginia Department of Transportation for several years has been planning to widen the I-64 bridge and dig a third tunnel beneath Hampton Roads. As part of the $4 billion project, the state would have to plow under the colony's nesting grounds at South Island. Under the migratory bird law, the state couldn't do that without federal approval of a plan to compensate for that ecological loss.

By the summer of 2017, VDOT engineers were engaged in lengthy talks with state and federal biologists about constructing a new home for the birds somewhere in the vicinity.

But in December of that year, the Interior Department's top lawyer issued a legal opinion decriminalizing unintentional killings of migratory birds. To run afoul of federal enforcement, any future action that

led to the death of birds would have to be proven intentional. Accidental bird kills, including those like the colossal BP oil spill in 2010 that led to 1 million avian deaths in the Gulf of Mexico, would no longer carry federal penalties.

The new interpretation represented a sharp reversal from how the law had been enforced for decades under Republican and Democratic leadership alike.

In 2018, the U.S. Fish and Wildlife Service notified VDOT officials that any "continued conservation efforts" for migratory birds on their part would be "purely voluntary." The state's conservation work screeched to a halt.

> *"It's just great to have an opportunity to say 'well done.' It looks like it worked as well as we could have hoped."*
>
> — Mike Parr
> American Bird Conservancy

A *New York Times* report in December 2019 detailed how the administration's hands-off approach had all but ended migratory bird protection across the country. Its star example was the Hampton Roads colony.

Stepping up to the job

In February this year — Valentine's Day, to be exact — Northam, facing pressure from conservation groups, announced a $2.2 million plan to temporarily relocate the birds to a spit of land adjacent to South Island. In the longer term, the state would work with the U.S. Army Corps of Engineers to study the idea of creating an artificial island for the birds.

South Island had been paved over already, and nesting season was less than two months away. Gwynn and her colleagues had to scramble.

A stony jetty connects South Island to a smaller, sibling island. It is called Fort Wool after the former Army post that has stood there since 1819. The state gained ownership of the island in the 1970s and has allowed the military citadel to crumble into weedy disrepair.

The first and most obvious problem with the site is that it's significantly smaller than the 10-acre South Island. So, the Department of Wildlife Resources, until recently known as the Department of Game and Inland Fisheries, had to anchor seven barges just offshore and cover them with tons of sand. That raised the amount of nesting space to about 2.5 acres, Gwynn said.

For all of the steps that biologists took to make Fort Wool attractive to birds — playing the bird calls, spreading the sand and more — they took just as many to discourage their use of South Island.

In addition to paving its surfaces, they hired a contractor to unleash border collies

David Norris and Becky Gwynn of the Virginia Department of Wildlife Resources take a boat in August to view the migratory bird nesting colony on Fort Wool. (Jeremy Cox)

Built shortly after the War of 1812, Fort Wool has long been closed as a military site. Now, it's home to the largest nesting migratory bird colony in Virginia. (Jeremy Cox)

to chase the birds away. "They almost look like they're playing," said Rob Cary, chief deputy commissioner of VDOT, "but they're seen by birds as a predator."

VDOT also wrapped wiring around railings to discourage the birds from perching. Netting now covers the lower half of the tunnel maintenance and operations complex on the island.

"At Fort Wool, that's where we have the romantic music and candlelight," Cary said.

Would it work? No one was sure. New artificial islands have been successful at attracting bird colonies — think Poplar Island in Maryland. But a retrofit on such a short turnaround time was something new.

New nesting grounds

During Gwynn's outing with fellow biologist David Norris in early August, several groupings arranged by species — "They like to be amongst their own kind," Gwynn explained — fluttered and skittered around their makeshift home. But she estimated that the colony's size had shrunk by about 80% from its height a month earlier, a sign that the annual southward migration was well on its way.

Gwynn's team, supplemented by researchers from Virginia Tech, monitored the birds throughout the nesting season. Because of pandemic restrictions, they depended on wildlife cameras at times to keep tabs on the birds.

During a rare in-person count, they recorded 3,500 royal tern chicks. Historically, South Island has been home to about 80% of royal tern nesting in Virginia, officials say.

The visitors also include 200 sandwich terns, 1,000 common terns, 150 black skimmers and thousands of laughing gulls. Only one pair of gull-billed terns was documented on the island, but fishermen and other observers spotted more in the air, Gwynn said. And the nesting pair produced two fledglings — chicks that survived to take flight.

The birds have thrived despite the occasional setback, she said. Despite the ubiquitous "No Trespassing" signs, her team has spotted evidence of people walking onto the island and barges. The state installed a ring of tethered buoys to ward off boaters. The birds quickly began using them as nesting spots.

The I-64 construction is scheduled to be completed in 2025. The state plans to continue deploying Fort Wool as a bird sanctuary until a new artificial island is built somewhere within about 6 miles of the current nesting location. That will require at least three years of planning and one year of construction, Norris said.

Meanwhile, a federal judge in New York struck down the Trump administration's interpretation of the migratory bird law Aug. 11, arguing that nothing in the original text precludes the government from treating intentional and unintentional kills equally.

"It is not only a sin to kill a mockingbird, it is also a crime," U.S. District Judge Valerie Caproni wrote in her ruling, alluding to Harper Lee's novel, *To Kill a Mockingbird.* "That has been the letter of the law for the past century." ■

Harsh beauty: Take a walk in serpentine barrens

By Ad Crable

One of the largest remnants of the world's rarest ecosystem lies in relative obscurity, just 12 miles north of Baltimore.

Here, in the curiously named Soldiers Delight serpentine barrens, you can walk 7 miles through a seemingly misplaced prairie grassland on hard-scrabble trails.

This terrain — once the bottom of the ocean floor — is covered with brownish-green rock so infertile and hostile that only specially adapted plants can survive on it. Serpentine refers to the color and pattern of the rock, named for its similarity to the skin of a snake.

No one knows for sure why the area is called Soldiers Delight, but one popular theory is that soldiers in Colonial times used to hunt, ride horses and otherwise carry on in the barrens.

In the Soldiers Delight Natural Environment Area, with 1,900 acres of the rarified landscape near Owings Mills, I struck out on a hot August morning hoping to see some of the 30 perilously rare grasses, sedges and wildflowers that are found here and few other places on Earth.

The serpentine chickweed, for example, is found only in serpentine soil. Other imaginatively named wildflowers and grasses include serpentine panic grass, serpentine aster, Bicknell's hoary rockrose and sandplain wild flax. Many of the wildflowers bloom in late summer or early fall.

Also in the landscape blend are savannas where gnarled and stunted blackjack and post oak trees, along with pea-stick sassafras, have forged an evolved existence to withstand the poor soil, heat, drought and fire.

On the dirt and rock path, I moved through waves of swaying bluestem and Indian grasses with blades that tinted red, green and yellow. One of the most common grasses, little bluestem, has gained purchase here by curling its long leaves inward during the hot midday hours. Serpentine chickweed has a dense layer of hair that reflects excessive sunlight.

The main barrens, a long bowl-shaped plain that stretched as far as I could see, is startling in its silence and unbrokenness, punctuated only by sentinels of stunted oaks.

What makes the barrens so, well, barren is that they are underlain by serpentine rock that is toxic to plants, with high concentrations of chromium, nickel and magnesium, while lacking the calcium that most plants need to grow. The soil is both poisonous for most plants and very shallow, consisting of eroded serpentine rock.

The rock was formed by magma pushed up from deep in the Earth to become the ocean bottom 500 million years ago. Later, when the serpentine rock was buried beneath the surface and continental plates crashed against each other, the rock was thrust to the surface in some places, forming islands of unique ecosystems.

Of the 40 barrens recorded in eastern North America from Alabama to Newfoundland, only about half remain. And most of those are clustered around the Maryland-Pennsylvania line.

When settlers arrived, there were perhaps 100,000 acres of barrens of open fields and oak savannas in Pennsylvania and Maryland that still allowed light to reach the ground and support barrens plants.

At that time, American Indians played a major role in maintaining the barrens by burning them periodically to keep the landscape attractive to big game for hunting. The mastodons and woolly mammoths, whose grazing helped to keep the barrens open naturally, were long gone, and any bison that remained were declining. Then settlers pushed the Native Americans out.

Though the barrens were useless for growing crops and timber, farmers often used them to graze livestock, which kept the fields open. And fires set by humans or lightning occasionally

Photo: Hikers explore the serpentine barrens found at Soldiers Delight Natural Environment Area just north of Baltimore. (Dave Harp)

Left photo: The terrain of serpentine barrens, like that shown here at Soldiers Delight Natural Environment Area in Maryland, was once the bottom of an ocean floor. The rock is so hostile to plant life that only specially adapted species can survive on it. (Dave Harp)

Right photo: Prairie blazing-star, a wildflower that depends on periodic fires to survive, grows in the Soldiers Delight serpentine barrens. (Dave Harp)

blazed through, killing plants and trees that had not adapted to fire.

Then, about 50 years ago, landscape managers began to aggressively suppress wildfire. Without it, Virginia pines began to encroach, forming dense clusters that eliminated the open ground needed for serpentine plants. Fallen pine needles formed a thin topsoil that allowed greenbrier and invasive plants to gain a foothold.

With no seeming good use for humans, the barrens were abused, used as trash dumps and developed into shopping malls, housing developments and golf courses.

A comparison of aerial photos of four Pennsylvania barrens from 1937 to 2011 shows the barrens shrinking from 2,037 acres to 52 acres. Today, all that remains are several thousand acres in a handful of spots in Pennsylvania and Maryland, protected by government agencies, conservation groups and easements from willing private landowners. The Nature Conservancy, in particular, acquired or protected many of the surviving barrens. Since the 1980s, there has been some momentum to restore and maintain them.

The barrens might have gone away completely without the tenaciousness of a few who saw the barrens as anything but. Soldiers Delight is by far the largest remnant and its rescue is a remarkable story of a few people who saw the beauty in harshness and crusaded for more than three decades against great odds to save it from oblivion.

When chromite was discovered in various barrens in the early 1800s, it became a prime source for the material used in the manufacture of chemicals, paints and dyes. An old mine pit with a section of railroad track can be seen at Soldiers Delight on the Choate Mine Trail.

Some of the finest buildings and homes in Baltimore and Philadelphia used the green-tinted serpentine rock from various barrens in Maryland and Pennsylvania in their construction.

Later, Soldiers Delight attracted squatters and was known as a forbidding place. Cockfights were common and federal agents plumbed the barrens for bootleggers.

Several local residents who fell in love with the barrens' unconventional beauty rose up and began pressuring the state in the 1950s to buy the land for a public park. The state finally agreed, and the park opened in 1975. An educational visitor center was added in 1991.

The Maryland Wildlife and Heritage Service and volunteers have conducted three projects to restore about 1,000 acres of the barrens back to the open conditions needed for rare plants to survive. They removed smothering pine trees and killed invasive plants with controlled burns and old-fashioned yanking. BGE helped with the project on land that runs under a pair of power lines.

The controlled burns have been quite effective. Withered gray stumps of Virginia pines rise from the grassy plains like bleached tombstones.

Paula Becker, who heads restoration work at the barrens, paused for a moment when asked to describe the allure of the barrens. "It takes a little bit of work to love them sometimes," she said. "But they have a subtle beauty. Each season is different. I like them first thing in the morning when dew is on the grass and the droplets are sparkling. These open areas of grass are waving back and forth and it's lovely.

