CHESAPEAKE
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The Maryland Transportation Authority announced in September three possible routes for a new Bay bridge, all of which would connect to the Bay's Western Shore in Anne Arundel County, MD. County executive Steuart Pittman, shown here near the site of a proposed route on the Mayo peninsula, called all options "severely disruptive to existing communities and sensitive environmental areas." See article on page 4. (Dave Harp)

Low salinity wallops oysters in Chesapeake

≈ Aquaculture, restoration efforts and fishery hurt as unrelenting rain made much of Bay water too fresh, causing die-offs and delayed spawning

By Timothy B. Wheeler & Jeremy Cox

The rains have finally let up, but they've dealt a serious blow to the Chesapeake Bay's oysters — and to the people who make a living harvesting, cultivating or restoring them.

Oysters need at least a little salt in their environment to live and a bit more to thrive. The record-setting downpours that began last year and continued through the first half of this year flushed so much freshwater into the Chesapeake that salinity sank to abnormally low levels.

In some places in Maryland and on the Potomac River, where the water turned almost completely fresh for months on end, oysters died in droves. Those that survived elsewhere didn't grow much, and reproduction was spotty.

"What a rough beast of a year that was," said Martin Gary, executive secretary of the Potomac River Fisheries Commission. "Everybody got

OYSTERS CONTINUES ON PAGE 19

Path to a clean Chesapeake poses problems for key Bay states

≈ Pollution reductions from farms will require huge ramp up in funding and technical support across the region

By Karl Blankenship

Must Chesapeake Bay states achieve the impossible to reach Bay cleanup goals by 2025? That's unclear. But their work must certainly achieve the unprecedented.

Most of the latest state cleanup plans, released in August, call for levels of action to reduce pollution from the hardest-to-control sources — agriculture and stormwater — that greatly exceed what states have so far demonstrated they can accomplish.

Much of the attention has focused on Pennsylvania, whose pollution control shortfall is more of a chasm than a gap. But a review of the latest state watershed implementation plans and supporting documentation reveals that other key states — Maryland and Virginia — face a steep climb as well.

Plans from the three states, which combined supply almost 90% of the nitrogen pollution to the Bay, call for reversing the rising trend of runoff from developed lands and accelerating conservation practices on farms — by far the largest source of nutrients. Both sectors must slash pollution by rates that the states have so far been unable to attain.

Maryland's plan, for instance, would require a 6.4-fold ramp up its annual rate of nitrogen reductions from farmland between now and 2025. Virginia needs a 14-fold increase, and Pennsylvania must step up its rate by a staggering 67 times.

It's unclear in the watershed implementation plans, or WIPs, whether any state has the programs or funding to achieve that magnitude of effort now, let alone the profound boost that will be needed in the coming years.

"Funding is the tragic flaw of the WIPs," said Ann Swanson, executive director of the Chesapeake Bay Commission, an advisory panel that represents state legislatures. "And without monetary support, there will not be progress. It is the Achilles heel."

Nutrients, in the form of nitrogen and phosphorus, are the major pollutant fouling the Bay's water. States have been working to curb the amount of nutrients entering the Bay since the mid-1980s. While progress has been made — especially with phosphorus — nitrogen has proven to be more difficult to control.

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Editor's Note

The less things change, the more things stay the same

"Pennsylvania has completed a new tributary strategy to guide the nutrient reduction efforts in its portion of the Susquehanna and Potomac river basins. But like the initial strategy released in spring 1994, it falls short of achieving its 40% nutrient reduction goal.

"State officials say they will ultimately make the full reduction — the question is when."

— Bay Journal, January 1996

The past, as William Shakespeare once wrote, truly is prologue. Pennsylvania struggled when writing its first Bay cleanup plan in 1992. Nearly 25 years later, it faces the same struggle. Its watershed implementation plan, released in August, does not achieve the reductions in nitrogen pollution needed to meet 2025 goals.

The lack of progress is evident. Since 1985, water quality monitoring has shown that nitrogen loads from the Susquehanna River, which drains most of the state's portion of the watershed, have ticked down only modestly. As a result, runoff from the state continues to fuel algae blooms that cloud the Bay's water and feed its oxygen-starved "dead zone."

While Pennsylvania clearly has not stepped up to the plate, it has significant challenges. Most of its nitrogen comes from farms and developed lands — and it has more of both than any other state in the watershed. The entire region has struggled to control those sources of pollution. Indeed, if you factor out nutrient reductions from wastewater treatment plant upgrades, our collective progress isn't great..

The thing is, from the beginning of the cleanup effort, everyone knew that development and agriculture would pose major hurdles. So when I read any state plan that talks about the need to develop and fund programs to control those sectors, it's hard to grasp exactly why that still should be the case. As far back as 1990, reports said that existing programs were "inadequate" — and the cleanup goals at the time, for the year 2000, were subsequently missed.

Today, regional leaders are making the same call to action. The reach remains enormous. To meet the 2025 goals, Maryland would have to ramp up its annual nitrogen reductions from farmland at 6 times its current level of effort — Virginia by 14 times.

Pennsylvania is facing a gap requiring a 67-fold increase in effort. If not for all of the attention this shortfall is drawing, the other states would (rightly) be criticized for also putting themselves in a position where goal attainment is unlikely.

New name, home for Alliance column

We are starting to roll out a number of changes you'll be seeing in coming months. A redesign of our website is nearly complete, and we will be updating the look of our print publication in the coming year.

And this month, our colleagues at the Alliance for the Chesapeake Bay are retooling their column to focus on citizen stewardship. It's something the Alliance has specialized in over the years, and readers in our surveys have asked for more information about things they can do. The new column, *Steward's Corner,* is now packaged with our other popular columns.

— Karl Blankenship

Correction

An article in the September issue about Montgomery County's struggles to reduce stormwater pollution incorrectly reported the status of Maryland's water quality trading regulations. They were finalized in July. The *Bay Journal* regrets the error

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Clockwise from left:

A dolphin calf forages in the Potomac River. Researchers witnessed the birth of a wild calf in the river's confluence with the Bay. See article on page 6. (Ann-Marie Jacoby / Photograph taken under NMFS Permit No. 19403)

Paddlers wend their way along the curvaceous course of Barren Creek as it approaches the Nanticoke River on Maryland's Eastern Shore. (Dave Harp)

A mylar balloon is shown washed up on a beach on Assateague Island. Communities are increasingly looking at banning the mass release of balloons, which pose a threat to wildlife. See article on page 10. (Ann Richardson)

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Opponents fear case has already been built for Bay Bridge option

≈ Hogan, state officials have already expressed their preference for Chesapeake span

BY JEREMY COX

After three years of high-stakes analysis and sometimes-clamorous rhetoric over environmental and community impacts, four possible courses of action remain on the table for dealing with heavy traffic on the Chesapeake Bay Bridge in Maryland.

The Maryland Transportation Authority in August proposed three possible routes for a new span, which would be the third to cross the Bay in the state. The agency also included a so-called "no-build" option — managing the congestion without constructing a new bridge.

Citizens and conservation organizations have reacted with concern over how a new bridge could affect the landscape wherever it touches down.

Maryland's first Bay Bridge, which opened more than 60 years ago, transformed parts of the rural Eastern shore with increased traffic and sprawl development, both of which have increased over time. Opponents say that a new span, which will cost billions of dollars, will trigger more land conversion in places, where communities don't want it and the environment will suffer, on both sides of the Bay.

The three proposed routes include adding a span to the existing bridge or building a new one to either the north or south. All would leave the Western Shore from Anne Arundel County.

Critics say that statements made by state officials could undercut a fair consideration of all options, including the "no-build" scenario. Under federal statutes, the lengthy review being led by the MDTA isn't supposed to be used for "justifying decisions already made." But that increasingly seems to be the case, they say.

Although the MDTA plans to make no final decision until 2021, the agency's head, a former state delegate, has publicly described one of the routes as the "best" alternative: a span running parallel to the two existing bridges. James Ports' comments came at a Queen Anne's County Commissioners meeting Aug. 27, the day the options were unveiled.

The next day, Gov. Larry Hogan doubled down on that assessment.

"There is only one option I will ever accept: adding a third span to our existing Bay Bridge," Hogan said on Twitter. "While the federal process requires multiple proposals, the data is indisputable — this option [at the existing site] would maximize congestion relief and minimize environmental impact," Hogan added.

Many conservation groups oppose the bridge's construction, warning that the expanse will trample across environmentally sensitive lands and fuel more urban sprawl on both sides of the Bay. But after Hogan and Ports drew their identical lines in the sand, groups are now expressing fresh doubts about whether the "no-build" alternative will get a fair airing.

Kate Livie stands by a wetland near her home outside of Chestertown, MD, near one of the three routes proposed for a new Bay crossing. Livie launched a Facebook group called "Stop the Span" as an online gathering place for opponents. (Dave Harp)

Questions about legitimacy

"It's problematic that the governor has already come out and said he will only support a new span at the existing location," said Kimberly Golden Brandt, director of the smart growth program with Preservation Maryland. "It raises questions about the legitimacy of the whole process."

"You don't preordain the outcome," said Gary Hodge, vice chairman of the Maryland Transit Opportunities Coalition, which advocates for mass-transit solutions.

Hogan's office disputes that characterization of his comments. His preference for the route nearest the existing bridges is supported by the study's traffic projections, which show it reduces traffic more on the other spans than any of the alternatives, said Michael Ricci, a Hogan spokesman.

"The community has the opportunity to provide its input and, as the process moves forward, to review the environmental impacts, the potential costs and how transit options can be incorporated," Ricci said.

Ports told the *Bay Journal* that although he and Hogan have made clear where they stand, the decision is not a done deal.

"So, all we're simply stating are the facts that [the route near the existing spans] provides the most relief," he said. "We're not picking it, not predisposed to it. We're just looking at the numbers. I think you would come up to the same conclusion."

An environmental law expert said the officials' comments aren't likely to get them into any federal hot water, as long as the final decision is informed by the evidence gathered by the study.

Still, whenever public officials publicly back one option over others prematurely, "it does undermine confidence, I think, in the process that what's going on is a careful look at the alternatives," said Jim McElfish, an attorney with the Environmental Law Institute in Washington, DC.

In Maryland, drivers can only cross the Bay on a pair of spans between Annapolis and Kent Island: a two-lane bridge constructed in 1952 and another three-lane span that opened beside it in 1973. The segment forms part of U.S. Routes 50/301.

The Hogan administration launched the $5 million route study three years ago. Advocates say a new bridge would ease traffic backups during weekday rush hours and summer weekends. The 4-mile bridges are a key chokepoint for tourists driving between the DC and Baltimore areas and popular coastal resort communities, such as Rehoboth Beach, DE, and Ocean City, MD.

Today, drivers heading westbound across the bridge on Sundays in the summer typically face a 1-mile backup, which equates to an hour of sitting in traffic. A 2015 MDTA analysis suggested that westbound traffic could back up 14 miles on such days by 2040, trapping drivers in an 11-hour wait.

In Queen Anne's County, where the Bay Bridge links up with the Eastern Shore, that congestion often boils over onto secondary roads, said James Moran, a county commissioner. On weekends, residents become prisoners in their own homes.

"You don't leave your home after 10 a.m." on Sundays in the summer, said Moran, a supporter of the third span. "If you go out, you'll have a hard time getting back home because of the traffic."

Dennis Dare, an Ocean City councilman and former city manager, said a third span would allow maintenance to be performed on one of the other spans without having to force traffic in both directions onto a single bridge.

Building a bridge next to the existing ones is "the only way" to ensure traffic continues to flow smoothly in the future, Dare added. "You could make an argument that the urban sprawl that's gone into Queen Anne's isn't smart growth, but it's happened and you have to deal with it."

Options for span

The MDTA began its study with a list of 14 potential bridge corridors, stretching virtually the entire length of state's Bay shoreline from north to south. None of the routes, including the three that remain, is an exact path. Each marks a swath 2 miles wide from one side to the other where a bridge and approach roads could be built.

The northernmost path would extend from state Route 100 in Pasadena down MD Route 177, making its crossing near Gibson Island. It would meet land near the entrance to the Eastern Neck National Wildlife Refuge in Kent County, cross the mouth of the Chester River and intersect with Route 301 south of Centreville in

BRIDGE CONTINUES ON PAGE 5

Bridge from page 4

Queen Anne's County.

The middle route would follow alongside the existing two bridges, departing the Western Shore near Sandy Point Park and ending on Kent Island.

The southernmost route would turn south from Routes US 50/US 301 at or near Davidsonville Road to connect with state Route 214, placing the bridge at the end of 214 on the Mayo Peninsula. It would make landfall on the opposite side of the Bay near St. Michaels in Talbot County. A second bridge would likely have to be built to take it across the Miles River to link up with Route 50 again just north of Easton.

In addition to the problems cited by residents along the current route, the new routes would require enormous infrastructure changes through existing towns and landscapes that do not have major highways running through them. In some places, the routes would travel through farmland and rural communities. In others, they would be challenged to navigate existing corridors already mired in congestion. Both of the alternate paths would transform the shoreline environments where the bridge was placed and have a ripple effect on surrounding land use.

Objections to all three routes have prompted many critics on both sides of the Bay to ask: Is a new span necessary?