"It's almost like being by the sea." ■

Serpentine barrens in Maryland & Pennsylvania

- **Soldiers Delight Natural Environment Area,** 5100 Deer Park Road, Owings Mills, MD: The largest intact barrens on the U.S. East Coast, this site has four trails through nearly 1,000 acres of open barrens habitat at the 1,900-acre site. The 2.5-mile Serpentine Trail has great vistas. Equestrians and cyclists are prohibited. Dogs are permitted on leash. Visit dnr.maryland.gov/publiclands/Pages/central/soldiersdelight.aspx.

- **Lake Roland Park,** 1000 Lakeside Drive, Baltimore, MD: The southwest corner of the 503-acre park is the Bare Hills Serpentine Barrens. The park is owned by the Baltimore County Department of Recreation and Parks and has a new Lake Roland Nature Center. Visit lakeroland.org/park.

- **Nottingham Park,** 150 Park Road, Nottingham, PA: Contained in the Chester County-owned park are 651 acres of serpentine barrens that were designated a National Natural Landmark in 2008. The 2.7-mile Buck Trail has good views of the barrens. Visit chesco.org/1744/Nottingham-Park.

- **William Penn State Forest,** Red Pump Road, Nottingham, PA: The Goat Hill serpentine barrens within the park cover 650 acres. The 2.3-mile up and back Rose Trail is named for Rose Chase, who kept the barrens from being mined in the late 1970s. Visit alltrails.com/trail/us/pennsylvania/rose-trail--2.

- **Rock Springs Nature Preserve,** Mason-Dixon Road, Peach Bottom, PA: Because these barrens are managed for habitat and not recreation, there are no formal trails but two maintenance lanes can be followed. Visit lancasterconservancy.org/preserves/rock-springs/.

- **Chrome Serpentine Barrens Preserve,** Barren Road, Oxford, PA: The preserve contains 390 acres. There are three trails totaling 4.5 miles. Horses and bikes are also permitted. Visit the2nomads.org/FriendsWebSite/TrailBrochures/Chrome.html.

Leave your tracks on the Blue Ridge Railway Trail

By Leslie Middleton

As American chestnut trees were dying, the Virginia Blue Ridge Railway sprang to life. It was 1914, and blight was decimating chestnut trees in hardwood forests from Maine to Florida. Nevertheless, a pair of undeterred entrepreneurs established a shortline railway to transport chestnut timber from a series of mills that lay in the shadow of Virginia's Blue Ridge Mountains.

It was a race against time, requiring more than a little luck to stay afloat, as the blight turned healthy hillside trees into rotting carcasses.

Three years later, war hampered their efforts, too. In 1917, at the onset of World War I, the federal government deemed these local timber operations nonessential to the wartime effort. Still, the railway hung on through a decades-long struggle to capitalize on changing markets.

For a time, farm orchards provided apples that the railway carried to market. Later, rocks and minerals were extracted along the Piney River for use in manufacturing, and the railway served related industries as well. But by 1980, all local commercial ventures had shut down, and the railroad no longer had customers.

A few years later, local residents concocted a vision for what would become the Blue Ridge Railway Trail — for walking, bicycling and horse riding. It began when Steve Martin, who owned a farm along the railway bed, purchased 7 miles of former railroad land between the historic sites of the Piney and Tye rivers settlements, which are home to just a few shops and houses today.

Conversations with forward-thinking neighbors led to the creation of a foundation that secured grants to build the trail, section by section, bridge by bridge, over approximately 15 years.

"There were a lot of folks in the community — including adjacent landowners — who felt nostalgia for the old railroad," Martin said. Building the railway trail was a way, they thought, to continue the railroad's legacy.

As each section was completed, the Martin family deeded the land over to Nelson and Amherst counties, through which the trail runs. The counties now own the land and work cooperatively to maintain the trail.

"It was a nice thing to do for the community," Martin said.

The railbed is fully transformed into a 7-mile recreational trail. It follows the Piney and Tye rivers, tributaries of the James, while weaving eastward through forest, open pastures and brushy woodlands.

I set out on a bright morning this spring to bicycle the entire route, starting from the Piney River Trailhead at Virginia Route 151. There you'll find good signage, a trail map and portable toilets.

Rows of tall Virginia pines at the beginning of the trail drew my gaze upward. With a slight wind at my back, I quickly pedaled through a short section of trail flanked by a robust

Top photo: A cyclist passes over one of several bridges on the Virginia Blue Ridge Railway Trail. (Leslie Middleton)

Bottom photo: Fire pinks push through the bank along the Virginia Blue Ridge Railway Trail. (Leslie Middleton)

chain-link fence and was soon greeted by the Piney River emerging from a crooked turn. I'd be cycling along the river for the next 4.5 miles until it merges with the Tye River, then follow the Tye to the trail's end.

At the first of many picnic tables and benches along the way, I stopped to admire the clear water tumbling over and around small boulders in the river. The Piney is narrow and shallow, like a mountain stream, and I could easily imagine coming back in the summer to enjoy its refreshingly cool flow.

The trail is rich with birdlife and included on the Virginia Birding and Wildlife Trail. On the opposite bank, I spotted snatches of color from two year-round avian residents, cardinals and blue jays. Behind me, the raucous call of the red-bellied woodpecker echoed from the edge a greening pasture rising just beyond the trail.

In a few weeks, the woods would be alive with yellow-rumped warblers, ruby-crowned kinglets and yellow-bellied sapsuckers. Later still, neotropical migrants would be drawing wildlife enthusiasts with binoculars.

Soon after crossing the Piney River on the first of five sturdy wooden bridges along the trail, I arrived at the Rose Mill trailhead, only 1.8 miles east from where I started. Here, too, are good signage and portable toilets. Having two trailheads with parking offers multiple trip alternatives. The terminus, 5 miles down the trail from Rose Mill, is a dead end and turnaround point, with no parking area.

Rose Mill was a once a thriving settlement, anchored by a grist mill, and named for the Rev. Robert Rose, a minister in the early 1700s. Rose was a protege of Virginia's lieutenant governor, Alexander Spotswood. He frequently traveled between the Northern Neck of Virginia and the Blue Ridge foothills, serving communities along the way.

The mill at this river crossing has long since disappeared. But if you want a close-hand look at the milling process and fresh-ground grain products, you can visit the original 1794 Woodson's Mill in Lowesville, a few miles off the trail by car or bike.

Close to trail Mile 5, the path crosses Naked Creek. I bicycled through the sturdy wooden, covered bridge in the midst of lowlands alight with Virginia bluebells and spring beauties.

Further along, just downstream from the confluence of the Piney and Tye rivers, I stopped to admire the view from another bridge where the trail crosses the Tye. The trail follows the Tye for the last 2 miles, at times hugging a steep bank. On my visit, the bank was draped in spring ephemerals like fire pink and trout lilies, emerging from winter's duff at eye level.

At the terminus of the trail, volunteers have reconstructed a shanty and a scale, designed in the 1850s, to facilitate weighing rail cars individually without decoupling them from the train line.

Resting there in the shade on a bench built by a local Eagle Scout, I watched a train across the Tye River rounding the bend toward the James River and beyond. For a moment, I wasn't sure what century I was in.

Through the woods are a few houses, the last echo of the Tye River settlement and the terminus of the Virginia Blue Ridge Railway and, until 50 years ago, a busy farm community hub. When Hurricane Camille came inland in 1969, it infamously stalled on the foothills east of the Blue Ridge, dumping a record 27 inches of rain in a three-hour period on Nelson County. Flash floods and mudslides killed 153 people and washed out 133 bridges (including several on the Blue Ridge Railway) and entire communities before causing massive flooding downstream all of the way to Richmond. Hillsides, homesteads and families still bear the scars from the devastating storm.

Returning back the way I came, I could feel the small but steady uphill grade in my thighs and lungs. From time to time, I stopped at one of the strategically placed benches for a drink of water and a view of the river. I could feel the stress of COVID-time falling away with every uphill mile. Trail founder Martin recalled encountering a man walking the trail one day. "He told me that the trail had saved his life. His doctor had given him maybe two years to live, so he started walking regularly on the trail — and now he was going on three years and feeling just fine."

The health of the Piney River has also been in trouble. Waste discharges from riverside industries caused a series of fish kills from 1977 to 1981. One troublesome source became a Superfund site. The site's current owner has removed sediment and treated groundwater through constructed wetlands and other processes to ensure that toxic chemicals do not pose a hazard to the Piney River or nearby household wells.

At the Piney River trailhead where I'd started, the information sign notes that the discolored water in the drainage ditches along the first half-mile of trail are from historic mining activities and that the slightly acidic water should be avoided by people and pets.

Myles Bartos, federal onsite coordinator for the U.S. Environmental Protection Agency, explained that recent monitoring and inspections revealed a small amount of potentially hazardous material in one of the mounded remediation areas. For a few months, starting in August, portions of that half-mile stretch and the parking lot may be temporarily closed for materials removal and site restoration.

I marveled at how this trail co-exists with an active Superfund site. Even now, as monitoring and cleanup continues, the Piney River downstream is clean enough to be considered for future trout stocking.

On the morning of my visit, the Piney River trailhead parking lot was full of cars with bike racks. A truck with a horse trailer was tucked into a corner.

Maureen Kelley, Nelson County's director of economic development and tourism, summed up her appreciation for the trail nicely: "We love the trail because it's flat, it meanders along the river and it has something to offer everyone, from outdoor and fitness enthusiasts to railway buffs."

I'm probably a little bit of each of these and know that I'm not alone in my fondness for the Blue Ridge Railway Trail. ■

Resources

TRAIL MAP:

- Visit nelsoncounty-va.gov/wp-content/uploads/Map-of-Trail-13.pdf.

TRAIL INFO, INCLUDING PARTIAL CLOSURES THIS FALL:

- Visit the Facebook page for the Virginia Blue Ridge Railway Trail.
- Call the Nelson County Parks & Recreation at 434-263-7130.
- Visit countyofamherst.com and look under the Trails section of the Recreation & Parks Department.

WOODSON'S MILL

- Visit woodsonsmill.com.

Photo: At the end of the Virginia Blue Ridge Railway Trail, volunteers have reconstructed a scale, designed in the 1850s, that could weigh rail cars individually without decoupling them from the train line. (Leslie Middleton)

Pickerelweed's purple flowers line the edge of a marsh near a wood duck box on Miles Creek in Talbot County, MD. (Dave Harp)

We'd like to thank all of our donors for their generosity

There's no greater sign of the *Bay Journal*'s success than the compliments and donations received from readers like you. Your gifts to the Bay Journal Fund continue to make our work possible, from coverage of the Bay restoration and the health of its rivers, to the impacts of climate change, toxics, growth and invasive species on the region's ecosystem. Our staff works every day to bring you the best reporting on environmental issues in the Bay region. We are grateful for your donations.
Please continue to support our success!

PHILANTHROPIST

Roy E. Hock
Williamsburg, VA

CHAMPION

W. C. Dickinson
Alexandria, VA

ADVOCATE

Chesapeake Bay Commission
Annapolis, MD

Cecil Davison & Nancy Adams
Washington, DC

Kate Patton
Snow Hill, MD

Steve Cassis
Frederick, MD

Cooper Family Fund of the Baltimore Community Foundation
Baltimore, MD

In Memory of Bill Brewer from Collot Guerard
Galesville, MD

Tom Pelton
Washington, DC

Susan Rosenthal
Reston, VA

BENEFACTOR

Dr. Alphonse Desena
Arlington, VA

Tom Straehle
Westminster, MD

Michael & Patricia Burke
Mitchellville, MD

David B. Nelson
Baltimore, MD

Aaron Claxton
Arlington, VA

Dan & Michelle Frank
Lititz, PA

Len Heckwolf
Phoenix, MD

Donna & Dennis Treacy
Hanover, VA

SPONSOR

Cacapon Institute
Great Cacapon, WV

Earl L. Chambers, Jr.
Stevensville, MD

Rick Cooper
York, PA

George Fox
Wilmington, DE

Joseph Friend
Arnold, MD

Rebecca Gates
Heathsville, VA

K. Hannaford
Lewisburg, PA

Polly Heninger
Baltimore, MD

Mary Hickman
Gloucester Point, VA

Anthony & Susan Kar
Carlisle, PA

Steve Kover
Silver Spring, MD

Lois & Mike Loges
East Berlin, PA

Janet Michael
Mystic, CT

Mr. & Mrs. Jeffery R. Olsen
Silver Spring, MD

Jeffrey Putt, Sr.
York, PA

Bill Reilly
West Chester, PA

Edward Robbins
Bowie, MD

Lynn Scholz
Washington, DC

SUPPORTER

Greg Bowen
Prince Frederick, MD

Mark & Christine Headly
Warrenton, VA

M. L. Pierce
McLean, VA

Charlotte Schomburg
Greenbelt, MD

Dr. Dale Schumacher
Elkridge, MD

Russel Shon & Ari Butler
Ashland, VA

Leonard & Connie Tritt
Carlisle, PA

B. J. Yolton
Richmond, VA

Richard C. Reilly
Delta, PA

Dr. & Mrs. Marvin S. Beitler

Alan Brandt
Columbia, MD

Jeff Corbin
Richmond, VA

Bruce Cumming
Bainbridge, NY

Donny & Cathie Dickerson
Seaford, DE

Alice F. Dorshow
Catonsville, MD

Leslie Fellows
Aylett, VA

Robin Fishpaw
Manchester, MD

Herb & Rhonda Floyd
Trappe, MD

Arthur Gernand
Emmitsburg, MD

Martin Gleason
Grasonville, MD

Kevin Heanue
Alexandria, VA

Yes! I want to help the *Bay Journal* maintain and expand coverage of issues related to the Chesapeake Bay and its watershed.

Enclosed is my tax-deductible gift of $_____

☐ **My check made payable to "Bay Journal Fund" is enclosed. OR ☐ Charge my Visa/MasterCard/Discover/AMEX.**

Card#:_____Expires:_____Security Code:_____

Name(s):_____

Address:_____

City:_____State:_____Zip:_____

Is this a memorial? Write name here: _____

Is this in someone's honor? Write name here:_____

☐ From time to time, the *Bay Journal* may include a list of its supporters in the print edition. Please check here if you would like your gift to remain anonymous and not be recognized in the *Bay Journal*.

Please mail your donation to the Bay Journal Fund, P.O. Box 222, Jacobus, PA 17407-0222

☐ **$15–$49**	**Friend**
☐ **$50–$99**	**Supporter**
☐ **$100–$149**	**Sponsor**
☐ **$150–$249**	**Benefactor**
☐ **$250–$499**	**Advocate**
☐ **$500–$999**	**Booster**
☐ **$1,000–$2,499**	**Champion**
☐ **$2,500–$4,999**	**Guarantor**
☐ **$5,000 & Up**	**Philanthropist**

The Bay Journal Fund does not share the names of its donors or their addresses with other organizations.

A dragonfly rests on a leaf between meals of mosquitoes, gnats, wasps and even stinkbugs. (Dave Harp)

Brian Higgins
McLean, VA

Thomas Kemp
Hollywood, MD

Bill Knouse
Colonial Beach, VA

Mike Lofton
Harwood, MD

Edward Lumsden
Sykesville, MD

Robin Makin
Fredericksburg, VA

Tim Maret
Shippensburg, PA

Michael Mininsohn
Owings Mills, MD

Stephen & Alina Muther
Annapolis, MD

Jim & Anni Naylor
Westminster, MD

Mike & Mary Jane Reber
Lusby, MD

***In Memory of Megan Richardson* from Karen Richardson**
Pasadena, MD

Larry Rittinger
Southport, NC

Eric Ruark
Galesville, MD

Katherine Shelly
Thompson, PA

Dr. Richard Szarko
Manheim, PA

Robert E. Tucci
Newmanstown, PA

Erika Goldsborough Turner
Ipswich, MA

Willis Ward
Mathews, VA

Greg Willis
York, PA

J. Wright Witcher & Leslie Erickson
Jarrettsville, MD

Tony Decint
Baltimore, MD

Karl Huber
Richmond, VA

John Joyce
Annapolis, MD

Mary Perkins
Glen Burnie, MD

Kay Sedlak
Westminster, MD

Laura Simms
Parkville, MD

Mable Gaies
Aberdeen, MD

Jerry Snyder
Burke, VA

Marlon Winston
Chesterfield, VA

Karen Clark
Arnold, MD

Stephanie Demma
North Bethesda, MD

***In Memory of* Grason "Jake" Jones, Sr. from Grason Jones, Jr.**
Crosswicks, NJ

Norman LaCroix
Jessup, MD

Ida Swenson
Palmyra, VA

Roland Cope
New Cumberland, PA

Melodie Anderson-Smith
Fayetteville, PA

Julia & Avery Brown
Coudersport, PA

Richard Budden
Chestertown, MD

James Colby
Moneta, VA

Fred Culbert
E. Springfield, NY

Cheryl Dennis
Halethorpe, MD

Liz Feinberg
Paoli, PA

Michael W. Fincham
Takoma Park, MD

Michael Gavin
Hellam, PA

Larry Grimes
Chester, VA

***In Memory of Helen Bass* Whitehead from James Goetzinger**
Richmond, VA

Melissa Herman
Bethesda, MD

Susan & Andy Hurst
Onley, VA

Richard Kantor
Merry Point, VA

Richard Kerns
Frostburg, MD

John P. Kirby
Parkville, MD

FRIEND

Ron Mattson
Palm Harbor, FL

Mark Meister
Wilmington, DE

Edgar Miller
Ruxton, MD

Fred Mirra
Clear Spring, MD

Jake Mohorovic
Dundalk, MD

Robert J. Morgan
Virginia Beach, VA

Joan O'Ottavio
Vineland, NJ

Robert Ogburn
Clinton, MD

James H. Payne, Jr.
Manassas, VA

H. Pazourek
Frederick, MD

John B. Ross
Berwyn Heights, MD

Gary Rosser
Federalsburg, MD

Katherine Sangiorgio
Malvern, PA

Lou Sedlak
Bel Air, MD

Kevin Sellner
Frederick, MD

Willie Staton
Landover, MD

Per Struck
Baltimore, MD

Joseph S. Sutton
Galeton, PA

Jeff Trader
Pocomoke City, MD

Catherine Turner
University Park, MD

Esther Walker
White Stone, VA

Douglas & Teresa Ward
New Freedom, PA

Carol Wieser
Chesapeake City, MD

Dennis Winston
Mechanicsville, VA

Amelia Wright
Church Creek, MD

Rich Young
Alexandria, VA

Rob Zacherl
Baltimore, MD

Daniel Tamkus
Aberdeen, MD

Mitchell G. Bernard III
Harrisburg, PA

Merle M. Bowser
Annapolis, MD

Dave Browne
Virginia Beach, VA

Joseph Cook
Pocomoke City, MD

Charles Fletcher
Sykesville, MD

Eleanor Freese
Elkton, MD

Warren Gardner
Roanoke, VA

Ronnie Gray
Odenton, MD

Bob Hettchen
Parkton, MD

Steve MacPherson
Midlothian, VA

M. H. Mervine
Bridgeville, DE

Jennifer Milligan
Baltimore, MD

Kevin Mock
Camp Hill, PA

Dennis Obermayer
Fairfax, VA

James J. Pulchine, Jr.
Amissville, VA

Wayne Randall
Greenbackville, VA

Christian Rose
Lutherville, MD

Howard Sathre
Bluefield, VA

Douglas Shaw
Penryn, PA

Robert Stover
Lancaster, PA

Lois Webber
Boonsboro, MD

David Webster
Stevensville, MD

Jan Wright
Roanoke, VA

Mark Lai
New York, NY

Isaac Lynch, Jr.
Petersburg, VA

Justin Mando
Landisville, PA

Beverly McDonald
Inwood, WV

John Ohanian
Coral Springs, FL

Thank You To These Philanthropic Donors

RAUCH FOUNDATION

ORC

THE CAMPBELL FOUNDATION

NOAA CHESAPEAKE BAY

Chesapeake Bay Program
A Watershed Partnership

WYE HALL
plant a tree, leave a legacy

Virginia Environmental Endowment

SHARED EARTH FOUNDATION

The Curtis and Edith Munson Foundation

The Sumner T. McKnight Foundation

Equity & justice: aspirations for the environmental movement

By Gabrielle Roffe

"It's no coincidence that 'aspiration' means both hope and the act of breathing. When we speak, we use the breath in our lungs to give our thoughts a physical form. The sounds we make are simultaneously our intentions and our life force. I speak therefore I am."

— *The Great Silence*, by Ted Chiang

Conservation organizations should reflect on why the environmental movement is not attracting people of color and why organizations are not retaining them. (Will Parson/Chesapeake Bay Program)

On Breath

I have been thinking a lot about breath. Lack of breath is at the center of the largest civil rights movement in history. Lack of breath is a symptom of COVID-19. To fight for breath is to fight for humanity. To say "I can't breathe" is at once a call for help and empathy and a call to action.

Too often those calls are silenced. The past few months have caused humanity to hold its breath, terrified, facing a global pandemic. But this is not a new feeling for communities of color, who are historically *and* currently oppressed and disproportionately impacted by environmental injustices like a lack of clean air to breathe, and now, COVID-19.

It's time to amplify the voices and aspirations of people of color. By acknowledging conservation's racist histories, then actively challenging racism and oppression, we can be co-conspirators in rebuilding the conservation movement, to give us all room to breathe.

On Voice

For decades, the greater environmental movement has been working in a silo, without considering the intersections of racial and social justice. I commend the recent *Bay Journal* article, *Chesapeake restoration under scrutiny for lack of diversity* (July-August 2020), which brings to light the connections between the racist origins of the conservation movement and how people of color have been systematically silenced over time.

Among others, the Sierra Club has been outspoken about the racist forefathers of conservation, and some environmental organizations are finally waking up to the White supremacy culture in which they were built. What does White supremacy culture mean? As described by Showing Up for Racial Justice, a national network of groups and individuals working to undermine white supremacy and work for racial justice, "Culture is powerful precisely because it is so present and at the same time so very difficult to name or identify." Mariah Davis of the Choose Clean Water Coalition brilliantly wrote about this in the *Baltimore Sun* article, "Sierra Club founder not the only symbol of racism the environmental community must reckon with."

Through this process, the voices and aspirations of Black and Brown people must be centered. To do this, Chanté Coleman, vice president of equity and justice at the National Wildlife Federation, says we need more than "quick fixes" and "virtue signaling," as these problems cannot be solved with one-off actions such as statements and diversity fellowships. "We must pause, listen, learn and change for the long term," Coleman says.