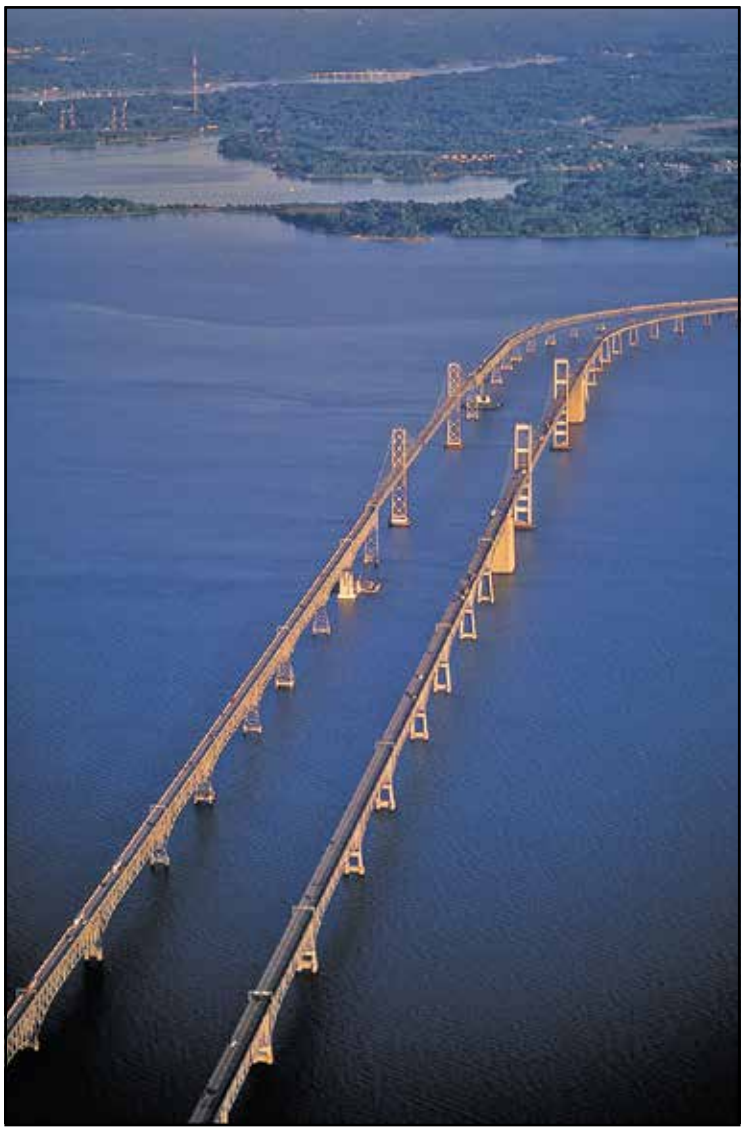
The Eastern Shore Land Conservancy urged the MDTA to strongly consider the no-build option, warning that a new bridge would kindle more sprawl on the Delmarva Peninsula. "So why not first try to fix the congestion at the existing Bay Bridge as best we can, prior to making more space for cars to cross?" the nonprofit asked on its Facebook page.

New vehicle technology, not concrete, may solve the traffic problem, said Klaus Philipsen, a Baltimore architect and land-planning activist. Autonomous, or driverless, cars are expected to begin filtering into the marketplace over the next decade. Even the presence of a few such vehicles on roads otherwise filled with human drivers can relieve certain types of traffic snarls, he said, citing recent research.

To invest great amounts of money into a new bridge — as much as $10 billion, according to Ports' predecessor — is nothing short of "insanity," Philipsen said.

"The definition of insanity is doing the same thing that didn't work before," he said. "We've added capacity for the last 50, 60 years as the default, and we've created more congestion as a result. We should have learned our lesson."

Even if autonomous vehicles become commonplace in the coming decades, Ports said, a third Bay Bridge will still be worthwhile to build. "A bridge like this would not be obsolete. It would be an enhancement to the traffic that would get across that bridge," he added.



In Maryland, drivers can only cross the Bay on a pair of spans between Annapolis and Kent Island: a two-lane bridge (left) constructed in 1952 and another three-lane span that opened beside it in 1973. The segment forms part of U.S. Routes 50/301. (Dave Harp)

The cost of a new bridge would likely force the state to raise tolls on the crossing. The Maryland Transit Opportunities Coalition estimates a jump from $4 to $12. Ports sharply disputes that figure, saying the cost won't be known until a tolling study is completed.

Impact on landscape

Others cringe at what a new bridge might do to the surrounding landscape.

"Any of the three options will be severely disruptive to existing communities and sensitive environmental areas," Anne Arundel County Executive Steuart Pittman said on Twitter. "All three options could destroy parks along the Chesapeake Bay at a time when we are trying to expand public water access."

The northern crossing appears to bisect Downs Park, the middle goes through Sandy Point State Park and the southern route could pass through Beverly Triton Nature Park, Pittman said.

If Hogan and the MDTA decide to drive forward with a new bridge, they should consider other options as well, such as an electric ferry and rail, Pittman added.

"If we haven't figured out how to get cars off the road by the time this bridge gets built, we'll have much bigger problems to confront than traffic," he said. "Let's not build yesterday's bridge tomorrow."

The MDTA's report closes the door to other options as sole solutions, declaring that operational improvements, ferries, new bus routes and rail lines alone wouldn't remove enough traffic from the existing bridges.

During the second phase of the study, the agency said it will analyze operational improvements — a ferry and bus rapid transit —but only in conjunction with the construction of a new bridge.

Projections show that a rapid-transit bus or rail line would each remove about 1,600 vehicles per day from the existing spans, Ports said. A bridge could remove the same amount of vehicles in an hour. "It takes multimodal resources to try to stop congestion."

Although no cost analysis has been performed on any of the bridge routes or alternative options, the MDTA is ruling out a rail connection "due to its high costs/impacts," agency officials said in a PowerPoint presentation adjoining the route announcement.

In Kent County on the Eastern Shore, elected officials expressed relief that Hogan had singled out the Anne Arundel-Queen Anne's corridor as the best candidate. In the rural county, the prospect of a new Bay bridge is deeply unpopular. Yard signs outside many homes urge "No Bay Bridge to Kent."

"I agree with Larry Hogan, though I'll be confident he'll be long out of office before any of this comes to happening," said Tom Mason, president of the Kent County Commissioners. He added that he was "a little surprised" by the twists and turns of the proposed Kent route, which depicts the future roadway as crossing the Chester River at its widest point.

Kate Livie, a freelance writer who lives in Kent, launched a Facebook group called "Stop the Span" as an online gathering place for opponents. It has more than 350 members. She opposes a new bridge being built anywhere but sees only one way that will come about.

"The no-build option will be implemented if they don't have the money to build it," Livie said.

In his remarks to Queen Anne's County Commissioners, Ports said that the route next to the existing bridges is the "best alternative," citing the agency's analysis of its traffic benefits. The agency's new analysis shows that summer weekend traffic on the existing two bridges is expected to be 135,300 vehicles a day in 2040 without the third span added next door; with one, that figure falls to 79,700.

Because the state is following the federal National Environmental Policy Act mandates, the agency had to go forward with any possible route that showed a "positive result," Ports said. Compared with the no-build option, the northern candidate would reduce the number of vehicles during that time to 111,200 while the southern route would result in 104,300, the study found. So, they were retained in the analysis.

"The feds are very careful about making sure it's not a political process," Ports said.

The MDTA scheduled several public gatherings in late September and early October to get feedback on the routes. Construction isn't expected to begin for at least several years after that because of the need for further environmental study and acquiring the funding, officials say. When pressed at the Queen Anne's meeting about when work might begin, Ports wouldn't commit to announcing a construction date, declining even to select a decade in which it might occur.

The Eastern Shore counties hold a trump card in the battle over the third span: A law dating back to the 1970s allows counties affected by a new toll bridge to veto the project by a majority vote.

"They're in a significant position to have the state come to them to have express consent to do a new bridge," said Hodge, the transit advocate.

He helped write a bill to give Western Shore counties the same power, but it failed in last spring's legislative session. He plans to give it another try next spring.

Scientists witness dolphin give birth in the Potomac River

≈ Researchers have intensified work during a fifth season to see if mammal's numbers are increasing

By Whitney Pipkin

A foraging calf is caught seeming to smile at the camera during an outing this summer on the Potomac River. (Ann-Marie Jacoby / Photograph taken under NMFS Permit No. 19403)

A team of researchers studying dolphins in the Potomac River got unexpected fruit from their labors last month when they witnessed a dolphin being born near the river's confluence with the Chesapeake Bay.

Bottlenose dolphins are among the most studied species in the world, but a wild birth has only been documented in scientific literature on one other occasion: in 2013 off the coast of Georgia.

"I was beyond excited," said Ann-Marie Jacoby, a Ph.D. student at Duke University and associate director of the Potomac-Chesapeake Dolphin Project, who witnessed the birth on Aug. 17.

Jacoby began working on the dolphin project, which was launched in 2015, while a graduate student at Georgetown University. The university supports the work led by Georgetown biologist and professor Janet Mann.

"We have been trying to understand why dolphins come into the Potomac River and the Chesapeake Bay," Mann said. "We see some very young calves and we see lots of mating behavior, but this is the most definitive evidence we have that they have their calves here."

Although dolphins are not new to the Chesapeake Bay, they appear to be cropping up more frequently in recent years and have been studied, for the first time in the Potomac, over the last five years. Researchers are trying to figure out whether there are, indeed, more dolphins in the river than in recent history and, if so, what's drawing them there.

Now, they have some evidence that the bottlenose dolphins, which carry their young for 12 months, could at least be conceiving and birthing babies in these waters during annual returns.

When Jacoby and two other students witnessed the birth from their boat near Lewisetta, VA, they saw a cloud of blood in the midst of a group of about 50 dolphins. After seeing no signs of injury, Jacoby told the others to look for a newborn.

"Lo and behold, a mom with a newborn, whose fin was still slightly bent, surfaced in front of and in line with the cloud of blood," Jacoby said.

Witnessing a dolphin birth is rare, even for researchers. Despite studying dolphins for more than 30 years, Mann has yet to see a wild birth. Mann said that a scientist off the coast of North Carolina also might have witnessed a dolphin birth but, unable to confirm or document the mother, didn't write about it. Several dolphin births have been recorded in captivity.

Dolphins visit the Chesapeake Bay region from April to October, with populations peaking in the warmest months. Mann and her research team, most of them student volunteers, have been focused on the dolphins' presence in the Potomac, working to understand how many there are and why they come.

"It's still surprising to us that so much is known about the Potomac and the Chesapeake, and so little is known about the dolphins," she said. "I think there's a lot of great findings to come."

According to historical accounts, dolphins were spotted in 1884 as far up the Potomac as the Aqueduct Bridge, just south of Georgetown University in the District of Columbia. They were an exotic enough sight at the time that, according to reports, men pursued the animals by boat and tried to shoot or capture them.

Other reports in the late 1800s mention dolphin sightings in the Potomac near Alexandria and Quantico, VA, the researchers said.

More recently, Mann's team has documented dolphins as far north as the Gov. Harry W. Nice Memorial Bridge, where U.S. Route 301 crosses the Potomac just south of Popes Creek, MD. That's about an 80-mile trip up the river from the Bay and just halfway to the Aqueduct Bridge.

Their work involves long days of dolphin-spotting, noting behavior as well as physical characteristics. The dorsal fins are as unique as human fingerprints — at least to the trained observer's eye — and critical for identifying individual dolphins.

"Initially, we didn't think there would be that many dolphins," Mann said.

But in their first summer of research, the team identified close to 200, "and that was just going out once a month," Mann said.

This season, Jacoby and the team have boated on the Potomac as many days as possible to systematically track and observe dolphins near the river's mouth.

Dolphin observation requires calm, almost windless waters so that choppy waves won't be confused for dorsal fins in the distance. If the weather is good, the boat will cover about 14 square miles of water, traveling between predetermined points and recording what the researchers see.

"Sometimes, we'll be out there three days in a row, and we won't see any dolphins," Jacoby said. "They are here, but you have to be pretty patient if you do want to see them."

Dolphins continues on page 7

Distinguished Designations for Dolphins

In a regional twist, the Potomac-Chesapeake Dolphin Project has always named dolphins identified here after U.S. historical figures, starting with the presidents, then their wives, then some vice presidents. As the number of dolphins began ballooning into the hundreds, the team turned to senators and leaders of other political movements for names, such as Ruth Bader Ginsburg.

This year, the team has been drawing on names of abolitionists and suffragists; there's now a Harriet Tubman, a Sojourner Truth, and a Gloria Steinem. If the dolphins named after such females have calves, the researchers try to name their offspring after the figure's children — but they often wait a year to make sure the young dolphin survives.

The researchers who witnessed the Aug. 17 dolphin birth in the Potomac River scrambled to find a name for the mother-baby pair. They settled on the late Patsy Mink, a former member of Congress representing Hawaii, who co-authored the Title IX Amendment of the Higher Education Act, and her daughter, Gwendolyn, a former academic who writes about law, politics and gender and American society.

This year, the Potomac Conservancy hosted a naming contest for another pair of Potomac dolphins in an effort to raise money for the project. The conservancy asked participants to use the theme of historical figures, but not everyone did.

Conservancy president Hedrick Belin said they received more than 3,200 suggestions, and 1,400 people participated in a vote to narrow them down.

In the end, names such as Rachel Carson and Sylvia Earle, famous female scientists, conceded victory to a catchier pair: Mac and Chessie (as in PotoMAC and CHESSIEpeake).

"I think there's something intrinsically exciting about dolphins," said Belin, whose organization has an ongoing partnership with the project. "At the end of the day, what's good for the river is going to be good for dolphins. And gaining a better understanding of what's going on with the dolphin population in the Potomac, given its relatively recent return, [can teach us about] the Nation's River."

— Whitney Pipkin

Dolphins from page 6

And sometimes, the wait pays off. The numbers of individual dolphins has been climbing.

"I'm still going through the data," Jacoby said at the end of August, "but I wouldn't be surprised if we had around 1,000 animals that we've documented coming into the lower Potomac River."

The public also is helping to report sightings in the Potomac and other Bay locations.

In 2016, the University of Maryland Center for Environmental Science's Chesapeake Biological Laboratory launched the Chesapeake Dolphin Watch website and phone app to gather information on dolphin sightings from the public. Nearly 4,000 people have reported more than 2,700 dolphin sightings, occasionally of 10 or more of the mammals at once, according to the website. Locations have been as far north as Maryland's Magothy River and off Hart-Miller Island east of Baltimore.

Those reports are most helpful when paired with a photo, Mann said. The Potomac researchers use and contribute to a massive *Mid-Atlantic Bottlenose Dolphin Catalog* managed by Duke University that identifies each dolphin by its dorsal fin. The resource is shared among more than 30 researchers along the East Coast, and fin-matching technology developed with the help of Google's machine learning programs has made it even easier.