Intersectional environmentalism means to dismantle systems of oppression in the environmental movement. This work is now about actively being anti-racist and shifting systems of power, internally reflecting to understand why the conservation movement and our organizations are not attracting people of color and, better yet, why we are not retaining them.

Hierarchical and bureaucratic systems are stifling the voices of people of color and young creatives, and they are silencing by design. This is not simply about bringing "new" voices to the table — it is about breaking down the walls of the room the table is in and rebuilding. "Given the embedded nature of racism and oppression, we must first shift our organizational cultures to center the needs and voices of Black staff and non-Black staff of color, build the competencies of our White staff, and build an informed strategy for coordinated action," Coleman says.

On Hope

There is hope in the conservation movement. I see it with the incredible growth of the Chesapeake Conservancy, where I work, on this journey. Anti-racism starts with the individual and it is a personal journey for each of us.

At the conservancy, we are intentionally focused on internal reflection, actively listening and shifting our organizational strategies to be anti-racist to truly achieve our mission of protecting and restoring a healthy Chesapeake for all. Crucial to these efforts is leadership at the highest levels, including the board, guiding and supporting this work, and the passionate energy of our staff and interns who want to do better for the future of conservation movement.

I have hope in the growing community of conservationists championing this work and collectively breathing equity and justice into their organizations. This is a village of people, usually people of color, who often feel alone and are exhausted from shouldering the burden, and we rely on each other for support. We are here, and we are shifting the narratives of the conservation movement. Listen to us. Give us power.

Aspirations

My aspirations for this movement are to redefine what it means to be an environmentalist. To be more inclusive of *all* voices. To shift power to those who have been marginalized to become the movement's next leaders.

We all have a role in this, it is the responsibility of everyone in the conservation community, especially White people. A teacher once told me that responsibility is your ability to respond to a situation. You can choose to respond with mindfulness and intention, in an equitable and inclusive way. But you'll have to make that choice.

There is a lot of learning and unlearning that needs to happen right now in our country and in our Bay community. The future of the environmental movement will neither look nor sound the same as it does today. From my own experience in this movement, we have a long way to go.

So here are some recommendations to the White leaders of the Chesapeake conservation movement:

- Commit to intentional self-reflection: listen, learn, ask questions, have difficult conversations. Take a deep breath, and start again. Growth happens in discomfort.
- Apply an anti-racist lens to all decisions in the organization, which may mean slowing down to dismantle a culture of White supremacy.
- Diversify your staff, leadership and board to ensure that the future leaders of the

See **EQUITY & JUSTICE**, *page 39*

Wind farm off Ocean City would fulfill MD energy plan, create jobs

By Susan Olsen

Proposals for wind energy projects offshore of Ocean City, MD, have drawn both opposition and support. The Thanet Wind Farm, shown here, consists of 100 turbines located about 7 miles offshore of England. (Vattenfall Nederland)

After several years of lobbying on the part of the Sierra Club/Maryland Chapter as well as countless other environmental and civic groups, the Maryland General Assembly passed the Clean Energy Jobs Act in April last year. This law requires Maryland to use 50% renewable energy by 2030 and ensures that the state creates a plan for 100% renewable energy by 2040.

Provisions for job training and startup money for small renewable energy businesses are included in the law. Nearly 20,000 jobs will be created in the solar energy field by raising Maryland's Renewable Portfolio Standard to 50% by 2030. Likewise, jobs in wind energy will increase by the thousands.

As Maryland works to build back better from this economic downturn, we must ensure we are creating clean energy jobs with wages that sustain families and investing in a regenerative economy. A whopping 80% of Marylanders want government stimulus dollars invested in clean energy, not fossil fuels, which means wind — including offshore wind — and solar.

Therefore, the reaction to the proposed offshore wind energy project in Ocean City at a hearing last January was disappointing. Testimony from residents was a broken record of complaints about their property values going down (this has not happened in other cities) and that the view of the turbines 19 miles off the coast would dissuade tourists from coming to Ocean City. One woman testified that the view would be so disruptive that she would no longer be able to teach her yoga class.

Although the City Council and delegates from a few Eastern Shore districts testified against placing the wind turbines off the coast of Ocean City, Salisbury's mayor, Jake Day, testified to the positive economic benefit that Wicomico and Worcester counties were already experiencing.

On July 25, 2018, the *Ocean City Dispatch* published a remarkable letter to the editor from Captain Monty Hawkins, who wrote in detail about the benefits of welcoming the wind turbines. He stated that although fish may be scared away during the building process, the turbines, once completed, will be the «greatest boon to MD's coastal recreational fishing ever." Hawkins should know. He has been fishing on party boats for 38 years.

The captain mentioned some of the new business that will come to Ocean City. There will be sightseeing tours to see the wind farm as well as boats servicing wind infrastructure. He also refuted the argument about navigational errors, saying "How often do we see reports of boats hitting lighthouses?" He dispels the myth of the turbines ruining the view, noting that, in summer, he rarely sees Ocean City's coastline until he is 7–10 miles out.

After a detailed explanation about ocean acidification from carbon emissions, the captain concludes by saying "Wind towers are a whole lot less ugly than a dead sea." This writer cannot agree more. ■

Susan Olsen is chair of the Sierra Club, Lower Eastern Shore Group.

EQUITY & JUSTICE *from page 38*

environmental movement are represented.

- Uplift, support and listen to people of color in your organizations and properly compensate them for their work.
- Inclusion is not what you do, it is who you are.

People of color have been separated from leading this movement for far too long. I am calling on the Bay community and challenging you to ask, "What are the aspirations of communities of color?" To breathe? To have a voice? To have hope? I hope it's all of the above. ■

Gabrielle Roffe is the manager of equity and community engagement at the Chesapeake Conservancy. She acknowledges and expresses gratitude to Brittany Omoleye-Hall, Lauren A. Mariolis, Chanté Coleman and Michael Bowman for their contributions to this piece.

LETTER TO THE EDITOR

'Swarms" is a poor word choice

I was disappointed to read the headline and framing in the July article, *COVID lockdown unleashes swarms of visitors at parks, trails.* The use of the term swarm is a troubling trend in recent news coverage on the increase in individuals and families connecting with their public lands during the pandemic. I expect better from the *Bay Journal*.

Presenting people as a swarm creates a negative connotation. At best, it leaves an image of a mass mobilized group taking over an area. At worst, it dehumanizes new visitors as invading insects. Because the new visitors in your article are also referred to as "different" and "the masses," it swings to the wrong end of the swarm analogy spectrum.

During the nation's worst public health crisis in 100 years, people are reconnecting with the outdoors. This is overwhelmingly positive. Yes, there have been impacts to sites, and many parks remain unprepared to handle the increases. But people aren't a swarm. If parks are crowded, doesn't that mean there's a true need to invest in creating more parks? And stories that depict swarming masses does little to advance an inclusive outdoors.

To help meet this historic moment, the growing #RecreateResponsibly Coalition is working to ensure safe, responsible and inclusive access to the outdoors. I invite the *Bay Journal* to share the coalition's principles with your readers and leave the swarm mentality behind.

Wendy O'Sullivan, Superintendent
National Park Service,
Chesapeake Bay Office

SHARE YOUR THOUGHTS

The Bay Journal welcomes comments and perspectives on environmental issues in the Chesapeake region. Letters to the editor should be 300 words or less. Opinion columns should be arranged in advance. Contact editor Karl Blankenship at kblankenship@bayjournal.com or 717-428-2819. You can also reach the Bay Journal by mail at 619 Oakwood Drive, Seven Valleys, PA 17360-9395. Please include your phone number or email address.

Chickens are often raised for market in crowded conditions. (Ad Crable)

COVID-19 invites us to rethink our food choices

By Karen Davis

The coronavirus pandemic has focused our attention on the link between cleanliness and the avoidance of disease. People are sanitizing their hands, social distancing and covering their faces to prevent the virus from spreading.

Still, most people consume products from chickens and other animals that have spent their lives in densely polluted, overcrowded and disease-ridden facilities.

Infectious microbes, including bird flu viruses, coronaviruses and foodborne bacteria, are drawn to population density, dirt and weakened immune systems — the perfect conditions in which to mutate and spread in animals and humans alike.

One of the cruelest things we do to animals trapped in industrial farming and live animal markets is to prevent them from practicing hygiene as they would in nature.

When chickens come to our sanctuary from a confinement facility, their first act after being placed on the ground is to take a cleansing dust bath. They instinctively want to clean their skin and feathers with particles of earth. A dust bath, for them, is comparable to a water bath for us. They love cleaning themselves, reveling in the communal dustbowls they make and inhaling fresh air for the first time in their lives.

The right of an animal to practice bodily hygiene is what I call an Earthright. Forcing animals to live in filth and breathe air rife with disease organisms is an alien experience they would not choose on their own.

When we think about the importance of hygiene and staying healthy, we need to remember that the same link between health and hygiene applies to other species. Animals in nature would never survive if they carried the load of diseases, pathogens and immunological weaknesses that characterize modern farmed animals, many of whose pathologies transmit to us, making us sick, as discussed in the *Neuroepidemiology* article, *What the COVID-19 crisis is telling humanity*.

We owe it to these animals, the environment and ourselves to think carefully about our food choices. A plant-based diet free of animal products is increasingly desirable and obtainable in today's society. While providing an opportunity for a less violent and more peaceful world, this diet is also an intelligent food safety choice. According to the U.S. Department of Agriculture's Economic Research Service, the major foodborne microbes that make us sick, and can even kill us, occur mainly in "high-protein, nonacid foods, such as meat, poultry, seafood, dairy products and eggs. Farm livestock and poultry infected with microbial pathogens may expose other animals in a herd or flock by excreting pathogens, pathogen cysts, or larvae."

A plant-based diet will not sacrifice jobs or hurt the economy. As long as people exist, the same amount of food will be produced and consumed. Just because people stop eating animal products doesn't mean they stop eating. Eating animal-free for more than 30 years, I'm one of the supermarket's most frequent shoppers. I find plenty to eat there, more all the time. In this respect, it doesn't hurt to be contagious. ■

Karen Davis, Ph.D., is the president and founder of United Poultry Concerns, which promotes the compassionate and respectful treatment of domestic fowl, including a sanctuary for chickens on Virginia's lower Eastern Shore. Her latest book is For the Birds: From Exploitation to Liberation: Essays on Chickens, Turkeys, and Other Domesticated Fowl *(Lantern Books, 2019).*

LETTER TO THE EDITOR

Solar power: A family, farmer and student pocketbook issue

Aerial maps reveal clusters of solar-paneled homes in Dundalk, Arnold and Silver Spring, MD. These residents learned that rooftop solar saves them up to $2,500 on yearly utility bills.

Farmers and the Chesapeake Bay can also benefit from new easements or zones allowing 15–25 acres of solar panels for every additional 100 acres of permanently conserved land. Solar energy sold to nearby residents helps farmers pay for water quality improvements. Residents save as well.

Small, dispersed amounts of solar arrays dotting rural landscapes allow room for ever-green visual buffers that respect surrounding property owners while protecting historic landscapes.

Solar can help the historic preservation economy. Most pre-1945 structures are energy inefficient, even when insulated. Solar panels discretely tucked away on rear lots, garages or on nearby farms eliminate big fuel bills for museums and owners of historic properties.

Some nonprofits have initiated community solar operations as a funding source. Other nonprofits might consider doing the same.

Solar wins the cost-benefit analysis between solar and fracked gas proposed for the University of Maryland Eastern Shore and Eastern Correctional Institute. Solar would permanently save tax payers enormous utility bills at these facilities.

Students at UMES should be asked to choose between solar and gas energy. They will likely choose solar, particularly if presented an opportunity for valuable work experience developing a regional, solar retrofitting action plan. Students can also plan renewable energy for local businesses. Solar and wind now power two U.S. steel mills. Indeed, a gas extension is not the most cost-effective option for Eastern Shore students, farmers, families and businesses.

Clark Hall
Culpeper, VA

Growth and the lesson of COVID: What have we learned?

By Tom Horton

Just as an earthquake mercilessly exposes shoddy building standards, a crisis like the current pandemic lays bare societal flaws. Both present opportunities to rebuild better.

Long before COVID-19, some environmentalists and economists worried about our nation's blind allegiance to unending economic growth. Pursuing infinite physical expansion of the human enterprise on a finite planet can't end well. Something has to give, and mostly it's been the planet; or in our case, the Chesapeake Bay.

Even environmental organizations that should know better haven't done a good job of linking economic growth and environmental decline. Or they think that growing "smarter" and "greener" will be enough.

When climate activist Greta Thunberg addressed the United Nations last year, the press coverage focued on the teenager shaming the world body for inaction in reducing carbon dioxide, the primary agent of climate change. Largely overlooked was her demand that, to prevent ecosystem collapse and mass extinction, nations must give up their "fairy tales of eternal economic growth."

Her overall message resonated among environmentalists and liberals, yet I couldn't think of a single U.S. presidential candidate (there were many in the fall of 2019) who would have touched the Swede's "anti-growth" sentiments with a 10-foot pole.

That's still almost universally so among our political leaders. Indeed, President Trump may have uttered an actual truth in March when he pushed back against the virus-enforced recession we're in: "This country," he said, revealing the core sentiment against limits on growth, "was not built to be shut down."

Obviously, no economy can be shut down as ours has been recently without adverse consequences. But it is especially true when you have built a head-to-toe, grow-or-die system, as the United States and many other developed nations have done. Even a whiff of a slowdown sends governments and business into panic mode.

Such a system measures success by more building, more consumption of goods and services, and a system of accounting — the gross domestic product — that counts economic activity as a plus, without subtracting its social and environmental costs. A major oil spill may thus cause the GDP to rise.

And so we now see dozens of states desperate to reopen their economies even as coronavirus cases and deaths surge. We see public health experts' cautions shunted aside and a growing willingness to accept perhaps tens of thousands of excess COVID deaths as the price of resuming growth.

It's no longer "grow or die"; it's now "grow and die" — a deadly clear term for the trade-offs between growth and nature, between growth and the Bay, that we've been making for decades, if not centuries.

Aided by impressive technological innovation and some decent environmental laws, we've managed to tamp down growth's impacts in the near term. The population in the Bay watershed has more than doubled, while pollution from sewage has been cut in half or more.

But feeding a U.S. population that is expected to grow this century by more than a hundred million — and a global population set to expand by the billions — without severely fouling Earth's waters? That still eludes us. Wildlife experts believe we are headed for an extinction event, a loss of biodiversity that has only happened a handful of times in Earth's history. We are, almost anyplace you look, far from able to live sustainably with the rest of nature, let alone live restoratively (our goal for bringing back the Chesapeake).

Further proof is abundant. COVID economic shutdowns have cleared the water in Venetian canals and the air in Manhattan to levels not seen in modern times. Less barge traffic has cleared the water on at least one Bay river.

The United States has developed an economy based on increasing consumption. (Dave Harp)

People are staying home, having family time, walking, bicycling and gardening. The slow-growth world is finally on a path toward reducing enough CO_2 to avoid climate catastrophe. But it's temporary, not to mention a hell of a poor way to achieve environmental and social goals.

So to what should we aspire? I suggest a "steady-state economy" — one that emphasizes innovation and quality and the concept of "enough" over bigger and the concept of "never enough."

The concept is not new; the steady-state model has been advocated for decades. It is the hallmark of a discipline called ecological economics — which holds that the human economy can only operate sustainably by respecting the bounds of nature's economy.

You can't get from grow-at-any cost to steady-state by merely tweaking modern economics. Steady-state requires a stable population and a drastic reduction of natural resource exploitation.

I think we begin by simply asking, "What kind of economy takes a pandemic to make it sustainable and restorative?" Or perhaps by reading the recent article that inspired this column: *The Silver Lining of the COVID-Caused Recession is Supra-Economic.* (March 24, 2020, on the website of CASSE, Center for the Advancement of Steady State Economics).

And read anything you can find, and there is a lot, by Herman Daly of the University of Maryland (emeritus) or his Canadian counterpart Peter Victor, both grandaddies of ecological economics. If you want short and to the point, read Daly's *Introductory Comments for International Forum on Ecological Economics and Ecological Civilization,* Peking University, Nov. 15, 2019.

COVID has exposed as never before the unsustainability of our economy. An alternative will be complicated, but nature and natural limits point the way clearly. ■

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.

BULLETIN BOARD

VOLUNTEER OPPORTUNITIES

WATERSHEDWIDE

Project Clean Stream
The Alliance for the Chesapeake Bay's Project Clean Stream takes place in all six Bay states and DC on and around the National Day of Service, Sept. 11. Pick up trash in waterways & parks using supplies (trash bags, gloves) provided by the Alliance. Residents, local businesses, environmental organizations, local governments, community groups, houses of worship, schools and universities welcome. Info: chesapeakenetwork.org/groups/project-clean-stream, projectcleanstream@allianceforthebay.org.

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

Chesapeake Network
Join the Alliance for the Chesapeake Bay's Chesapeake Network to learn about events or opportunities that protect or restore the Bay, including webinars, job postings,networking. Connect with the conservation world. Info /search engine: Chesapeake Network.

PENNSYLVANIA

Plant trees in Waynesboro
Help Antietam Watershed Association, Waynesboro Fish & Game Protective Association and Pennsylvania Chesapeake Bay 10 Million Trees plant 800 trees 9 a.m.–3 p.m., Oct. 10 at Waynesboro Fish & Game. Shovels, gloves provided or bring your own. Children must be supervised by parents. The planting is in a partly mown area; dress appropriately. Wear a mask if Pennsylvania still requires one at gatherings. Rain or shine. Registration / info: antietamws.org/events, antietamwa@gmail.com, rfgoldman@comcast.net, ckgawa@gmail.com.

Middle Susquehanna River
There are many ways to get involved with the Middle Susquehanna Riverkeeper Association:
- ***Susquehanna Stewards:*** Deliver programming and information to people in their region, help develop new initiatives. Info: middlesusquehannariverkeeper.org.
- ***Water Reporter App:*** Help to track the health of various fish species in the Middle Susquehanna watershed by sharing photos, locations, other info about your catches via the app. Reports are made available to view via an interactive map at middlesusquehannariverkeeper.org.
- ***Share Concerns:*** The Middle Susquehanna Riverkeeper Association takes reports of any concern regarding the river or its tributaries very seriously. If you have a report of something out of the ordinary, contact Riverkeeper John Zaktansky: midsusriver@gmail.com, 570-768-6300.

MARYLAND

Cromwell Valley Park
Join the Habitat Restoration Team at Cromwell Valley Park in Parkville, 2–4 p.m. Sept. 26; Oct. 10 & 24; and Nov. 14 & 21. (Dates are canceled if there is heavy rain, thunderstorms, or extremely hot temperatures.) Remove invasive plants, plant natives, maintain restored habitat. Bring your own tools. Gloves and mask must be worn for the initial conversation about work. All volunteers must sign waivers; parents or guardians must sign waivers for ages 13–18. Work is inappropriate for ages 12 & younger. Wear long pants, closed-toe shoes, sunscreen, hat. Bring water bottle, insect repellent. Meet at Sherwood House parking lot. Volunteer three times to earn a Cromwell Valley Park Habitat Restoration hat; five times, a handbook, *Native Plants for Wildlife Habitat and Conservation Landscaping from the Chesapeake Bay Watershed.* Preregistration required. Info: Laurie Taylor-Mitchell at lmitchell4@comcast.net. Groups of two or more interested in helping but cannot work on scheduled workdays should contact Taylor-Mitchell. For disability-related accommodations, call 410-887-5370 or 410-887-5319 (TTY), giving as much notice as possible.

Bird Atlas Project
Help the Breeding Bird Atlas of Maryland & the District of Columbia, a five-year project documenting the distribution and abundance of local breeding bird populations, by looking for nests in backyards, forests. Information collected is used to manage habitat, sustain healthy ecosystems. Info: Breeding Bird Atlas website.

Report a fish kill
If you see a fish kill, call the Maryland Department of Environment's Fish Kill Investigation Section. Normal work hours: 443-224-2731 or 800-285-8195. Evenings, weekends and holidays, call the Chesapeake Bay Safety and Environmental Hotline: 877-224-7229.

Anita C. Leight Estuary Center
Workdays at Anita C. Leight Estuary Center in Abingdon:
- ***Invasinators:*** 2–4 p.m. Sept. 13. Ages 14+ Remove invasive plants, plant native species. Wear sturdy shoes, long sleeves, work gloves for field work in the Reserve, weather permitting.
- ***iNaturalist Trek:*** 10:30–11:30 a.m., Sept. 12. All ages. Use the iNaturalist app to search for the park's plants, animals. and help us collect biodiversity data. Registration / Info: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

Severn River Association
Work independently on land & water to track conditions in the Severn River's watershed using COVID-19 safety protocols developed with the MD Department of Natural Resources to protect staff and volunteers working in the field. Training will be offered as circumstances allow. Citizen scientist opportunities include:
- ***Water Quality Monitoring:*** Through October. Conduct weekly boat tours to monitor the river's health.
- ***Water Quality Crew:*** Morning river cruise collects scientific data and monitors wildlife habitat.
- ***Join the SAV Navy!*** Set your own hours through September. Use kayak, canoe or small boat to map SAV beds, identify submerged aquatic vegetation. Paddlers of all skill levels welcome. Gear supplied.
- ***Tell Severn's Story?*** Writers, photographers, reporters, memoirists needed to record story of river's wildlife, people, forests, history, culture and sailing. SRA can create internships for journalists of all ages who want to tell a story, cover meetings, take pictures.
- ***GEMS Expedition:*** Explorers, naturalists, foresters needed for a land-based expedition to map 500 ecological features throughout the Severn watershed: wetlands, trees, ferns, plants, wildlife, creeks, historical & cultural features to create a GIS map of watershed's ecology. Info: Info@severnriver.org. Put "volunteer" in message box.

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

Ruth Swann Park
Remove invasive plants. 10 a.m.–4 p.m. the second Saturday in September, October and November. Meet at Ruth Swann Park-Potomac Branch Library

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.

Submission Guidelines

ONLINE
The *Bay Journal* website has a new look! It also has a new section called ***Bulletin Board***, where you can log in and post your own events — and even include a photo. Visit bayjournal.com and click on "Bulletin Board."

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

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

October issue: September 11
November issue: October 11

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

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

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

parking lot. Bring lunch. Run by Maryland Native Plant Society, Sierra Club & Chapman Forest Foundation. Info: ialm@erols.com, 301-283-0808, (301-442-5657 day of event). Carpoolers meet at Sierra Club MD Chapter office at 9 a.m. & return at 5 p.m. Carpool contact: 301-277-7111.