Researchers Ann-Marie Jacoby (far left) and Janet Mann (far right) observe and photograph dolphins near the mouth of the Potomac River on a windless day, so choppy waters aren't confused with dorsal fins. Since starting the Potomac-Chesapeake Dolphin Project in 2015, the crew of researchers and volunteers has tried to make it onto the water as often as possible to learn about the region's bottlenose dolphins. (Madison Miketa / Photograph taken under NMFS Permit No. 19403)

"When we get a photo, then we know that 'Zachary Taylor' was seen close to Annapolis," Mann said, using a name the project has assigned to a dolphin they regularly see in the Potomac. "That helps us know how far these animals are going."

Some of the dolphins spotted in the Potomac were first added to the catalog in the early 2000s, which gives researchers a sense of their age. Bottlenose dolphins can live for 30 to 50 years.

Anecdotally, people seem to be seeing more dolphins in recent years, the researchers say, but it's hard to confirm. Jacoby plans to interview watermen who have spent much of their lives on the river to record their memories of dolphin sightings in recent decades.

"Their parents or grandparents might even have something to share," Jacoby said.

The Potomac researchers say it's too early to make projections about long-term population trends. The boundaries for dolphin populations along the Atlantic Coast are not particularly well understood, with territories overlapping and spanning large distances. Many of the animals spotted in the Chesapeake Bay and Potomac River have also frequented the waters off North Carolina. Others have been seen near Cape May, NJ.

"We do think that there are multiple populations coming to the Chesapeake," Jacoby said.

"And I think the work we're doing now of photographing them and matching them is extremely valuable for helping to understand the population structure and how best to manage them," Mann added.

Groups work to stop brook trout from being the fish that got away

≈ Habitat drastically shrinks as climate change, removal of shade trees make streams too warm

BY AD CRABLE

About 100 days a year, you will find Michael Garrigan by himself with a fly rod, sneaking along small mountain streams hoping to catch and hold, just for a few seconds, a small trout widely revered as the jewel of freshwater fish.

It's not just the haloed dots, shadings and multi-hued colors of the wild brook trout that enthrall anglers like Garrigan, of Marietta, PA, though that would be reason enough. "They're wild and they're native. There's something innately beautiful about that," Garrigan said. "There's a special allure finding water that has brook trout in it. It's usually the most remote and close to wild you can be in Pennsylvania. There's that connection to something that is of that place."

Recognition of wild brook trout — the East Coast's only native trout — as an important cultural, recreational and economic icon has never been stronger. Scientists and policy makers also point to the brook trout as an indicator of water quality in streams that eventually feed the Chesapeake Bay.

"Saving brook trout is saving the Bay in a big way," said Alan Heft, a state fisheries biologist and brook trout program manager for the Maryland Department of Natural Resources.

Brook trout are found along the Appalachian Mountains from Georgia to Maine. They are the state fish of nine Eastern states, including Pennsylvania, New York, Virginia and West Virginia, all of which are in the Bay watershed.

Yet "brookies" are gone from an estimated 60% of their historical range in the Bay's drainage, mainly because of human development and competition from the nonnative and more aggressive brown trout and rainbow trout. Incredibly sensitive to pollution and sedimentation, one study found that the brook trout is doomed if even 1.5% of its watershed is covered by impervious surface.

This wild brook trout was caught using an artificial fly in a Pennsylvania mountain steam. (Michael Garrigan)

Brook trout also depend on cool water, and their scientific name means "dweller of springs," indicating their reliance on colder temperatures. Their precarious state has worsened as forest loss and climate change warm the streams where they live. The widespread loss of hemlocks, which shade many headwater streams, to a nonnative pest called the woolly adelgid has also depleted brook trout habitat. The lacy green trees were once so synonymous with the fish that they often were called hemlock brook trout.

In the face of such alarming declines, unprecedented efforts and money are focused on preserving and improving brook trout habitat — mostly small forested streams — and even restoring brookies to streams where they used to swim. Virginia recently resettled brook trout in several streams in the Massanutten Mountains where the fish disappeared generations ago. In Western Maryland, limestone treatments were used to restore brookies to several streams long made fishless by acid mine drainage.

The save-brook-trout movement began in 2006 when conservation groups, universities, and state and federal agencies from 17 states formed the Eastern Brook Trout Joint Venture.

Since then, harmful pollution, such as acid rain, which can make streams too acidic to support trout, has improved considerably.

New technology is aiding the effort, such as the use of computer modeling to predict where streams will warm and help identify where to plant or preserve streamside trees that shade and cool the water. Satellites can help locate where cool underground springs add colder pockets of water to a stream, steering conservation efforts toward them.

Genetic studies have revealed that brook trout live longer than was thought and some will swim far to survive. A study that tracked brook trout in Maryland, for example, found ones that lived up to 8 years and swam more than 6 miles. Another found that some brookies will hang in place, perhaps even as lethal warm water envelopes them, while others are wanderers and will relocate to survive. In the future, managers may zero in on peripatetic trout and use them to establish new populations. Sampling for the presence of brook trout is vastly more efficient with the emergence of environmental DNA or "eDNA." A laboratory filter that captures the biological material shed by trout is simply placed in a stream and collected later. No need to net or shock trout to see if they are there. Samplings can also reveal important information about trout densities and the health of the population.

But climate change has emerged as a looming new threat that many fear will add the extra few degrees in water temperature that could tip the balance.

"The threat of warming temperatures from climate change is the number one threat. No question about it," said Jason Detar, an area fisheries manager for the Pennsylvania Fish and Boat Commission, which has seen the state's watersheds holding brook trout shrink by one-third.

"I'm very concerned about that. I think the reality is we're going to lose brook trout habitat," added Fred Henson of the New York Department of Environmental Conservation.

In a 2015 report on the impacts of climate change, the U.S. Environmental Protection Agency warned that coldwater fish habitat could decline by as much as 62% over the next 80 years. And the state-federal Chesapeake Bay Program, which has made brook trout a priority, has said the species could become regionally threatened within three or four decades.

The Maryland Chapter of Trout Unlimited said that warming water over the next 100 years could eliminate brook trout from the state, except for one county in western Maryland. In Virginia, the National Wildlife Federation warned that the species could be gone as soon as 2050 from all of its 614 brook trout streams.

The Eastern Brook Trout Joint Venture has tweaked its mission because of climate change. "Our focus now is to assure [that] the brook trout that we do have can move around where they need to go within a system," stated Stephen G.

TROUT CONTINUES ON PAGE 9

Brook Trout in the Bay States

Native wild brook trout have been declining in every state with streams and rivers that drain into the Chesapeake Bay. Here are the status and predictions for a few of the states based on predicted impacts from climate change and development.

Maryland

- Gone from 62% of their historic range
- Found in 151 streams. Significant populations found in only three parts of Maryland: Garrett County in Western Maryland, Baltimore County in the Upper Gunpowder Falls watershed and Frederick County in Catoctin Mountain Park
- One wildlife group predicted brook trout could disappear from all streams in the state with the exception of some in Western Maryland, by 2100.

Virginia

- Gone from 35% of their historic range
- Found in 614 streams
- One climate change model predicted the elimination of brook trout from the entire state by 2050.

Pennsylvania

- Gone from 34% of watersheds
- 39% of watersheds that still hold brook trout have populations half their original size.
- 16,000 miles of streams have wild trout; much of that includes brook trout.

Trout from page 8

Perry, the effort's coordinator.

The danger of climate change is straightforward enough. Unlike the more tolerant rainbow and brown trout, brook trout need water temperature near 68 degrees. Adults can survive water warmed to 77 degrees, which results in less oxygen, but reproduction slows when the temperature hits 70.

Except in higher elevations, many streams where brook trout are found in Bay states are perilously close to that tipping point. Without ideal stream habitat and shading trees overhead, a degree or two could render a waterway section troutless.

"I think there probably will be a shift favoring northernmost brook trout streams in our watershed," said Jennifer Greiner, a U.S. Fish and Wildlife Service liaison to the Bay Program.

"It's vital that we protect the best of our best [steams] right now," Heft said.

Another threat from climate change is predicted greater rainfall. High water in winter can sweep away eggs and fingerling trout.

While the ultimate fate of brook trout remains uncertain, a formidable coalition of private and public efforts has been pulling out all of the stops to, as one popular license plate puts it: "Back the Brookie."

"It's not looking optimistic, but we're going down fighting," said Scott Scarfone, coordinator of the Upper Gunpowder Falls Watershed Trout Conservation Partnership, which led a successful effort to establish a brook trout population in the Upper Gunpowder River. The project involves mostly private landowners not far from Baltimore.

An angler tries to catch a native brook trout from a small stream in Pennsylvania. Climate change could severely reduce native brookies in Chesapeake Bay states. (Michael Garrigan)

It's one of only three brook trout strongholds left in Maryland. The other two are in Garrett County and in Frederick County near Catoctin Mountain Park.

One of the chief strategies to stave off thermal pollution is planting buffers to shade streams. "Planting trees is an amazingly simple thing to do to get the largest impact in the quickest amount of time for the least amount of dollars," Perry said.

Another push has come to replace old culverts that are prone to streambed scourings at their ends, cutting off trout from migrating in search of better habitat. Highway departments now use more fish-friendly culverts to replace old ones or when new road crossings are built.

In Pennsylvania, there has been a concerted effort in the last 10 years to find and document all of the streams that hold any kind of wild trout, especially smaller ones. About 16,000 miles have been found so far. Once documented, the best are given protection from development.

Hands-on projects already are under way to give brookies a fighting chance against climate change.

In Big Hunting Creek in Maryland's Catoctin Mountain Park, wild but introduced brown trout, which muscle out brookies for food and eat their fingerlings, are being caught and transported farther downstream where a waterfall blocks their return. The U.S. Geological Survey is reintroducing sculpin, a small fish that is part of a healthy brook trout stream ecosystem, to several streams in the park.

Unquestionably, the future of brook trout is at a critical juncture. Even more resources must come to bear to make streams as good as they can be as warmer temperatures move in.

Many of those trying to save the brookie point to the importance of getting the public aboard so that they clamor for all that can be done and that private landowners agree to be good stewards of streams in their midst.

"If the general public places a high value on our streams, then there can be a concerted effort to work collaboratively to conserve these resources," Detar said. "Otherwise, I believe the handwriting is on the wall for these systems."

Queen Anne's is first MD county to let go of balloon releases

≈ More bans could follow as balloons become focal point of litter reduction campaigns

By Whitney Pipkin

When Jay Falstad tells of the cluster of balloons that landed on Unicorn Lake near his home in Queen Anne's County, MD, it sounds like he's beginning a children's tale. Instead, it begins the story of the first county-based balloon ban in the state.

The balloons Falstad spotted near his home on the Eastern Shore came with an "if found" phone number to call written on them with a Sharpie pen. When he dialed it, the person who answered was nearly 500 miles away in Dayton, OH, and had released the balloons from there four days before.

Falstad found it hard to believe that helium-filled latex balloons could travel so far. Then he started noticing them everywhere.

"I was seeing balloons in ditches, in trees, in farm fields," said Falstad, who, despite being executive director of Queen Anne's Conservation Association, hadn't previously thought of balloons as a large source of litter. He realized that those released in his county, often in high numbers around school graduations, "are probably out at sea if we're finding ones here from Ohio."

Falstad reached out to a county commissioner about introducing a ban on balloon releases at a meeting this summer, and "the support was overwhelming." The new law levies a $250 fine for the deliberate release of "non-biodegradable helium balloons" into the environment.

"Intentionally releasing balloons into the atmosphere is nothing short of littering, said Christopher Corchiarino, the commissioner who introduced the bill.

Balloons are the latest in a string of bans that local and state governments have passed in an effort to reduce common sources of litter. Earlier this year, Maryland became the first state to ban the polystyrene foam containers commonly used for food and beverages, following in the footsteps of jurisdictions that make up the Anacostia River watershed.

When they reach Chesapeake Bay waters, these nonbiodegradable materials break into smaller and smaller pieces, called microplastics. Studies show that fish and oysters can mistake those tiny bits for food, moving chemical-laden plastics into the food chain.

When balloons become litter in the marine environment, they can pose more problems. Their bright colors attract sea turtles, birds and other species that can mistake the balloons for food or nesting supplies. A 2014 photo depicting the skeleton of a critically endangered Kemp's ridley sea turtle found dead on Fisherman Island, VA, with a balloon string hanging out of its mouth was a widely circulated example.

A balloon string hangs out of a wild horse's mouth on Assateague Island, MD, in this photo by Ann Richardson. "The balloons are no longer pretty when you see them in the middle of a lovely dune or in the mouth of a horse," Richardson said.

In response, laws aimed at plastic litter have been coming in waves, reducing access to foam containers, then plastic straws and now, perhaps, balloons.

"When it comes to trash policy, when one jurisdiction does something, it definitely gets others thinking," said Ashley Van Stone, executive director of Trash Free Maryland.

Baltimore and Ocean City, MD, already had laws banning balloon releases, but Queen Anne's is the first countywide law. Falstad said a representative from Harford County has reached out to him with interest in also proposing a ban, and the Ocean City chapter of the Surfrider Foundation is circulating a balloon ban petition for Worcester County.

"We aren't talking about a child accidentally releasing a balloon," the petition states. "We want to ban the act of releasing a bunch of balloons on purpose."

In Pennsylvania, a petition started by an individual to ban balloon and sky lantern releases is close to a goal of 500 signatures before it will be sent to the state's governor, Tom Wolfe. Virginia has for years had a law prohibiting the release of 50 or more balloons with a civil penalty of $5 per balloon above the allowable limit.

While the law is little-known and rarely enforced, Katie Register, executive director of Clean Virginia Waterways at Longwood University, said it still got results when she called school principals who had been planning a celebratory, end-of-school release.

"When they found out there was a law, they said, 'That's it. We won't do it,'" said Register. "Laws, even when they're not enforced, do modify some peoples' behavior."

Last year, the Balloon Council — an industry group representing balloon makers and sellers in the United States that had long fought balloon release bans — updated its stance from discouraging only certain types of balloon releases to advising against all of them.

"Whether it's a single balloon or hundreds, let's keep them from flying away," the statement says. "Don't let go: Inflate. Weight. Enjoy."

Virginia was the first state on the East Coast to create a marine debris reduction plan in 2014, and it has spawned several efforts that have given the state a good grasp of what's washing up where. For example, volunteers tallied and analyzed 11,441 balloons and balloon-related pieces of litter during four years of monitoring on the state's remote barrier island beaches, making them the most common type of debris there.

The most common types of balloons they found were those celebrating birthdays, followed by graduations and Mother's Day. With a grant from the National Oceanic and Atmospheric Administration, Register led a social marketing effort to reduce balloon releases at weddings. They interviewed brides, wedding planners and vendors to understand what balloon releases symbolized and to suggest alternatives, such as blowing bubbles or planting trees.

That effort is being expanded to address even more occasions this year with a NOAA grant that supports the joint efforts of Delaware, Maryland, New Jersey, New York and Virginia to prevent balloon litter in the mid-Atlantic region. One of their first efforts is to get people in the region to participate in a survey to better understand their views on balloon releases.

The survey asks, among other questions, what participants think happens to balloons once they're released and reflects choices that are commonly held: They disintegrate in the atmosphere, float into space or break down naturally. (The answer: They fall to the ground or water and break into smaller pieces that persist in the environment instead of breaking down entirely.)

Kimberly Grubert, a coastal planner with Maryland's Department of Natural Resources, said the survey will help the coalition of state-based organizations better target their messages to reduce balloon releases. The agency has begun some of its own monitoring efforts and recently found about 20 balloon fragments per mile on a stretch of beach on Assateague Island. But, Grubert added, the volunteers believed visitors who frequent the island had already picked up much of the debris that might concentrate there.

And it's not just the beaches that are impacted. For the last 20 years, a charter captain out of Ocean City, has been recording the location of every mylar or foil balloon he has come across in the ocean. He has found some nearly 45 miles off the coast. Capt. Mark Sampson's records indicate he finds an average of 18 mylar balloons per year, mostly in May and June when graduation and wedding releases are popular.

A Facebook group called Blume's Balloon Round Up also tallies the number of balloons picked up by boat-based and shore cleanups near Ocean City. Their page reports 2,750 balloons so far this year.

The grant to reduce marine debris across the mid-Atlantic will fund balloon awareness efforts over the next three years.

Advocates for balloon release bans say they're not opposed to balloons, in general, or to "a 6-year-old kid who accidentally releases a balloon at a birthday party," Falstad said.

Instead, he hopes that laws like the one in Queen Anne's County spur alternatives to a deliberate, large release.

"We're one county, but this is a nationwide problem," he said.

Take the mid-Atlantic balloon release survey at surveygizmo.com/s3/5176323/balloon2.

Court rules that DC's daily *E. coli* limit is inadequate

≈ Advocates argue current regs allow waterbodies to exceed standard as long as averages are met

By Whitney Pipkin

How much *E. coli* can an urban waterway contain and still be considered "clean"?

A federal court ruled in August that the limits the District of Columbia set for *E. coli* in its waterways didn't adequately answer that question.

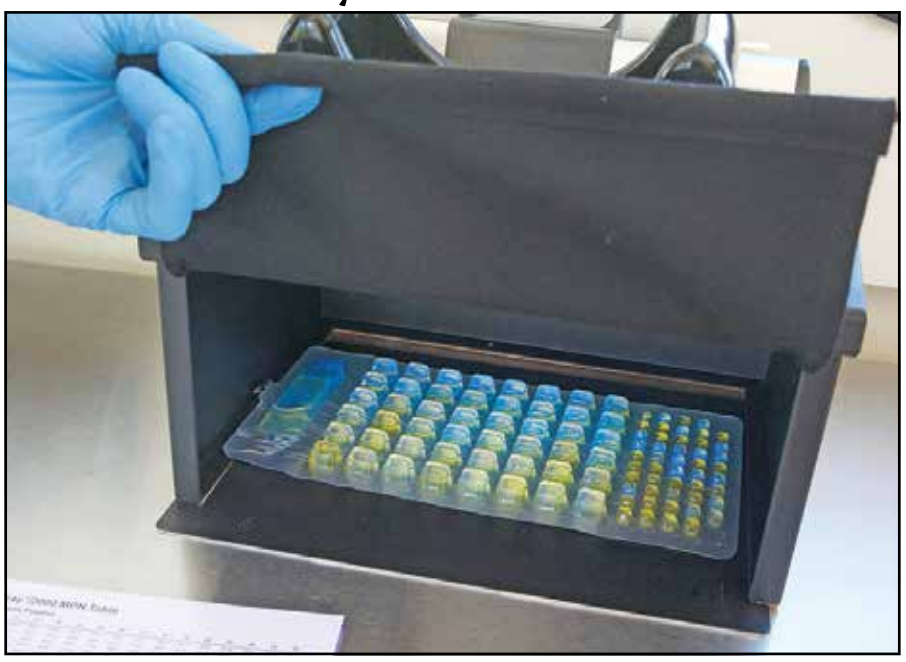
E. coli is a type of bacteria often found in fecal matter that can indicate the presence of other pathogens. Some strains of *E. coli* infection can cause abdominal cramps, diarrhea, fever and vomiting.

The decision from the U.S. District Court for the District of Columbia gives regulators about a year to craft new limits for the Anacostia and Potomac river systems running through the nation's capital.

The decision was a response to a lawsuit filed in 2016 by Earthjustice on behalf of three environmental groups — the Anacostia Riverkeeper, Kingman Park Civic Association and Potomac Riverkeeper Network — against the U.S. Environmental Protection Agency for its approval of the District's *E. coli* limits in 2014.

Earthjustice contended that the EPA violated the Clean Water Act because the limits, formally known as total maximum daily loads or TMDLs, did not set daily discharge maximums. Instead, the TMDLs were based in part on equations that allowed the waterways to exceed the numeric daily standard in a 24-hour period as long as certain averages were maintained over a 30-day period. The document said this approach allowed for more variability, but the plaintiffs disagreed.

"A TMDL, on the face of it, should represent the maximum total amount of a pollutant that can be added to a waterbody on a given day and still have it comply with water quality standards," Earthjustice attorney Seth Johnson said.



A tray of water taken from the Potomac River south of the District of Columbia this summer is analyzed for the presence of E. coli by one of several nonprofits now monitoring bacteria levels in local waters. (Whitney Pipkin)

The court largely agreed, though it did not side with the plaintiffs on other technical arguments.

TMDL calculations, one of several criteria used to achieve water quality, are the basis for permits issued to regulated dischargers stating how much of a pollutant can be present in their wastewater.

One of those regulated dischargers, DC Water, runs the world's largest advanced water treatment facility on the banks of the Potomac River at Blue Plains. It interceded as a defendant on the case, arguing on the EPA's side.

DC Water had sued the EPA in 2015 over an earlier version of the *E. coli* TMDLs, contending that the limits were too stringent. The EPA then issued a revised rationale for the limits, and DC Water dropped its suit.

DC Water officials said they are still reviewing the court's most recent ruling, which will result in the *E. coli* TMDLs being reworked once again.

"Our efforts thus far have resulted in significant improvements in the Anacostia River's water quality, and we will continue our active engagement to bring tangible, measurable benefits to the District's waterways," DC Water spokesman Vincent Morris said.

The statement also said that such an effort will require "sound science and data-based approaches spanning multiple generations and coordinated efforts" between government agencies and the public.

To help reduce the amount of *E. coli* entering the city's rivers, DC Water is in the midst of a $2.7-billion Clean Rivers Project required by the EPA to curtail the city's long legacy of combined sewer overflows. Those overflows have routinely gushed sewage-laden stormwater into nearby rivers during heavy rains.

The project involves 18 miles of large underground tunnels designed to capture polluted runoff and steer it toward the wastewater treatment plant. The first stretch came online in spring 2018. When the second phase is completed in a few years, officials predict it will end approximately 98% of all polluted overflows to the Anacostia.

Contamination from *E. coli* is one of the many challenges in an ongoing effort to make the Anacostia River swimmable by 2025. A secondary issue with a TMDL that allows for average rather than daily *E. coli* limits is that it could leave future swimmers vulnerable to the bacteria on some days.

Though it is still illegal to swim in District waters, the Anacostia Riverkeeper now operates a sizable citizen monitoring program that allows the public to track the river's real-time progress toward that goal. The results of weekly tests are posted on the *Swim Guide* website, which, despite its name, includes the reminder in capitalized letters that swimming is still prohibited regardless of the status.

"We cannot disclaim that enough," said Trey Sherard, Anacostia Riverkeeper's outreach coordinator and biologist. He emphasized that the *E. coli* TMDL lawsuit and the citizen monitoring effort are different facets of the same approach toward cleaner water.

"This is just one more piece in the puzzle to keep it moving in the right direction," he said.

The District also is in the process of rewriting its so-called trash TMDL for the Anacostia River after the Natural Resources Defense Council successfully argued in a lawsuit that the TMDL, which detailed how much trash must be removed from the river, falls short of establishing a maximum for how much trash can enter the river in the first place. Until then, trash is still being removed from the river in accordance with the previous TMDL.

MD denies permits for solar projects that sought to clear forests

≈ Move will also protect high-quality streams and an 'important bird area'

By Timothy B. Wheeler

Maryland regulators have blocked two large solar power projects in Charles County that together would have cleared 400 acres of woodlands. Some environmentalists hailed the decisions while others lamented them, highlighting tensions in the state over the siting of renewable energy projects.

The Maryland Department of the Environment announced Aug. 28 that it had denied a wetlands and waterways permit to put about 100,000 photovoltaic panels on a mostly wooded tract near La Plata that would have sold electricity to Georgetown University.

The MDE also said that a second project planning about 80,000 more solar panels a few miles away did not meet the state's requirements for protecting a high-quality stream flowing by that heavily forested site. That project would have produced power for the Southern Maryland Electric Cooperative, or SMECO.

MDE Secretary Ben Grumbles said that the projects posed "an unacceptable trade-off for the environmental benefits of clean energy."

"While Maryland strongly supports the increased use of clean and renewable energy sources," Grumbles said, "these two proposed projects would harm the nearby high-quality stream in Charles County and threaten our continued restoration progress in the Chesapeake Bay watershed."

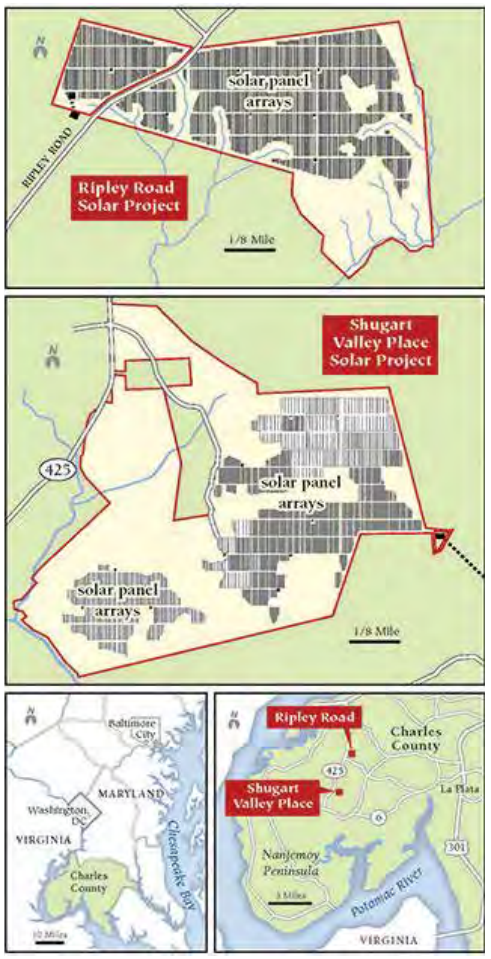
Origis Energy USA, the Miami-based developer of both projects, did not respond to requests for comment.

The larger of the two projects, on Shugart Valley Place, would have produced nearly half of the electricity consumed by Georgetown University. The proposal was a centerpiece of the university's efforts to shrink the carbon footprint of its District of Columbia campus.

But the plan drew fierce and wide-ranging opposition because it called for clearing 210 acres of trees in Charles County's Nanjemoy Peninsula. The Audubon Society has identified the 537-acre site as part of an "important bird area" on the peninsula because of the habitat the woods provide, particularly for species that need undisturbed forest to nest.

"This is really good news for the forest birds that live at this site," said David Curson, interim executive director of Audubon Maryland-DC. The peninsula harbors the largest contiguous forest in Southern Maryland, he said, where species such as the wood thrush, prothonotary warbler and Eastern whip-poor-will have been seen.

Environmentalists also had voiced concern about the consequences the project construction could have had on Wards Run, which flows through the site on its way to the Potomac River.



The Maryland Department of the Environment has denied permits for two solar energy projects proposed for Charles County. (Lucidity Information Design, LLC)

The MDE declared that Origis had "failed to document and demonstrate that a serious effort was made to avoid, minimize and mitigate or otherwise offset the [project's] effects on water quality."

Alison Prost, Maryland executive director of the Chesapeake Bay Foundation, applauded the MDE decision and said she hoped it would set a precedent. While Georgetown's embrace of solar is "admirable," she said, "clean energy should never require clearing high-quality forests."

The other solar project, on Ripley Road, had not generated nearly as much pushback, and the state Public Service Commission had conditionally approved the project more than a year ago. But the MDE announcement said the developer had not met a key condition, requiring that Mill Run, which flows through that 300-acre site, be protected from any harm caused by the clearing of 190 acres of trees there.

"MDE does not consider the economic or social benefits of the proposed project to justify any decrease in water quality," the agency announcement said.

The projects' rejections come amid continuing friction in Maryland over the siting of renewable energy projects, particularly solar.

The General Assembly earlier this year boosted the state's renewable energy goals, from 25% by 2020 to 50% by 2030. Of that total, 14.5% is to come specifically from solar. But some rural and suburban counties — responding to complaints about the loss of farmland or scenic landscapes — have taken steps to limit the amount or location of solar development in their jurisdictions.