Chesapeake Bay Environmental Center

Help CBEC in Grasonville. Drop in a few times a month or help more frequently. Openings: help with educational programs; guide kayak trips & hikes; staff front desk; maintain trails, landscapes & pollinator garden; feed or handle captive birds of prey; maintain birds' living quarters; participate in CBEC team of wood duck box monitors or other wildlife initiatives. Other opportunities: fundraising, website development, writing for newsletters & events, developing photo archives; 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.

Chesapeake Biological Laboratory

Lend a hand at Chesapeake Biological Laboratory's Visitor Center on Solomons Island. Ages 16+ Volunteers must commit to a minimum of two, 3– to 4-hour shifts each month in spring, summer, fall. Training required. Info: brzezins@umces.edu.

Citizen Science: MD volunteer angler survey

Help the Department of Natural Resources collect species, location, size data using its Volunteer Angler Survey on a smartphone. Data are used to develop management strategies. The artificial reef initiative, blue crab, freshwater fisheries, muskie, shad and striped bass programs also have mobile-friendly methods to record data. Win quarterly prizes. Info: dnr.maryland.gov/Fisheries/Pages/survey/index.aspx.

Mount Harmon Plantation

Help with manor house student tours, colonial crafts, hearth cooking, guided nature walks & herb garden at Mount Harmon Plantation in Earleville, MD. Special events include manor house tours, admission/ticket sales, gift shop, auction & raffle fundraisers. Training provided. Docents are asked to commit to eight service hours per month during tour season: 10 a.m.–3 p.m. Thursdays–Sundays, May–October. Info: 410-275-8819, info@mountharmon.org.

VIRGINIA

International Coastal Cleanup

Clean Virginia's Water, which is participating in the Ocean Conservancy's International Coastal Cleanup, will be following social distancing requirements mostly by replacing larger events with many mini cleanups using a smaller number of volunteers. Small groups register their own time / date in September or October and pick up cleanup supplies at locations around the state. Volunteers also record data about they find. This information is used to keep up with trends and develop solutions to marine debris and plastic pollution. Use the paper forms at longwood.edu/cleanva/VolunteerSiteCaptain.html or the CleanSwell App on a smartphone.

Contacts for supplies:

- ***Fairfax:*** Clean Fairfax Council. Order supplies, pick them up at various locations. Sign up at least 10 days before cleanup: cleanfairfax.org/programs-events/community-clean-up-program/.
- ***Farmville:*** (Prince Edward, Buckingham & Cumberland counties): Borrow cleanup supplies from Clean Virginia Waterways of Longwood University. Call 434-395-2602 at least seven days before event for pickup in Farmville.
- ***Hampton:*** Hampton Clean City Commission, causink@hampton.gov.
- ***Hampton:*** Hampton Public Libraries have cleanup kits to check out, then return return after the cleanup year-round. Call your local library branch for details.
- ***Richmond:*** Sign up at least seven days before cleanup for pickup. Contact the Alliance for the Chesapeake Bay at 804-775-0951 or sstern@allianceforthebay.org.

Registration / info / if your organization has a staffed location and can serve as a supply pickup location: cleanva@longwood.edu, 434-395-2602. Clean Virginia Waterways will send each group/family a certificate of appreciation. Safety guidelines: longwood.edu/cleanva/SafetyPlan.html.

Tree planting sites needed

Goose Creek Association has partnered locally with the Friends of the Rappahannock and Weplanttrees.org to plant 50,000 trees this fall within their watersheds, particularly farms in Fauquier and Loudoun counties. They are looking to plant at least 60 trees for a riparian buffer or reforestation project at each location. There is no cost to the landowner. Volunteers are also needed. Info: info@goosecreek.org.

VA Master Naturalists

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

Cleanup support & supplies

The Prince William Soil & Water Conservation District in Manassas, VA, gives stream cleanup events the supplies and support they need for trash removal projects. Groups also receive an Adopt-A-Stream sign recognizing their efforts. For info, to adopt a stream, get a proposed site: waterquality@pwswcd.org. Register events: trashnetwork.fergusonfoundation.org.

Chemical Water Quality Monitoring Teams Volunteers with the Prince William (County) Soil and Water Conservation District and Department of Environmental Quality Chemical Water Quality Monitoring Teams collect data from local streams. Training includes collection techniques, reading data. Monitoring sites are accessible for easy collection. Info: waterquality@pwswcd.org, pwswcd.org.

Hoffler Creek Wildlife Preserve

Volunteer 10 a.m.–1 p.m. Sept. 12 at Hoffler Creek Wildlife Preserve in Portsmouth. Remove brush piles, debris from trails; widen trails; trim invasive vines from trees; help with kayak tours, rentals. Recommended ages 16+ (18 & younger w/adult). Parents of children ages 10–15 who would like to volunteer are invited to contact the preserve for age-appropriate tasks. Because of COVID-19 concerns, the park is limiting the size of volunteer groups & will work to set up projects for groups of 10 or more. Individual volunteers and families can help with projects at their own convenience outside of the monthly workday. Info / volunteer questionnaire: hofflercreek.org, 757-686-8684, hofflercreek@hofflercreek.org.

EVENTS / PROGRAMS

MARYLAND

Taste of the Chesapeake

The Alliance for the Chesapeake Bay's annual fundraiser, Taste of the Chesapeake, takes place 7 p.m. Oct. 1 on Zoom. J. Drew Lanham, the keynote speaker, an "insiders" tour of the Alliance's projects, as well as Chesapeake Bay delicacies delivered to your door. Ticket prices: $30 / entrance into the virtual event; $75 / entrance, access to silent auction; $150 / entrance, silent auction, Chesapeake gift box delivered to your home; $500 / entrance, silent auction, Chesapeake box, VIP experience. Buy tickets at: allianceforthebay.org/tastetickets.

Cromwell Valley Park

Programs at the nature center at Cromwell Valley Park in Cockeysville.

- ***Paint with Rocks & Minerals:*** 1–3 p.m. Sept. 13. Participants meet at Primitive Tech Lab for this event. Ages 5+ Search stream for naturally occurring pigments, use them to paint. Bring white t-shirt or bandana. Shoes, clothes will get wet. Fee: $4.
- ***Polliwogs:*** 10:30–11:30 a.m Tuesdays Sept. 15–Oct. 20 ***or*** Wednesdays, Sept.16–Oct. 21. (Register for one only) Ages 2–5 w/adult. Nature play, stories, crafts. Dress for outdoors. Non-mobile siblings only; adult is active participant. Fee: $80.
- ***The Lost Ladybug Project:*** 1–3 p.m. Sept. 19. Ages 8+ Some native ladybug populations are declining. Look for them in meadows, take photos to submit to entomologists at Cornell University. Fee: $4.
- ***Stream Dweller & Digger - Crayfish:*** 1–3 p.m. Sept. 20. Ages 8+ Search under rocks, in streambanks for these crustaceans. Learn about their role in stream ecology. Shoes, clothes will get wet. Fee: $4.
- ***Autumn's Insect Symphony Night Hike:*** 7:30–9 p.m. Sept.25. Ages 8+ Identify who is chirping, clicking, zipping, buzzing and rattling in the meadows, trees. Bring flashlight. Fee: $4.
- ***It's a Bomb!*** 1–3 p.m. Sept. 26. Ages 8+ Make bombs out of clay, native seeds. Throw them in a garden for native flower explosion. Fee: $5.
- ***QUACKtastic Animal Encounter / Meet Quacky & Webster!*** 1–2 p.m. Sept 27. All Ages. Duck duo. Fee: $4.
- ***How About Them Apples!*** 1–3 p.m. Oct. 3. Ages 8+ Learn the Appalachian art of making apple heads, corn husk dolls. Bring paring knife. Fee: $5
- ***A Walk in the Park:*** 1–3 p.m. Oct. 4. Ages 5+ Wear sturdy shoes. Fee: $4.
- ***Balancing Reservoir Hike:*** 1–3 p.m. Oct. 10. Adults. Hike to the northeastern edge of the park to learn how water flow at Loch Raven Dam was managed. Wear sturdy shoes. Fee: $4.

(For complete registration details, including COVID-19 protocols: cromwellvalleypark.org. Info: info@cromwellvalleypark.org, 410-887-2503.

Chesapeake Bay Maritime Museum

Programs at the Chesapeake Bay Maritime Museum in St. Michaels, include:

- ***Coffee & Wood Chips:*** 10–11 a.m. Sept. 14. Join CBMM's shipyard programs manager Jennifer Kuhn via Zoom for a live look at work being done by CBMM's shipwrights, apprentices. Fee: $5. Register: cbmm.org/shipyardprograms.
- ***Virtual Tool-Sharpening Workshop:*** 10 a.m.–12 p.m. Sept. 19. Workshop will focus on gouges, oddly shaped edge tools. Fee: $10. Register: cbmm.org/toolsharpening.

See **BULLETIN**, *page 44*

CHESAPEAKE CHALLENGE

ANSWERS TO QUIZ ON PAGE 45

Striped Burrfish: 1, 3, 6, 8, 9, 12, 14s
Northern Pufferfish: 2, 4, 5, 7, 10, 11, 13

BULLETIN BOARD

BULLETIN *from page 43*

■ ***Where Land and Water Meet / David Harp Photo Exhibition:*** Sept. 25 through Sept. 20, 2021, Steamboat Building gallery, and in a virtual format. Forty years of images by *Bay Journal* and documentary photographer David Harp will be on display. His inspiration comes from exploring literal and figurative edges: shorelines, communities, habitats and traditional worklife where culture and nature connect, creating the essence of what defines the Chesapeake. The exhibition is included with general admission.
Museum visitors must wear facial coverings inside buildings at all times and outdoors when within 6 feet of other guests. Additional health and comfort measures, as well as operational changes, are found at welcome.cbmm.org.

Anita C. Leight Estuary Center

Programs at Anita C. Leight Estuary Center in Abington:

■ ***Monarch Canoe:*** 1:30—4 p.m. Sept. 12. Ages 8+ Search the sky, marsh for monarchs butterflies, dragonflies.Fee: $12.
■ ***Wild Sunset Campfire:*** 6:30–8 p.m. Sept. 12. Meet at the Pontoon Pier. Ages 4+ Look for animals in the water, grass, sky. S'mores. $12/family.
■ ***Meet a Critter:*** 1 p.m. Sept. 13. All ages. Up close animal encounter. Free.
■ ***Kayak Cruising on the Creek:*** 10 a.m.–12:30 p.m. Sept. 18. Adults. Explore Otter Point Creek, upper Bush River. Fee: $12.
■ ***Critter Dinner Time:*** 1:30 p.m. Sept. 19. Learn about turtles, fish, snakes while they eat. Free.
■ ***Chesapeake Storytellers – Capt. John Smith Historic Kayak:*** 2–4:30 p.m. Sept. 19. Meet at Flying Point Park. Ages 8+ Paddle to where Smith once stood while mapping the Bay. Fee: $12.
■ ***Nature Playgroup:*** (Session 1 / 9:30–10:30 a.m.) (Session 2 / 11 a.m.–12 p.m.) Sept. 21, 28; Oct. 5, 12. Ages 0–5. Stories, songs, simple crafts, discovery outings highlight each day's theme. Topics: foxes, leaves, squirrels, spiders. Fee: $30/child.
■ ***Good Morning Marsh - Kayak:*** 7:30–10 a.m. Sept. 26. Ages 8+ Kayak around the marsh, looking for animals. Fee: $12.
■ ***Fall Equinox Campfire:*** 6:30–8 p.m., Sept. 26. Meet at Pontoon Pier. Ages 4+ Learn fall nature lore, search for seasonal constellations. S'mores. Fee:$12/family.
■ ***Kids 'n' Kayaks:*** 9–11 a.m. Sept. 27. Ages 5+ Paddling safety, basic strokes covered before venturing out on Otter Point Creek. Fee: $12.
■ ***Tails & Tots:*** 1 p.m. Sept. 27. Ages 0–6. Stories, songs, moving like animals. Free.
■ ***Migration Watch on the Water Pontoon:*** 10–11:30 a.m. Sept. 19. Ages 6+ Fee: $10. 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.