In August, Gov. Larry Hogan issued an executive order forming a task force to develop what he called "consensus-based recommendations" on the siting of new solar and wind energy projects in the state.

Kimberly Golden Brandt, director of the smart growth program with Preservation Maryland, said she thinks more state guidance is needed. She noted that Charles County had approved both of the solar projects now blocked by the MDE.

"What's the next project that's going to come in and [have] hundreds of acres of forest approved for clearing?" she asked.

Solar industry representatives have reacted coolly to the governor's move, noting that their industry would have only one of the 15 seats on the task force. But they also said they were not concerned by the denial of the two Charles County projects.

"It's not a huge surprise to see those particular projects and that particular company get an unfavorable outcome," said Cyrus Tashakkori, president of Open Road Renewables, a Texas-based company developing other large-scale solar projects in Maryland.

Relatively young trees grow in an area that had been cleared on the 537-acre mostly wooded tract where Origis Energy USA had proposed installing 100,000 solar panels. (Dave Harp)

Tashakkori said that industry representatives have been working for the past couple of years with state and local officials, legislators, and farm and conservation groups to address siting concerns and develop "best practices" for solar development in Maryland.

David Murray, executive director of the Maryland, Delaware, District of Columbia and Virginia affiliate of the Solar Energy Industries Association, said that "clear cutting for forests is not an industry best practice."

"We'd like to see projects with greater community support and environmental stewardship move forward," Murray said.

It's unclear what could happen next. A lawyer for the family that owns the tract targeted for the Georgetown project had said that if the project fell through, the trees still could be harvested and the land sold for development.

The Audubon Society's Curson said he hoped that wouldn't happen.

"What I would hope," Curson added, "is that a conservation purchase could be arranged."

Curson and other opponents of the Georgetown project say they support solar energy, but they want to see it steered to non-agricultural sites such as rooftops and former industrial "brownfields."

Industry advocates counter that those sites are often too costly to develop. It's unrealistic, they say, to expect to meet the state's solar energy goals if projects are not allowed to convert at least some of the state's farmland.

"The only affordable form of solar energy is in fields," said Montgomery County Del. Kumar Barve, chairman of the House Environment and Transportation Committee. He said those who claim to support solar energy only if it avoids taking farmland "want to eat omelettes [but] don't want to break any eggshells."

Mike Tidwell, founder of the Chesapeake Climate Action Network, noted that Origis had pledged to permanently preserve more forested acreage elsewhere to make up for what it would clear — woodlands that could now wind up developed in the future.

"How is that a win?" Tidwell asked. "We'll get no solar now, and the trees could be cut down, too."

Deluge of development spurs call for Rappahannock research

≈ Entrepreneur wants to create facility that would forge stronger ties between river, scientists and growing community

By Jeremy Cox

Ed Whelan, foreground, and Henry "Buck" Cox take in the view of the Rappahannock River in a building that could be transformed into a research and education facility. (Dave Harp)

Fredericksburg, VA, faces a "coming storm."

That's how Henry "Buck" Cox describes the new homes, office parks and businesses forecast to pelt down on his boyhood hometown in the coming decades.

The population of Fredericksburg and the four counties that border the Rappahannock River in the region — Caroline, King George, Spotsylvania and Stafford — have swollen by more than 50% since 2000, census figures show. That number is projected to grow another 30% by 2040, creating a sprawling metropolitan area of almost 500,000 people within a few dozen miles of the bucolic waterway, according to University of Virginia demographers.

"We have a massive amount of growth that's happening," Cox said. "It's going to be a battle to stay ahead of the effects."

He worries about a future in which forests are hacked down to make way for new subdivisions, and endless miles of asphalt and concrete shunt ever more nutrient-laded stormwater into the river.

Cox, a 69-year-old who made a living on the entrepreneurial side of environmentalism, wants to help the region and his beloved Rappahannock chart a different course. He and a business partner are funding a clutch of academic studies they hope will guide development decisions and build the foundation of a new, Rappahannock-centered research facility.

The facility would be a clearinghouse for research on the 195-mile Chesapeake Bay tributary, Cox said. He also envisions it as a place that would offer classes and excursions to help forge stronger connections between the river and the growing community.

"The idea is to turn this whole river into an ecological destination," he said.

The project has the enthusiastic support of Virginia Tech, the University of Mary Washington, the Friends of the Rappahannock and others. With financial support from Cox, researchers from those institutions began fanning out down the river and across its 2,700-square-mile watershed this summer, gathering an elaborate scientific snapshot of ecological life before the "storm" fully arrives.

Cox and the scientists involved in the project hope their findings help local officials make land use decisions that protect the Rappahannock — and the Chesapeake Bay downstream — from increased pollution.

The long but narrow Rappahannock watershed winds from the Blue Ridge Mountains in the western half of the state to the Chesapeake Bay. It drains stormwater from just 7% of the state, but the river flows through one of its fastest-growing regions: the Fredericksburg area.

The area's growth, experts say, can be traced to spillover from the ever-booming District of Columbia to the north and from Richmond, the state's capital, to the south.

"It's just creep from these various urban and suburban areas around DC,"

Research continues on page 14

RESEARCH FROM PAGE 13

said Daria Christian, executive director of the Friends of the Rappahannock, a conservation group. "People are willing to make the drive to have a less expensive place to live."

The river is also a draw, particularly for newly retired residents, said Hamilton Lombard, a University of Virginia demographer.

"A lot of people are retiring there because they want riverfront property or access to it," he said. "So, I think you're going to see a disproportionate concentration of development along the river."

Perched on the Rappahannock's southern shore, Fredericksburg has evolved into the focal point of the development boom.

"Fredericksburg is just going to keep attracting people," said Ed Whelan, a real estate developer and lifelong resident. "We're right off [Interstate] 95. People are moving into cities all over the country. They want the old buildings. They want to go back in time."

The construction of new roads and subdivisions on or near the riverbank, though, has intensified problems with sediment and bacteria in the waterway, Christian said.

While nutrient pollution continues to be the greatest problem facing the Bay and many of its rivers, sediment — dirt swept into the water from freshly tilled farms and construction sites — is a one-two punch against water quality. Floating particles block sunlight from aquatic grass beds, causing them to die off; the decomposition process consumes oxygen in the water. Sediment particles also act like Ubers for nutrients, offering rides well downstream from their pickup points.

Owing to its abundance of farms and hilly terrain, the Rappahannock watershed loses more sediment per square mile — 329 tons per year — than any other major Bay tributary.

The conversion of forests to housing or farmland is a big factor, Christian said. "When they're cleared, the soil is open to erosion."

Meanwhile, the portion of the river around Fredericksburg is designated by the state as impaired for two types of bacteria: *E. coli* and fecal coliform. That pollution is largely tied to failing septic tanks and poor farm management, particularly the widespread failure to fence off cattle from ditches that flow into the river, Christian said.

Although Whelan, the real estate developer, is as much responsible for Fredericksburg's growth as almost anyone — having invested millions into a blocklong downtown revitalization project — he has mixed feelings about the trend.

"I never was a big growth guy, and I'm still not," Whelan said. "I wish [Interstate]

Graffiti blares from the bare concrete walls of a former hydroelectric plant in Fredericksburg, VA. It is one of a handful of sites being considered for the home of a future research center focused on the Rappahannock River's health. (Dave Harp)

95 had gone 50 miles west of here. It's a traffic jam all the time."

Cox remembers days from his youth when the Rappahannock was a serene getaway. He would spend his free moments fishing for shad and striped bass, lighting campfires on cool evenings and paddling a canoe until his arms gave out.

After graduating from Virginia Tech in 1973 with a bachelor's degree in biology, Cox found work as a pollution monitor with the State Water Control Board. But he had larger ambitions. He returned to the university to get his master's and a doctorate in environmental engineering.

One business venture begat another. Today, he owns a firm called Advanced Oxidation Technology, which holds a patent on a formula that breaks down oil and grease deposits in municipal sewer systems. He and his wife live in Blacksburg, nearly four hours away. But Fredericksburg remains a big part of Cox's life.

"We have a lot of friends here," he said while driving his pickup truck down a highway just outside town recently. "It's home."

He serves as a board member on his alma mater's alumni advisory committee. So, partnering with the university was a natural choice when it came to pursuing his vision in Fredericksburg, he said.

In addition to securing $200,000 for the studies that launched this summer, Cox has been spending much of his days drumming up more donors and trying to acquire riverfront property for the proposed river center.

When he pictures the form his dream might take, he looks 150 miles southeast to the Chesapeake Bay Foundation's Brock Environmental Center in Virginia Beach, which the nonprofit group touts as "one of the world's greenest buildings." To build the Rappahannock version, Cox estimates he will need to raise about $10 million.

He has cobbled together about $1 million so far — $750,000 in cash and the rest in pledges — he said. But he is confident he can turn his dream into reality because there are so many questions yet to be answered about the watershed's health — and so much at stake.

"We want to show people the future in anything we do here," Cox said.

He laid out his dream while driving at a golf cart's pace amid midday traffic in the city. No one seemed to mind the white pickup's leisurely presence. His purpose was to show off the possible locations for the research center: a plot east of town owned by the University of Mary Washington, a graffiti-stricken former hydroelectric plant owned by Whelan, and the Friends group's headquarters.

Cox anticipates the facility containing classrooms, the latest in ecologically friendly construction and water-based activities for families, such as kayak rentals and boat cruises. If Whelan's downtown site is selected, he wants to reserve part of the industrial-looking building for a restaurant with expansive river views.

That's all in the future, if the money can be raised. But some of the scientific research is already under way. The Wetlands Research Initiative, a Gainesville, VA-based environmental consultant firm, has donated $200,000 to jump-start the work.

David Sample, a Virginia Tech environmental engineer professor, is leading an investigation of stormwater runoff. He plans to monitor pollution loads at five sites in the city of Fredericksburg, each representing a different type of predominant land use.

His goal is to update the runoff loads that were developed in a national study in the 1980s and are still used in computer models, including the one used to guide the Bay restoration. Sample suspects his results will generally show that stormwater has become cleaner, in part because of the reduced smokestack emissions of nitrogen oxides.

If that is the case, he said, future developers might be able to downsize — and save money on —infrastructure designed to catch and treat stormwater. But, he added, such gains in water quality may be wiped out by the increasing amounts of rainfall induced by climate change. His research will help clear those clouds of uncertainty.

Another study led by Durell Scott, also of Virginia Tech, aims to clarify which water-management tools work best for both human use and the environment. But first, he and his team are cruising the river, taking water samples. That information will show where the river is most polluted and where those contaminants are coming from.

The Fredericksburg area's growth presents a case study that couldn't be duplicated in a lab, Scott said.

"The Rappahannock is one of these river systems that's typical of other river systems in the mid-Atlantic," the biological systems engineering professor said. "It's growing population-wise. There's still some farming in the upper part of the watershed, but there's a lot of pressure from development. Then, you have the downstream water and the Chesapeake Bay and how that's important for fisheries."

More studies are planned or under way. All are driving toward the same destination, Cox said: a more-sustainable Fredericksburg and healthier Rappahannock River.

Researchers find sunscreen chemicals in Chesapeake oysters

≈ Antibiotics, natural and synthetic hormones also detected in water, sediment and bivalve tissue

By Timothy B. Wheeler

The Chesapeake Bay's oysters already have plenty of challenges to deal with — nutrient and sediment pollution, parasitic diseases and harvest pressure, to name a few.

One thing they won't have to worry about is getting sunburned. A new study finds Bay bivalves are apparently ingesting sunscreen ingredients from the water and sediment around them.

A team led by researchers from the University of Maryland, Baltimore County, found ultraviolet ray-filtering chemicals used in commercial sunscreens, along with antibiotics and endocrine-disrupting hormones, in Bay water, bottom sediments and oyster tissue taken from the mouth of the Chester River and three water bodies on the Lower Eastern Shore.

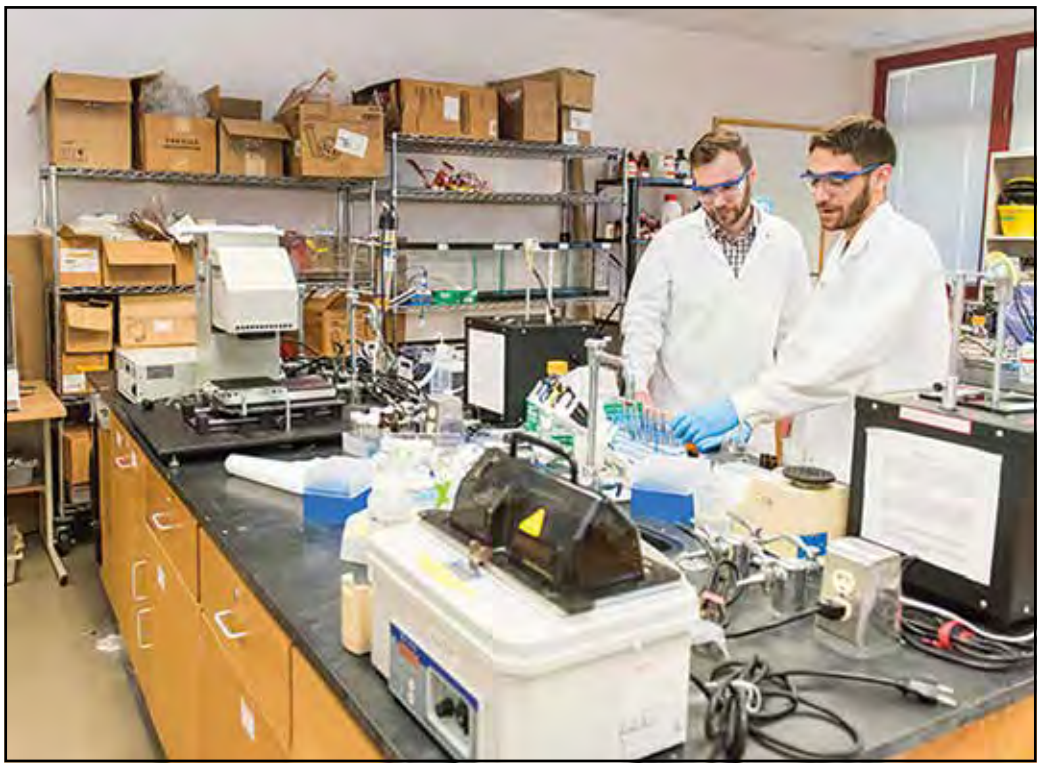
The study, produced in collaboration with researchers from the University of Maryland School of Medicine, U.S. Forest Service and Maryland Department of Natural Resources, appeared in the August issue of the journal, *Science of the Total Environment*.

"Every day, we use these specialty chemicals, like antibiotics, like sunscreens, to improve our personal health, and these molecules go down the drain and eventually get discharged out into the Chesapeake Bay," said Lee Blaney, the study's lead author and an associate professor of chemical, biochemical and environmental engineering.

"Until recently, no one has tried to measure them in the Bay and see if they're at levels that could have impacts…," he added. "We found that, indeed, these chemicals are out there and at levels that have presented concerns in other places."

The impacts on the Bay's creatures, as well as human health, are unknown. But one antibiotic was measured in at least one place at a level high enough to make potentially disease-causing bacteria resistant to treatment, researchers found. And the sunscreen chemicals reached levels that have been implicated in the die-off of corals in tropical waters.

"Are there environmental impacts on oysters? We don't know that," Blaney said. But, he added, "we figure it's better to get out ahead of the issue" to determine if these contaminants are accumulating in sediment or living creatures and warrant further investigation.



UMBC researcher Lee Blaney (left) works in his lab with engineering student Donald Ocasio (2017). (Marlayna Demond / University of Maryland, Baltimore County)

Researchers collected water, sediment and oysters and mussels from two sites in the Chester River in 2016, then sampled 12 sites the next year at the mouth of the Manokin River and in Holland Straits and Kitts Creek. The research work has been funded by grants from the National Science Foundation and Maryland Sea Grant.

Other studies have found pharmaceuticals and sunscreen ingredients in more populated watersheds, especially downstream from wastewater treatment plants. In an earlier study, Blaney said he found those contaminants in sediment and crayfish in Baltimore's Gwynns Falls, a stream that doesn't get any intentional wastewater discharges. The sources there could include sewage leaks as well as runoff, he suggested.

It's not especially surprising that these chemicals turned up in the Chester, with a wastewater plant upriver discharging 2 million gallons daily. But Blaney said he and his colleagues hadn't expected to spot the same contaminants in more rural areas like the Lower Shore. The sample sites there are downstream from a smaller wastewater plant in Princess Anne, which discharges 1.26 million gallons daily.

Technology already exists that could filter out or chemically treat all these contaminants from wastewater. "But these things cost a lot of money," said Lee Blaney, the study's lead author and associate professor of chemical, biochemical and environmental engineering at the University of Maryland, Baltimore County.

But there are also 29 large chicken farms in the watershed that produce about 3.7 million birds annually, the paper noted. It suggested that farm runoff contaminated with animal manure might be a source, or household septic systems leaching into groundwater and streams.

At least one of the antibiotics found in the Manokin is not given to people, the paper noted. Two of the drugs detected have been found in poultry litter in other countries. They're banned for use in chickens in the United States, but are permitted for limited use in cattle and swine.

"We're not trying to point fingers, just saying we're detecting things," Blaney said. In addition to farm runoff, sources could include household septic systems, he said.

The sunscreen levels measured in the Bay were generally lower than what his earlier study found in the Gwynns Falls, Blaney said, but researchers were still surprised by the concentrations they found on the Lower Shore. One sunscreen ingredient they found reached levels that other studies have shown can harm water fleas and corals. The researchers suggested such findings warranted further study to see if sunscreen contaminants could affect Bay creatures, including the economically important blue crab population.

"These results emphasize the need to investigate the potential toxicity of estrogenic hormones and UV-filters to ensure the sustainability of not only oyster populations, but also restoration efforts in the Chesapeake Bay," their paper concluded. "As Chesapeake Bay oysters are widely consumed by humans, the occurrence of these priority [contaminants] in oyster tissue, along with the continuous exposure to diverse antibiotics, also raises potential human health concerns."

Blaney said technology exists that could filter out or chemically treat all of these contaminants from wastewater. "But these things cost a lot of money," he added.

The UMBC researcher said other as-yet unpublished data he's gathered from samples taken elsewhere around the Bay find sunscreen chemicals as well.

"We find these everywhere," he said.

Though sunscreen ingredients aren't as persistent as some other contaminants impacting the Bay watershed, like polychlorinated biphenyls (PCBs), or per– and poly-fluoroalkyl substances (PFAS), Blaney said it's clear they do linger in the ecosystem at least for a while, and more are getting into the water all the time.

"We're not trying to tell people, 'Hey, don't wear sunscreen!' " Blaney said, because those compounds help prevent skin cancer. Rather, he said, he hopes research will prompt the public and policy makers to consider the environmental and health implications of chemicals used widely in food, cosmetics and other personal care products.

"Ultimately, they go down the drain," he said. "It makes sense to start thinking about them now."

Outreach strategies cropping up to help growing number of female farmers

≈ Studies find that women are more open to conservation, stewardship practices

By Ad Crable

One of the biggest changes to the face of agriculture and forestry these days in Chesapeake Bay states is women. That new demographic is leading some environmental groups and government agencies to launch new strategies for engaging female decision makers in projects that help water quality.

The unprecedented numbers tell part of the tale. Approximately 59% of farmland in Maryland is now owned or co-owned by women, or a woman makes decisions on the farm. Women hold those roles on 54% of farmland in Virginia; 55% in Pennsylvania, 53% in West Virginia and 60% in New York, according to the federal 2017 Census of Agriculture.

During the 5-year survey period, the number of male farmers declined by 1.7% nationwide while female ag producers leaped by 27%.

According to the American Farmland Trust, the trend toward more female management of farms is likely to increase. Over the next 20 years, about 70% of the nation's farmland is expected to change hands, and women will take the reins at an even greater rate, the trust says.

Many farms in Bay states have at least some woodland, and more women are becoming decision makers of that land, too. The percent of women who own or manage woodlots doubled across the United States between 2006 and 2013, according to a survey by the U.S. Forest Service.

In some cases, wives, who generally live longer than their husbands, inherit farms and woods. Daughters are taking more of an active interest when they inherit a family farm with siblings. They are becoming more active entrepreneurs in making a living off the land and some, who have long toiled on family farms, are insisting on a bigger voice.

"Women have always been in a supportive role in agriculture but they always have been in the background," said Lisa Graybeal, who owns and manages a 1,400-cow dairy operation with her father and brother in Lancaster County, PA. "The men are out front and visible on tractors but women are doing a lot of bookwork and hidden jobs. My grandmother worked her ass off.

"More and more women are coming back to work on the farm but are insisting on a more active role."

Conservation, farmland preservation and environmental groups are encouraged by studies and surveys that find women are generally more conservation– and stewardship-minded and accepting of practices that improve and sustain the health of the land they will pass on to another generation. So they are launching women-only outreach programs.

Women who own or help run farms and forests gather at one of the American Farmland Trust's "learning circles." According to the trust, the numbers of women who control agriculture and wooded land is rapidly growing. (American Farmland Trust)

For a broader adoption of conservation practices on the farm to take hold, "we need women in the game," said Gabrielle Roesch-McNally, executive director of American Farmland Trust's Women for the Land initiative.

More women may be owners and decision makers of farmland, but they also encounter gender barriers in what has long been a man's world. And they are sometimes hamstrung by self-perceptions that they don't know enough about farming or managing a forest to ask for a seat at the table.

That's the chief reason for the trust's popular "learning circles" (farmland.org/learning-circles-for-women-landowners) for women in the Bay states. Since 2014, the trust has offered 38 learning circles in Maryland, Virginia, Pennsylvania and New York. More will take place in Berks County, PA, on Oct. 22; in Chester County, PA, on Oct. 23; in Virginia's Spotsylvania, Orange, Culpeper and Louisa counties on Oct. 25; and in Lancaster County, PA, on Nov. 6.

Based on a model that started in the Midwest by the Women, Food and Agriculture Network, learning circles are groups of 12–20 women usually new to farming or forestry or who own or rent their land. They find solidarity in shared experiences, take a field trip to see a woman-owned farm, share knowledge, and are introduced to local and state agricultural agencies that can provide technical and financial help.

The formula has worked remarkably well. A study of learning circles in Illinois and Indiana found that 72% of the women who attended made conservation changes on their farms. Soil health and winter cover crops are big topics in Bay learning circles.

"[Women] just can't believe that there are women in the same boat as they are," said Margot Mays, the trust's mid-Atlantic conservation and stewardship manager, who has led learning circles. Often, groups of women continue to meet, and the trust has a goal of creating a national network of women landowners.

That was certainly the case for Marli Hickins, who was thrust into managing a 200-acre farm in the Shenandoah Valley of Virginia after moving to her husband's family farm and then losing her spouse in a plane crash.

Though she grew up on a college campus in Texas with no farming experience, over time she introduced sheep for their meat, goats for their milk, ducks for eggs and rabbits for meat. She began to consider herself as a shepherdess but shied away from calling herself a farmer.

"I don't think I would have had the confidence to go to the local feed store," she said. "I was a landowner but I felt like I was kind of playing at it. A lot of people in this area do really serious farming, and I didn't have the credentials."

That changed when she attended her first learning circle. "It's amazing that there are so many people in my situation. When I came away, I felt like I had gained a little bit of credit," she said.

"Being with a bunch of women allowed me to share honestly. I admitted I was there to figure it out. That was good enough for them and that was a freeing thing. It's OK if I call myself a farmer or a shepherd because to be a farmer you don't have to have a degree or have it in your blood."

The success of learning circles and other efforts has swept up local and federal farm agencies into the movement. Federal farm agencies, for example, now list women ag producers as an "underserved population."

The U.S. Department of Agriculure Natural Resources Conservation Service reaches out to women at learning circles and now provides money for them to meet in Bay states. "Learning circles provide a great atmosphere for open communication and open the door for us to meet them and them to meet us," said Casey Iames, a federal women's emphasis program manager with USDA NRCS in Virginia.

The momentum of the learning circles is inspiring other efforts.

In Lancaster County, Jenna Mitchell of the nonprofit Alliance for the Chesapeake Bay was surprised a year ago when she called up an Amish farmer to try to talk him into a streamside buffer and he immediately handed the phone over to his wife. When it came time to pick out native plants at a nursery for the buffer, it was the wife and her mother who showed up.

"We learned about how really, really passionate they are about this stuff, which is great," Mitchell said. "Out of that, my team has an opportunity to work with Amish wives, mothers and maybe even daughters."

To further reach this conservative audience, the Alliance designed a native plant recipe book with information about plants that attract wildlife and pollinating insects and birds. They will introduce the books at newly formed garden clubs for Amish women, earmarked for the spring.

"We know that women are traditionally more interested in conservation," Mitchell said. "The more we can educate the wives, hopefully the more we can make some moves with those interested in best-management practices on the fields and in the pasture and in the barnyard."

Other groups are targeting women who control woods.

An effort run by the USDA Forest Service called Women Owning Woodlands (womenowningwoodlands.net)

OUTREACH CONTINUES ON PAGE 18

Bay scientists studying environmental, economic uses for hemp

Backers cite its benefits for humans, soil and water; others question environmental claims

By Ad Crable

A Gold Rush mentality has erupted across Chesapeake Bay states as the lacy fan-shaped leaves of more than 50,000 acres of industrial hemp spring from the landscape for the first time since World War II.

Bay states and the federal government are removing barriers to growing the misunderstood plant, which was a staple crop from Colonial times and then banned for little more than its likeness to a mind-altering cousin, marijuana.

Now, hemp is again being embraced amid bold claims that include a possible economic life preserver for struggling farmers and an environmentally friendly cash crop that could help reduce nutrient pollution in the Bay. Nearly 2,800 farmers and entrepreneurs had hemp in the ground this summer in Virginia, Pennsylvania, Maryland, West Virginia and New York.

Hemp backers are convinced that the plant is a sustainable alternative to plastics, cotton and fossil fuels, touting the possibility of more than 25,000 natural products that range from plant-based concrete and pain-salving lotions to animal feed and biofuel.

But much is still unknown about hemp's future economic and environmental impact. In the Bay watershed, scientific research is under way to determine if high-quality hemp can even be grown in the region's climate and soils and to learn whether it is indeed a miracle plant that offers all of the Earth-friendly benefits and human health claims promoted by supporters.

Samuel Fisher, an Amish farmer in Chester County, PA, walks among the rows of his first hemp crop. (Dave Harp)

Advocates say that the plant stores more carbon than it needs to grow, which makes it a possible tool for fighting climate change. Early research also suggests the plant is better than mainstream crops in sucking up phosphorus from manure and poultry litter spread on fields before it can wash off and pollute local waterways.

Hemp grows fast, tall and thick, outcompeting weeds and reducing the need for herbicides, proponents boast.

Flowers emerge from a hemp plant growing on a Pennsylvania farm. (Dave Harp)

In Pennsylvania, it is being planted on abandoned strip mines to see if it can take root in the depleted soil. Minnesota has a state-run pilot project studying hemp as a mass-produced alternative to corn and soybeans to improve water quality.

Because it grows fast and profuse with a robust root system, hemp may make an excellent streamside buffer to stabilize banks and catch manure and soil runoff, some have claimed.

But some studying hemp aren't seeing it as an environmental panacea for the Bay states.

Ryan Davis of the Alliance for the Chesapeake Bay said that the group took a look at hemp for riparian buffers but rejected it because hemp is a seasonal crop and dies back in winter. Also, a monoculture of one plant is not good for an ecosystem, he said.

"I have concerns about the crop itself. The mid-Atlantic is a tough place [to grow hemp] because of the weather and climate. We have a lot of humidity and warm evenings that promote disease," said Andrew Ristvey, an Extension specialist for commercial horticulture with the University of Maryland.