RESOURCES

Planting a tree?

Using the extra time at home time to spruce up your landscape? Put "How to plant a container tree Maryland DNR" in your search engine for a YouTube video.

Property pointers

The Alliance for the Chesapeake Bay offers resources for property owners who want to make their landscapes more friendly:

■ ***Wood you Like to Learn about Forests?*** Put "Alliance Websites, Resources, Videos, Blogs" in your search engine, then scroll to the Tree Talks under Videos. Titles include: *How to Plant A Tree, What's That Conifer?, Live Staking, Gray Dogwood, Boxelder, Poison Ivy, Black Raspberry, Pawpaw, Blackgum, Snags, Witch Hazel, Christmas Fern, White Cedar, Mountain Laurel, Atlantic White Cedar,* and *A Hobbyist's Guide to Maple Sugaring.*
■ ***Bouquets for the Bay:*** Visit NativePlantCenter.net to find the perfect native species for your landscape.
■ ***Right as Rain Landscape:*** Learn how to design a stormwater runoff plan to help you better manage water running off your property. Visit the Alliance for the Chesapeake Bay's Yard Design Tool at stormwater.allianceforthebay.org.

Severn River speakers online

Severn River Association's John Wright Speaker Series presentations are available online. Titles include *Oyster Farming in St. Jerome's Creek; The Demise of Our Yellow Perch Fishery; Land Preservation: How Does it Work?; Tree Care In The Critical Area; Enjoy The Severn River – Standing Up!; Runoff, Permits & Water Quality; Annapolis Neck – Mud Floods, Fishing on the Severn;* and *Will Butterflies & Bees Survive?* These, and other titles, are available at severnriver.org/category/speaker-series.

Bilingual educator resources

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

Track Severn River's health

Check the health of the Severn River online at cmc.vims.edu/#/home. Water quality data collected from the Severn River Association's network of 41 monitoring stations, from Indian Landing near the headwaters to Lake Ogleton and the creeks of Whitehall Bay, are posted on Data Explorer, a data-sharing platform run by the Chesapeake Monitoring Cooperative. The site also contains SRA water quality monitoring data for 2018 and 2019 and fecal bacteria levels collected by Operation Clearwater, run by Professor Tammy Domansky at Anne Arundel Community College. Anne Arundel County's bacteria reports are also posted.

Watershed 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.

Boating safety instruction

Boating safety classes are required for operators of recreational boats in Virginia, Maryland and the District of Columbia, most other states. Online opportunities include:

■ ***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:*** Put "recreational boating safety outreach" in your search engine.

Stormwater class

The Alliance for the Chesapeake Bay's Municipal Online Stormwater Training Center's Dig Once Course suggests how local leaders can integrate green infrastructure into community capital projects: road construction and school & park improvements. Interactive lessons and videos in a user-friendly format give communities tools to build and enhance local stormwater programs. Info: mostcenter.org.

Wetlands Work website

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

Marine debris toolkit

The National Oceanic and Atmospheric Administration's National Marine Sanctuaries and Marine Debris programs have developed a toolkit for students and educators in coastal and inland areas to learn about marine debris and how to monitor local waterways. The toolkit supports efforts to reduce impacts on marine ecosystems through hands-on citizen science, education and community outreach. Info/search engine: marine debris monitoring toolkit for educators.

Is your yard Bay-Wise?

Master Gardeners in Prince George's County, MD, are part of Bay-Wise, a program offering free consultations on environmental practices to help county residents certify their landscapes. Those who demonstrate healthy lawn maintenance, efficient watering, pest control and create habitat for native trees & plants for wildlife receive Bay-Wise signs. Homeowners can evaluate their property online using the *MD Yardstick*, which tallies pollution-reducing gardening and landscaping practices. To be certified, though, a landscape must be visited, evaluated by a Master Gardener. Info: Esther Mitchell at estherm@umd.edu, extension.umd.edu/baywise/program-certification. Click on "download the yardstick" to evaluate a landscape and/or vegetable garden online.

Turf / lawn programs

For information on 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.

Wildlife education trunks

Maryland Department of Natural Resources Wildlife Education Trunks are available to teachers, home-school educators and naturalists. Free, interdisciplinary tools are designed to interest students in local wildlife while building on art, language arts, math, physical education, science, social studies skills. It contains an educator guide, lesson plans, hands-on K–12 activities, supplies, books, furs, replica tracks, videos. Subjects include aquatic invasive species, bats, black bears, furbearers, white-tailed deer and wild turkeys. Trunks can be borrowed on a first-come, first-served basis for up to two weeks. Info/search engine: Wildlife Education Trunks.

Floatable monitoring program

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

Baltimore Biodiversity Toolkit

To help meet habitat needs of native plants & animals, the Baltimore Biodiversity Toolkit identifies species that represent habitats within and historic to a community. It shows how to support specific wildlife needs; helps citizen scientists monitor and collect data; and develops a culture of conservation and stewardship. Using 20 ambassador species from four habitats, the toolkit helps prioritize community greening projects based on representative species, citizen science data and spatial analysis that includes social, economic and ecological indicators. Info: fws.gov.

CHESAPEAKE CHALLENGE

— Kathleen A. Gaskell

2 Swell Fish

Puffers. Balloonfish. Blowfish. Blow toads. Bubblefish. Globefish. Swellfish. Sugar toads. Spiny boxfish.

No matter what you call them, the northern puffer and striped burrfish are two of the Chesapeake Bay's most intriguing fish. This month's puzzle challenges you to tell them apart. But first, we focus on how they are alike.

Photo C: The northern pufferfish is most common in the Lower Chesapeake but has been found as far north as Kent Island, MD. (flickr.com/photos/28567825@N03/CC BY 2.0)

I'll huff & I'll puff and blow myself up: Pufferfish, burrfish and some other animals have an organ — the buccal pump — which allows it to breathe through its cheeks. When threatened or stressed in water, the fish's stomach can inflate up to 100 times its size, pushing the internal organs out of the way. If the fish is taken out of the water, the stomach fills with air.

Here's the skinny: Instead of scales, these fish have rough to spiky skin. This skin is made of fibrous wavy folds that inflate much more easily than scales would. Once fully puffed up, this skin forms a tight, hard, spiky barrier that makes it difficult for a predator to sink its teeth into.

Photo A: The striped burrfish is found from the mouth of the Chesapeake up to the Patuxent River. (cliffordsphotography.com/CC BY 2.0)

Photo B: A northern pufferfish fills itself with air when it is taken out of the water. This is very stressful for the fish's inner organs and can result in the death of the fish. (flickr.com/photos/zooxanthellae /CC BY-NC-SA 2.0)

Look, don't touch! If you want to watch a northern pufferfish or striped burrfish inflate, enter "pufferfish" in your computer's search engine to find a video. Puffing up puts a lot of stress on the fish and can occasionally kill it. Also, the fish is unable to swim properly while inflated, making it vulnerable while it takes the time needed to deflate.

Surf in their turf: Both fish eat the invertebrates and shellfish found in their habitat. That includes oysters, barnacles, mussels, clams and a variety of crabs. The pufferfish is known to also eat finfish, and large schools of puffers have been observed dining on soft-shell blue crabs.

Beware the beak! Breaking open all of that seafood can be rough on teeth. It's a good thing the teeth continue to grow throughout these fishes' lifetime. Remember, teeth strong enough to break open shellfish can deliver a nasty bite to fingers. Consider yourself warned.

Just a pinch of salt: Both fish are found in brackish waters with about 10–5 parts per thousand salinity.

Inflatable Pop Quiz

Any plan by a creature aiming to prey on the northern puffer or striped burrfish would blow up in its face — literally, with spikes thrown in! The Chesapeake's two self-inflating fish species are often lumped together, but they aren't even in the same animal family. Can you match each fish to its facts? Answers are on page 43.

1. My spines are always erect.
2. My short prickles lay flat until I inflate.
3. Authorities recommend that you don't eat me. I release a toxin when I am stressed.
4. I am so delicious that one of my nicknames is "honey toad," although I am sold under the more palatable name,"sea squab."
5. I am club-shaped.
6. I am box-shaped.
7. I can grow up to 14 inches long, although most of my kind are closer to 8 inches. I can expand to three times my size.
8. I grow up to 10 inches long. I can expand to twice my size.
9. I move by jet propulsion. I squirt jets of water out of my gill slits, which propels me forward.
10. I push myself forward by rapidly swishing my rear fins back and forth like paddles.
11. I belong to the *Tetraodontidae* (4 teeth) family. I have 2 fused teeth on the top of my mouth and two fused teeth on the bottom.
12. I belong to the *Diodontidae* family. I have 2 large fused teeth: one on top, one on the bottom.
13. I live near sandy, silty or muddy bottoms of the Bay's flats and channels. I live nearshore during the summer and move offshore in the winter.
14. I am found in or near Bay grass beds. In winter, I head south for warmer waters. ■

Top photo: Northern pufferfish (Chesapeake Bay Program)

Elevating the 'green' workforce in a changing landscape

By Laura Todd

Speakers at the DC Workforce Development and Green Jobs Roundtable included, from left, Vinicio Linares, Johnnie Philson, Ted Scott, Brian Rodgers and Seth Charde. (Alliance for the Chesapeake Bay)

The Chesapeake Bay region has a unique challenge during the unprecedented times we are currently facing. The District of Columbia and six Bay states are working toward the completion of their share of the Bay cleanup goals, and there is still much work to be done before the 2025 deadline.

To continue reducing the pollutants entering the Bay, the district and states are implementing stormwater best management practices, among other steps, toward their goals. As the number of BMP installations increases, long-term investments need to follow in the form of maintenance and inspection to ensure that these practices don't lose their pollution-reduction effectiveness.

At the Alliance for the Chesapeake Bay, we believe the solutions to environmental issues, like reducing stormwater runoff and reducing unemployment, are not necessarily mutually exclusive.

In October 2019, the Alliance convened more than 50 representatives from the private sector, government and nonprofit organizations to discuss how local partners could better prepare trainees in green workforce programs and better connect them to employment opportunities in the industry. This event was part of the Alliance's ForumPlus initiative, which hosts educational and networking events throughout the Bay watershed. The DC Workforce Development and Green Jobs Roundtable was created by the Alliance, in partnership with the DC Department of Energy and Environment and the National League of Cities, and was sponsored by the National Fish and Wildlife Foundation.

"No other city that I know of has convened a meeting like this," said Andrew Moore of the National League of Cities at the DC Workforce Development and Green Jobs Roundtable.

Panels hosted during the roundtable focused on green jobs training programs, private sector employers and alumni of local training programs. The collective interest and excitement around this topic was palpable. Interested participants were invited to join a workgroup to continue working toward some of the goals laid out during the initial meeting.