Ristvey added that he is encouraged by research showing that hemp grown for fiber may remove phosphorus, a type of nutrient, from the soil. But whether hemp proves to be a better plant for the environment in Bay states will depend on the amount of fertilizer and chemicals needed to grow quality plants. For now, those are unanswered questions.

And, because hemp grows around the same time as mainstream crops such as corn and soybeans, it cannot be used as a winter cover crop to help reduce nutrient runoff.

As for needing fewer pesticides, Eric Williams, a spokeswoman for the Virginia Department of Agriculture and Consumer Services, noted that when hemp is grown for its flowers and CBD oil, which constitutes the great majority of plantings so far, plants are spaced farther apart and weed growth can be a problem.

Samuel Fisher, a Plain Sect farmer in Chester County, PA, who is growing hemp for its flowers as a source of CBD oil, said his experience so far shows that the crop needs plenty of nutrients from fertilizer. Insects have not proven a problem but threats of fungus and bacteria have been.

"For dairy farmers who are struggling, it could either keep them in business or put them out of business very quickly," Fisher said. "You can't just plant it in a field and pretend it's going to grow and come out two months later to harvest it. We have two to three people in the field every day."

"I think we're going to quickly learn that it's like a lot of crops we deal with. Insect and disease pressure will be prevalent," added Lancaster County hemp farmer, Christopher Harnish, who is growing a little more than 3 acres in a field used last year for corn.

Dr. John Fike, a Virginia Tech associate professor of crop and soil environmental sciences who has researched the plant, said there are a number of "hemp mythologies."

He said claims of reduced pests and less fertilizer needed are simply not true.

Referring to studies on growing hemp on compromised land to clean

Hemp continues on page 18

Hemp cultivation in the Bay region

Maryland

- 847 growers, 161 processors, 36 dealers
- 8,500 acres of hemp cultivation permitted
- 2019 is the first year Maryland has allowed cultivating hemp for commercial use.
- Many growers are struggling tobacco farmers.

New York

- 490 growers, 118 processors
- 19,932 acres of hemp cultivation permitted
- The state is spending $10 million on research and economic development.
- June 2019 legislation gives farmers the first chance at permits to grow commercial hemp.

Pennsylvania

- 324 growers at 828 locations
- Struggling dairy farmers and Plain Sect farmers who embrace labor-intensive crops hold a significant number of permits.

Virginia

- 955 growers, 191 processors, 55 dealers
- 10,000 acres of hemp cultivation permitted
- The cultivation of hemp for commercial use was approved in March 2019.
- The biggest concentration of growers are tobacco farmers hit hard by declining sales and tariffs imposed by China.

West Virginia

- 158 growers
- 2,531 acres of hemp cultivation permitted
- Hemp licenses tripled in 2019, the second year hemp was allowed to be grown commercially.

— Data provided by the state agricultural agencies

OUTREACH FROM PAGE 16

mainly offers a website pooling resources and information but also runs workshops and retreats to educate women about sustainable forestry in Bay states.

"Forestry is just kind of traditionally a male industry. Girls aren't necessarily growing up learning from their dads how to cut down a tree. Women maybe have a feeling of not feeling welcome," said Katherine Hollins, who works for The Sustainable Family Forests Initiative at Yale University.

"A man might look at it from a business standpoint. For women, it's conservation. A lot of them don't know where to start," added Barb Breshock, recently retired from the West Virginia Division of Forestry and a leader of several workshops.

Another initiative, Women and their Woods (delawarehighlands.org/watw), has run retreats on forest stewardship in New York and Pennsylvania.

"A lot of the questions, when we ask what programs are wanted, go beyond the typical 'how much value is in my woods?' It's more of 'how do I enjoy my property, how do I put trails on my property?'" said Amanda Subjin of the Delaware Highlands Conservancy, part of a coalition of private and public partners. Topics range widely, from chainsaw safety to controlling invasive plants, forest ecology, estate planning and how to encourage migratory birds.

Often, participants share their challenges in working with the land. "One of my favorite parts is just introducing women and giving them time to show their scars from digging up barberry."

Female farmers gather at one of the "learning circles" held across Chesapeake Bay states and the Midwest by the American Farmland Trust. The number of women who own or make decisions on farms is growing, and groups are trying to tap their conservation ethic. (April Opatik / American Farmland Trust)

HEMP FROM PAGE 17

up the soil, such as polluted industrial sites and strip mines, he said, "You can grow it on marginal land but you get a marginal crop."

He said hemp can be grown with no-till farming methods but that herbicides are needed to control weeds.

Some have expressed concerns that if hemp becomes a profitable cash crop that farmers and landowners will pull out of government conservation programs that set aside farmland for streamside buffers and instead plow the land for hemp.

But officials in Bay states say that is not happening, at least not so far. Most hemp is being grown in former tobacco and alfalfa fields and other areas already in production.

"No one is clearcutting wooded acres for hemp," said Shannon Powers, spokeswoman for the Pennsylvania Department of Agriculture.

The hemp boom comes at the same time that the region's dairy and tobacco farmers are reeling from low prices, tariffs and falling demand. Though they are a savvy and conservative bunch, some can't help but hope that the arrival of hemp is a fortuitous blessing.

"I've had more than one dairy farmer say 'I'm going to grow this stuff to try to save my dairy operation,'" Fike said.

But it's too early to predict how much of a lifeline hemp might be for farmers.

Markets and processing facilities for most of hemp's projected uses, especially the line of products derived from fiber and seeds, have not emerged on a wide scale yet. Research is still taking place to determine which varieties can be grown in Bay states and how successfully.

And everyone is still waiting to see how the federal government will regulate hemp, now that it is no longer considered a dangerous, controlled substance. To date, the federal Food and Drug Administration hasn't approved the use of any pesticides to treat hemp or decided which CBD health claims can be verified. And while the 2018 federal Farm Bill made hemp eligible for crop insurance, the guidelines have yet to be put in place.

Skittish ag-lending banks are not yet handing out loans for harvesting and processing equipment.

Most of the growers in the Bay states are experimenting with hemp on only a few acres. When and if hemp takes off, will farmers in the region be able to compete with 500-acre spreads in the Pacific Northwest where the industry has a head start by years?

"There's just an awful lot of unknowns," Fike stressed. "Will this be a flash in the pan or the next big thing or just another crop? That remains to be seen."

Even hemp cheerleader Erica Stark, chair of the National Hemp Association, advised caution, though she sees hemp's future footprint as huge. "Certainly, we love the enthusiasm out there and we want to get everybody excited, but we also need to be realistic. It's not going to happen overnight."

Ristvey offers his own prediction. "It won't be a magic bullet. I suspect it will be just one of those crops that will add to the palette of agriculture that we have in the United States."

Christopher Harnish, left, and his brother, Bryan Harnish, both of Lancaster County, PA, examine their first-year crop of hemp plants, which can grow to 20-feet tall. (Dave Harp)

Potential Uses for Industrial Hemp

Advocates of hemp say there are more than 25,000 possible uses of industrial hemp beyond the current considerable and growing CBD oil market. Here are some most likely to see a market.

- Hemp CBD oil can be used to treat a variety of ills including anxiety, inflammation, chronic joint pain, epilepsy, headaches and sleep disorders.
- Hemp seeds and oils can be used for cooking oil, baking flour, yogurt, beer, snacks and high-protein animal feed for pets and livestock.
- Hemp fiber is similar to but lighter than plastics for packaging. The automobile industry is exploring products such as dashboards, door panels and mirror frames to reduce plastics and install a lighter material that could improve gas mileage.
- Hemp fiber can be used for clothing, animal bedding, kitty litter and to absorb oil.
- Hemp fiber is used as a core for insulation, paneling and home building blocks. It is being sold as Hempcrete.
- Fast-growing and tall hemp can be planted in streamside buffers.
- Hemp is touted as a biofuel.
- Heating hemp plants produces a soil amendment known as biochar that absorbs water and stores greenhouse gases.

— Ad Crable

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hammered by it."

The condition of the Bay's oysters matters economically, ecologically and culturally. They're a money maker for the region's seafood industry. They're important water filterers, and the reefs they build provide habitat for fish and other Bay creatures. And, they're part of the traditional fabric of life around the Bay, a staple at many family, church and community feasts in fall and winter.

Now, with commercial harvests of wild oysters down in both Maryland and Virginia, watermen in the two states face new catch restrictions this fall, imposed at least partly to give the beleaguered bivalves a chance to recover from their freshwater woes.

Oyster farmers, meanwhile, are bracing for another off year, after seeing a dip in production in 2018 — breaking what had been steady growth in each of the two states' aquaculture industries.

And government agencies and environmental nonprofits had to delay or scale back oyster restoration work, as low salinity disrupted the supply of hatchery-bred oyster larvae for seeding rebuilt reefs.

Scott Budden, foreground, along with Sean Corcoran, center, and Sam Saviertka, all with the Orchard Point Oyster Company, cull oysters for market on Shipping Creek near Stevensville, MD. (Dave Harp)

Hatchery hiccups

Oysters are like Goldilocks when it comes to salt — they don't like too much, or too little. They're happiest in brackish to moderately salty water, with salinity ranging from 10 to 28 parts per thousand.

But oysters don't reproduce well or grow much if salinity drops below that floor. And they can die if it stays under 5 ppt for weeks or months at a time.

At Stingray Point near Deltaville, VA, salinity was 8 ppt in March, half of what's normal that time of year. Up the Bay, where the water tends to be fresher, salinities dropped to deadly levels late last year and stayed that way well into the spring.

Hatcheries, which draw local water to spawn oysters in captivity for use in aquaculture and ecological restoration, struggled to produce larvae or get them to survive long enough to settle on shells as "spat" or "seed."

No hatchery had more trouble than the one run by the University of Maryland Center for Environmental Science at its Horn Point laboratory near Cambridge. The facility, one of the largest on the East Coast, produced a record 1.8 billion spat in both 2016 and 2017.

But this year, persistently low salinity in the Choptank River delayed spawning until August, said Stephanie Tobash Alexander, who manages the operation. As a result, Horn Point only managed to produce about 10% of its usual output.

"That's science for you," Alexander said. "We made the most of what we could."

She hopes next year will return to normal. By late September, the salinity had risen to 12 ppt but it was too late to help this year's class much. The facility spawned its last oysters of the season on Sept. 18.

The hatchery woes at Horn Point and other private facilities around the Bay had a ripple effect for aquaculture, oyster restoration and even the public fishery.

"People didn't get seed as early as they wanted to get seed. In some cases, they didn't get as much seed as they wanted to get," said Mike Oesterling, executive director of the Shellfish Growers of Virginia. "So that puts everyone a little behind."

Oyster farmers scramble

Oyster farmers in both states felt the impact. In Virginia, the top producer of oysters on the East Coast, the harvest from aquaculture was down by one third, to 248,347 bushels, according to preliminary figures from the Virginia Marine Resources Commission. Growers surveyed by the Virginia Institute of Marine Sciences reported that heavy rains and unusually low salinities were impacting their oyster plantings and sales.

Maryland's smaller oyster farming industry grappled with even lower salinities. Growers there managed to produce just 57,543 bushels last year, down 22% from 2017, according to the state Department of Natural Resources. That was the first drop in production seen since Maryland revamped its shellfish leasing laws around 2010 to revive aquaculture. Until then, the industry's output had been growing so steadily that it was on track to overtake the state's fading wild harvest.

Robert T. Brown, Sr., president of the Maryland Watermen's Association and an oyster farmer himself, said he lost close to 95% of the market-size oysters he had growing on leased bottom in the Potomac, where salinities dropped below 5 ppt in the spring. Closer to the river's mouth, where salinities were a little higher, mortality was around 35%, he said.

The small, young oysters weathered the freshet better, he said, with only about 5% dying.

"They didn't grow, but they didn't die," he said. They started growing again in August, he noted, as the salinity levels rebounded. But he doesn't expect many to reach marketable size until sometime next year.

In Virginia, the Bay's salinity is generally high enough that oysters reproduce well in the wild. Growers there only have to put down shell before spawning begins in late spring to catch freshly hatched larvae. But in Maryland, conditions are less favorable, and many oyster farmers get their spat from hatcheries, often the one at Horn Point. But its troubles this year forced many growers to approach other, private hatcheries, with limited success.

Some had to do even more. Scott Budden's Orchard Point Oyster Co. raises bivalves in the Chester River, where salinities aren't that high even in normal years. Early this year, as rains kept coming down, he saw salt concentrations dropping into the danger zone.

"I'd never seen salinity levels that low in winter," he recalled.

Some of his oysters in the Chester died, but Budden tried to save as many as he could. He pulled 500 bags of oysters out of the river and hauled them by boat and trailer — 40-plus road miles — to another leased area off Eastern Bay. The slightly higher salinity levels there gave the bivalves "a shot in the arm."

By late spring, as rains began to ease, salinity started creeping back up, and he and his crew moved the oysters back to the Chester. But Budden continues to use Eastern Bay as a place to grow out oysters just before taking them to market.

Restoration setbacks

The hatchery hiccup also set back oyster restoration efforts in Maryland, which with Virginia has pledged to rebuild the bivalve populations and habitat in five tributaries in each state by 2025. Virginia generally counts on natural reproduction to stock the reefs it has built or expanded, but in Maryland, federal and state agencies depend on Horn Point to for larvae or spat on shell.

Officials had at one point planned to plant spat this year in all five of the Maryland tributaries targeted for large-scale restoration. The Little Choptank and Tred Avon rivers need a final round of seeding to finish up projects that began three to four years ago. Harris Creek, though essentially completed in 2015, was in line for some light overseeding of thin spots. Officials even hoped to begin plantings in the St. Mary's and Manokin rivers, where restoration plans are still being fleshed out.

Much of that work got scaled back or shelved until next year. So did Marylanders Grow Oysters, the popular program under which about 1,500 waterfront property owners voluntarily raise young oysters in cages from their piers for planting in sanctuaries.

"Most of the sanctuary spat are typically produced in the first half of the hatchery season," explained Chris Judy, the Maryland Department of Natural Resources shellfish program manager, "but this was when the hatchery had zero production."