The goals of the workgroup include better defining the green jobs industry in DC by identifying the needs and skills necessary for trainees and new professionals to succeed, and professional growth opportunities. A common theme throughout the discussions at the roundtable and through the workgroup is the need for support. To help ensure the success of local green job training initiatives, both trainees and employers need additional resources and training.

Other projects the workgroup seeks to accomplish include the creation of a trainee-to-job pathway map, a toolkit by and for young industry professionals, and outreach and employer training with local maintenance, landscaping and construction firms to encourage hiring local talent with certifications to install or maintain stormwater management projects. Long-term goals of the group include working toward the standardization of local credentials as well as a 10-year industry job forecast to help guide future decision making.

The Alliance workgroup coordinator, Erin O'Grady, said, "The roundtable initiated great discussion and universal excitement for a more structured and supported green workforce training-to-job pathway in the District. By prioritizing and elevating this topic in our regularly convening workgroup, we hope to amplify the conversation across the city and encourage collaborative, well-informed decision making to ensure a sustainable green workforce."

The District is building a green workforce to meet its energy, water quality and restoration goals while providing pathways to economic mobility for DC residents. There are more than 1,200 practices in public spaces in the District that have been installed to reduce polluted runoff entering streams and rivers, and they require regular maintenance. Training underemployed and unemployed residents to perform this maintenance helps the District to meet its stormwater management and Bay restoration commitments. Through its Solar for All program, the DOEE is striving to provide the benefits of solar electricity to 100,000 low-income households and reduce their energy bills 50% by 2032.

These workforce programs quickly pivoted to operate virtually during the public health emergency. Given the disparate health and economic impacts of the COVID-19 pandemic, the skills and income that these programs provide and the job opportunities they create for under– and unemployed residents are increasingly important.

DOEE director Tommy Wells spoke to the importance of these efforts. "Training and employing a green workforce are central to the Bowser administration's goals for the District to be a sustainable and resilient city and to give every resident a fair shot," he said. "The District's River Corps, Solar Works DC, Green Fellows and Green Zone Environmental Programs are training under– and unemployed residents to help meet Mayor Bowser's water quality, habitat restoration and clean energy targets, while also attracting top talent and cultivating the next generation of environmental leaders."

The proposed Green New Deal legislation introduced in early 2019 is a large-scale example of how the Bay region can further work toward achieving its environmental and economic goals. With intentional investment, planning and support, the future looks bright for a green DC workforce, even in times of uncertainty. ■

Laura Todd is RiverSmart program coordinator at Alliance for the Chesapeake Bay.

Red-winged blackbird's flight a choice in the crowd

By Mike Burke

Female red-winged blackbirds are not as colorful as males and look like oversize sparrows, with bold brown streaking on their breasts and cryptic — coloring that camoflauges an amblacks and browns on its back. (Dave Harp)

The flock of blackbirds raced in a tight mass above the marsh, then swirled in an impossibly tight ball, effortlessly changing directions in a matter of seconds. They looked like a single organism as they whirled, stretched out and collapsed again in a series of fluid movements in the darkening sky.

Red-winged blackbirds (*Agelaius phoeniceus*) are plentiful in this region. The male's trademark red epaulets giving the species its common name.

I find it impossible to think about what the individual birds look like, though, when I'm witnessing these aerial displays. The intricate, coordinated flocking behavior demands attention to the flock as a whole, not to a single bird. Even if I wanted to, trying to track an individual bird would be impossible. There doesn't appear to be a leader directing the complex acrobatic movements. A bird at the head of the pack is quickly absorbed in the swirling mass as it rapidly and continuously changes directions.

In the field, red-winged blackbirds look like two different species. The males are substantially larger and are all black, except for those red-and-gold shoulders. Females look like oversize sparrows, with bold brown streaking on their breasts and cryptic blacks and browns up top.

In the spring breeding period, males perch precariously atop slender grasses. From there, they sing their trademark *conk-la-REE* song and flash their epaulets in their "spread-song" display. Females are quieter and frequent the dense grasses below. Colors and behaviors make the males easy to identify and females easy to overlook.

Red-winged blackbirds can be found year-round in every U.S. state, large parts of Central America and the Caribbean.

During breeding season, a large number head into southern Canada to nest. They prefer marshes but will use fields with nearby freshwater if ideal habitat is unavailable. Their widespread breeding supports

A male red-winged blackbird. (Mike Burke / based on a photo by Ian Davies, Cornell Lab of Ornithology.)

an enormous North American population, making red-wings one of our most abundant birds.

Insects are plentiful in marshes, of course, and they constitute the main part of the bird's diet during the spring/summer breeding season.

The female constructs the nest low in the grass, often suspended just above the water level. She alone broods the three-egg clutch for its 12-day incubation period. Both parents feed the nestlings until they fledge two weeks later. They will continue to supply insects to begging young birds for another two weeks. Red-winged blackbirds are promiscuous. Dominant males will have multiple females in their territory, and they are aggressive about defending all of their nests. Females will readily mate with male intruders, however, so that male aggression is often ineffective. The result is most nests support chicks with more than one father.

At the end of the breeding season, red-wings switch their diets from insects to grains and fruits. They no longer need a high-protein diet to feed a growing brood. With late summer seeds plentiful, the switch is an adaptive evolutionary response to the changing environment.

In late summer, the males' territoriality seems to switch off. Suddenly gregarious, birds of both sexes form large flocks, which often include other blackbird species as well as grackles, starlings and cowbirds. These flocks gather each evening in huge roosts that can number in the tens of thousands. In the morning, they will disperse, often miles away, to fields and marshes to feed. Come dusk, they congregate again at their favorite roosting site.

When I watch the birds exhibiting their flocking behavior, I am always amazed that they simply don't go crashing into one another. How do they execute these complex turns in such tight formations without constantly getting in each other's way?

Ornithologists now understand that each bird is making a series of individual decisions based on its immediate environment, not as part of a coordinated grand plan. If the bird on my right turns left, so do I. If the bird in front swoops down, so do I.

Sometimes in life I'd like to be one of those swirling blackbirds, mindlessly being swept along as part of a larger, graceful movement. I'd be happy to play a small part, and happier still to let all the responsibilities and decisions of modern life fall away and simply follow the lead of others. But then I remember that in the avian world as in our own, it's not so simple. Winds change, obstacles appear, and suddenly a whole new set of decisions needs to be made: Lead or follow? Left or right? Faster or slower?

At home, at work, with friends, or in the anonymity of traffic, in truth we live in a complex, swirling mass of humanity, making thousands of decisions and adjustments constantly. And so, the realization comes upon me again: The goal is not to be mindlessly swept away, but rather to play a mindful role, aspiring to add a tiny element of grace to humanity's sweep across the heavens. ■

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

Want more mussels? Work out to get rivers in better shape

By Kathy Reshetiloff

The federally threatened yellow lance is native to Maryland, Virginia and North Carolina (Sarah McRae / U.S. Fish and Wildlife Service)

Top: The brook floater, which is in decline, prefers streambeds and creek bottoms with riffles and moderate currents.
Bottom: The green floater, which is in decline, does not require a host fish. Juveniles form in the adult female. (North Carolina Water Resources Commission)

At the bottom of our streams and rivers lives an incredible, yet often unnoticed animal: freshwater mussels.

Mussels are bivalves — they have two halves to their shell that protect soft body parts. They have no head, eyes, ears or appendages — with the exception of a single foot, which they use to burrow into mud or sand. Their internal gills filter food and oxygen from water.

Freshwater mussels strengthen and stabilize entire aquatic ecosystems. Like oysters of the Chesapeake Bay, freshwater mussels filter water for food, removing nutrients and other pollutants from the water. This filtering action improves water quality for fish and other aquatic animals.

In addition, many other animals rely on freshwater mussels as a food source, including raccoons, otters, herons and egrets.

Mussel beds also create habitat for other aquatic invertebrates which, in turn, are eaten by fish. Empty mussel shells are a refuge for crayfish, snails and fish. Decaying shells provide a slow-release source of calcium, phosphorous and nitrogen.

Although their relatively sedentary lives may appear boring, their reproduction and colonization of new areas is quite complex and requires a host fish. The male disperses sperm, carried by currents, to the female, where fertilization occurs. Fertilized eggs are transformed into a larval state inside the female. She then packages the larvae into an enticing lure that will attract a specific fish. When the target fish approaches, the larvae are expelled at the fish. The larvae attach to the fish's gills or fins and hitch a ride for a few weeks while they continue their transformation into a juvenile mussel.

When the transformation is complete, juvenile mussels drop off the unharmed fish and begin their life as a young adult mussel.

The fact that mussels require specific species of fish to reproduce means that mussels are also good indicators of the health of their host fish populations. Mussels and fish have a symbiotic relationship — mussels maintain water quality for fish. In return, mussels rely on fish to produce the next generation and colonize new areas.

The federally endangered dwarf wedgemussel requires well-oxygenated water with low silt, little pollution and high stability. (Susi von Oettingen / U.S.Fish and Wildlife Service)

WHAT YOU CAN DO

- Conserve energy to limit the need for new hydroelectric power plants.
- Limit or cease pesticide use to prevent runoff into nearby rivers and streams. Integrated pest management strategies can replace pesticide use.
- Help control soil erosion by planting native tree and creating vegetative buffers near freshwater areas.
- Remove aquatic weeds from boat trailers and motors after each use to prevent the spread of invasive species such as zebra mussels.

North America has the highest diversity of freshwater mussels in the world. But within North America, no other group of animals is so gravely imperiled. More than 70% of the 300 mussel species in North America have been in decline for decades. Although mostly sedentary, they can move short distances. They can close their shells to avoid short-term exposure to toxins or other unfavorable environmental conditions. It is the significant, long-term changes to streams and rivers that threaten freshwater mussel populations.

Whether for hydropower, recreation or navigation, dams are a physical barrier, which is a major threat to mussels. Because of their reliance on host fish to complete their life cycle, dams that inhibit the movement of fish also prevent mussels from colonizing new areas upstream and downstream. Depending on the type of dam, water releases may not mimic natural conditions. Instead, unnaturally high releases alternate with unnaturally low releases. Low water conditions are particularly hostile to mussels (and most other kinds of wildlife in the river).

Many kinds of mussels require river bottoms composed of rock, gravel or firm sands. Large amounts of sediment entering streams and rivers can bury gravel and rocky bottoms, smothering the mussels.

Agriculture and development cause eroding soil to run off into rivers. Bridges are also sites of high erosion and sedimentation. The sediment in runoff often carries pesticides with it, which further pollutes the water. Other contaminants such as PCBs, mercury and lead are deposited in waterways from industrial plant discharges. A wide variety of other toxic substances are released from industrial sites.

Also, many public and private septic systems empty into our waterways.

Exotic species are an ever-increasing threat to our native plants and animals. For native mussels, the infestation of zebra mussels has had near catastrophic effects. Most likely, zebra mussels were introduced inadvertently in the ballast water dumped by large ocean-going vessels. These mussels increase in numbers faster than native mussels and attach to almost any hard surface, including native mussels, where they stifle the latter's movement, feeding and reproduction.

To conserve freshwater mussels, unneeded dams and other blockages are being removed from streams and rivers so that fish can move upstream and downstream, bringing host fish to freshwater mussels.

Fish hatcheries are experimenting with producing certain freshwater mussel species to stock in rivers with suitable habitat. Many agencies and conservation groups are banding together to restore degraded rivers and streams to support freshwater mussels, fish and other aquatic organisms. ■

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