The Chesapeake Bay Foundation had hoped to contribute to the effort by producing 25 million spat on shell, said senior scientist Doug Myers. Four-fifths of that was to go on the Maryland sanctuary reefs, under a $3 million, three-year

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grant from the National Oceanic and Atmospheric Administration. The other 5 million spat were planned for CBF's oyster gardening and other initiatives.

CBF normally buys oyster larvae from the Horn Point hatchery and sets them on shell or reef balls at a facility in Southern Maryland. The problems at Horn Point left CBF 13 million spat shy of its goal, Myers said, despite scrambling around to find other sources of larvae.

"It's been a rough year," said Stephanie Westby, NOAA's oyster restoration program manager. "But you know, with climate change, these kind of extreme weather episodes may be the new normal, unfortunately."

Spat on shell oysters were loaded in mid-September at the Horn Point Lab oyster hatchery in Cambridge, MD, destined for the sanctuary on the Tred Avon River. Hatchery problems, attributed to low salinity, delayed restoration plantings. (Dave Harp)

Faltering fisheries

Public fisheries in Maryland and Virginia also suffered.

In Maryland, the DNR works with local watermen's committees to replenish reefs thinned by harvest. But Horn Point's problems reduced the amount of hatchery-spawned juvenile bivalves available. Nearly 49 million spat got planted on 48 acres, about a third less than last year, according to the DNR's Judy.

Meanwhile, salinities north of the Bay Bridge and upriver in major tributaries declined to the point that shellfish in the water grew very little — or died.

In the Potomac River, the extended freshet devastated a promising experiment in rotational harvesting, said Martin Gary of the Potomac River Fisheries Commission. Since 2013, watermen had been planting juvenile oysters annually on reefs or bars above Cobb Island, he said, with plans to harvest them in three years and then every four years afterward.

Virtually all of the bivalves planted there got "crushed," as Gary put it. The Maryland Department of Natural Resources' annual survey of oyster reefs in the fall of 2018 found more than 90% of the oysters in that area of the river had died.

Gary said he's waiting for the DNR survey crew to return in October to find out if any of the oysters there are still alive.

Downriver, near the Potomac's mouth, low salinity inhibited the oysters' growth but didn't kill them.

"We were thankful that we didn't lose any down there," Gary said.

Farther south in Virginia, reef surveys found that many oysters didn't grow much over the last year, either, and some in deeper water had died.

Last season's wild harvest was the state's smallest since 2012–13, with just 209,032 bushels landed, according to preliminary data gathered by the Virginia Marine Resources Commission.

Hoping to give Virginia's oysters a chance to recover, the commission took steps in August to scale back harvests a bit.

The public fishery season traditionally opens Oct. 1, and that's when watermen using hand or patent tongs can start plucking oysters from the bottom. But the commission delayed until November when watermen can work reefs over with dredges or mechanized hand-scrapes.

The delay gives the oysters more time to reach the 3-inch minimum marketable size, officials explained.

Virginia's new harvest rules also require that dredge boats stop working by noon on two out of the four months when they're allowed on the water. Last year's season allowed them to continue until 2 p.m.

"Generally," said Andrew Button, who oversees the state agency's conservation efforts, "it's a more resource-conservative season."

Most watermen seemed resigned to the restrictions, but some complained it was unfair to cut back on only certain types of harvest gear.

"If we're in that bad of shape with the oysters, let's just shut it all down in October," said Charles DeMarino, a waterman based out of Cape Charles on the Eastern Shore.

New restrictions took effect this fall in Maryland as well, mainly in response to a study last year that found a long-term decline in the fishery, with most areas being overharvested.

The DNR reduced from five to four the number of weekdays when oysters could be harvested throughout the season, which ends March 31. The agency also scaled back the daily maximum number of bushels that could be harvested by 20% to 33%, depending on the type of gear used.

The limits were aimed at making the fishery sustainable in eight to 10 years, but the freshwater woes figured explicitly into at least one rule change.

The DNR temporarily barred harvests in several places around the Bay, including much of the area north of the Bay Bridge, where few oysters survived the freshet.

The DNR projected that its package of restrictions could reduce the harvest by as much as 26%. Last season's harvest of 137,000 bushels was already down 25% from the 2017–2018 catch.

The Chesapeake Bay Foundation expressed skepticism about the efficacy of the restrictions. The environmental group had urged tighter limits and pointed to the DNR's own analysis, which found that reducing the harvest by one day a week would have "little conservation value."

Just one in four watermen harvest oysters five days a week at the start of the season, according to a DNR presentation, while by the end of the season only 5–10% do.

But, watermen say they're expecting a leaner harvest from the DNR rules, and that the minority who work the water full-time may feel the pinch more than the part-timers.

"The majority recognized some belt tightening was going to be needed," said Jim Mullin, executive director of the Maryland Oystermen Association, "especially after the tremendous amount of freshwater events of last year that set the Bay and restoration activities back severely."

Still, Mullin and other watermen say they're frustrated by the emphasis on curtailing harvests instead of doing what they contend could help sustain or improve the fishery. They have pushed for reopening some of Maryland's 51 oyster sanctuaries to rotational harvest and for replenishing worn-down harvest reefs with large quantities of old shell dredged from the Bay bottom. Environmentalists have opposed such moves, arguing that by themselves they won't make the fishery sustainable long-term.

Meanwhile, with oysters still reeling from the prolonged surge of freshwater, the seafood industry in both ends of the Bay is preparing for another gloomy year.

"We're not going to have as many market oysters this year," said Tommy Kellum of W.E. Kellum Seafood in Weems, VA. "It's a Mother Nature event. It's not like an occurrence we could have prevented or managed for."

But most say they think that with a little more "normal" — meaning drier — weather, the Bay's oysters will rebound, along with aquaculture, restoration and perhaps even the fishery.

"Long term, this is just a bump in the road," said Stephan Abel, executive director of the Oyster Recovery Partnership, a Maryland nonprofit that works on restoration with state and federal agencies and other nonprofits.

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Since 2010, when the U.S. Environmental Protection Agency established the latest Bay cleanup goals, known as the Bay's Total Maximum Daily Load or "pollution diet," 85% of the nitrogen reductions have come from upgrading wastewater treatment plants. But there are few plants left that need upgrades.

In the six years from now to the end of 2025, when all cleanup actions are to be in place, state plans call for about 82% of the remaining nitrogen reductions to come from agriculture and 5% from stormwater. But progress in these areas has been difficult.

Unlike wastewater, where reductions can be required through permits, getting nutrient reductions on farms is more difficult, often requiring one-on-one advice from technical support providers, usually from county, state or federal agencies, as well as funding assistance to install any recommended conservation practice.

Reducing runoff from development is problematic because there is more developed land each year — much of it in areas not covered by stormwater permits — and it is hugely expensive to retrofit runoff controls into urban areas built before such measures were required.

A Plain Sect farmer plows his field in Lancaster County, PA. Almost a quarter of the state's nutrient reduction must come from that county. (Ad Crable)

Providing assurance?

The cleanup plans submitted by the states in August are supposed to show how states would meet the nutrient reduction goals outlined in the Bay's pollution diet. The plans also are supposed to offer enough detail about programs and funding to provide "reasonable assurance" that they will succeed.

After the EPA reviewed draft plans this summer, the agency asked states for more detail about how they would support significantly higher implementation rates for runoff control on farms and developed lands. That call was echoed in comments from conservation districts, agricultural trade groups, environmentalists and others.

Little additional detail emerged in final plans issued on Aug. 23, though.

The EPA will be reviewing the plans over the coming months. If the agency concludes that they do not provide "reasonable assurance" of success, it can take a variety of actions, such as increased oversight or redirecting funding, among other actions.

There is no set timetable for the EPA to release its conclusions.

Evan Isaacson of the Center for Progressive Reform, an advocacy group, asserted in a blog post that the latest plans "fail to come close to providing the public with the reasonable assurance that EPA demanded of the states when the Bay TMDL was launched at the beginning of this decade."

Pennsylvania's plan took the brunt of the criticism because it missed its nitrogen reduction goal by a wide mark and identified an annual funding shortfall of $324 million. It sends more nutrients to the Bay than any other state, and failure to meet its goal — with a shortfall that is about the same amount as the entire nitrogen reduction sought from Maryland — would mean the Chesapeake would not attain water quality standards by a wide mark.

Maryland Gov. Larry Hogan sent a letter to EPA Administrator Andrew Wheeler and Pennsylvania Gov. Tom Wolfe, saying Maryland had "alarming concerns" about Pennsylvania's progress and calling on the agency to offer a "robust demonstration" that it will use its oversight authority to spur greater action.

William Baker, president of the Chesapeake Bay Foundation, said his organization would "seriously consider our legal options" if Pennsylvania does not ramp up its effort.

The challenge in reducing nutrient runoff from farms and developed land has stymied other Bay states as well — but Pennsylvania has more of both than any other state in the Bay watershed.

Pennsylvania achieved only 8% of its nitrogen reductions from agriculture during the last decade, but hopes to get 93% from farmlands between now and 2025.

The numbers for Maryland and Virginia tell similar tales. Virginia achieved only 6% of its nitrogen reductions from farm operations during the past decade. From now to 2025, it is counting on 77% of reductions coming from farms.

Maryland got 18% of its reductions from agriculture over the last decade, but expects 55% to come from farmland by 2025.

The farmland challenge

Stemming the flow of nutrients from farmland has long been elusive. Huge amounts of fertilizer and animal manure, the major sources of nutrients, are placed on crops each year. But many crops, such as corn, use nitrogen inefficiently, and sometimes unused portions of the applications run off the fields.

Nitrogen also comes from crops such as soybeans that don't need fertilizer but directly "fix" nitrogen out of the atmosphere and put it into the soil. Nutrients also reach waterways directly from the manure of cattle and other livestock that leave waste in or near a stream. Altogether, agriculture accounts for about half the nitrogen reaching the Bay.

Over the years, state and federal agencies have promoted a wide range of "best management practices" to help reduce runoff, from building covered manure storage facilities and better managing fertilizer and manure applications to fencing livestock out of streams.

Progress has been made, but adopting some of the most effective runoff control techniques, such as buffers or streambank fences, takes land out of production — which many farmers resist, especially when struggling to make a profit.

Federal and state programs historically have helped farmers pay for runoff control practices, but levels have fluctuated over the years.

The federal government has historically been the largest source of conservation money, but its support decreased after the Chesapeake Bay Watershed Initiative, a 2008 Farm Bill program that prioritized spending on the Bay watershed, expired several years ago.

As a result, by 2016 and 2017, the number of federally funded farm conservation practices implemented annually in the Bay watershed has declined by half, according to a recent study by the U.S. Geological Survey, which tracked implementation of Farm Bill programs.

"The Chesapeake Watershed Initiative proved that if you had the money to support the farmers, the farmers would engage," said Swanson, of the Bay Commission, which has been heavily involved in Farm Bill issues. "So as long as you can figure out the funding streams, conservation can be had in the Bay watershed."

A new five-year Farm Bill approved by Congress this year will likely result in some increased funding, but not to levels seen during the Chesapeake Bay Watershed Initiative, she said.

State programs generally provide less money and are more variable from year to year, although Maryland does have dedicated annual funding. Across the watershed, conservation districts report that demand for help from farmers typically exceeds funding.

Even if funding is available, it usually requires a match from a farmer. That's become more difficult, conservation districts and environmental groups report, as the farm economy has been hurt by bad weather, federal trade policies and other factors in recent years.

"If the farm economy is not healthy, our ability to provide assistance in implementing the WIP goals will likely become a greater challenge," said the Montgomery Soil Conservation District in comments on the Maryland plan.

State and federal funding also has lagged behind the need for technical staff to help farmers design and implement practices. That work is considered critical.

"Farmers may have all the cost-share funds they need to implement a best management practice, but without the knowledgeable people to assist, the likelihood of increased implementation is low," the Delmarva Poultry Industry said in comments on state WIPs. That view is echoed by many others.

A 2017 report by the Bay Commission called the shortage in technical

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support staff a "red flag" for the Bay cleanup effort.

Because of that shortfall, "farmers may not receive the assistance they need to reach the pollution reduction goals for which the agricultural sector is responsible under the Bay cleanup." And it cautioned the gap "will grow still larger as the region works to meet its 2025 cleanup goals for the Bay."

Plans lack detail

None of the plans provides clarity on how states would increase funding for either cost-share or technical support on the orders-of-magnitude needed to meet Bay restoration goals.

Virginia outlined more than 50 actions that could help meet the goals, including increased and more stable state funding, as well as legislation requiring farmers to write and implement nutrient management plans that guide fertilizer application and to exclude livestock from streams.

Whether the legislature would back such efforts is unclear, though lawmakers have backed modest funding increases in recent years. The plan does not say exactly how much money is needed.

"The challenges will be significant," said Peggy Sanner, CBF's Virginia assistant director and senior attorney. "It is achievable. A lot will depend on our legislators and our regulators enforcing it. But there is a lot of support for the program."

Maryland may be in the best shape, mainly because it has the largest dedicated funding source which provides tens of millions of dollars annually for its agricultural programs. But those programs still have not delivered the rate of nitrogen reductions required by its watershed implementation plan.

"The reality is, the [watershed implementation plan] for agriculture cannot be achieved with current staffing and resources" at the county level, the Maryland Association of Soil Conservation Districts said in its comments on the state plan.

While Maryland's plan acknowledges that meeting goals will require a "substantial increase in effort," it also insists that it has "sufficient resources" in place to meet the goals and no new statewide fees or taxes are required.

Erik Fisher, CBF's Maryland assistant director, said he would like to see more details from the state. But, he said, it is also possible that the state has implemented more on-the-ground actions than have been tracked, meaning its gap for coming years is smaller than data suggest.

It is also possible, he said, that the state has adequate money to meet its agricultural goals but might need to spend it differently. Much of Maryland's funding is earmarked to subsidize the planting of nutrient-absorbing cover crops each fall.

While such crops can reduce runoff, they have to be replanted — and subsidized — each year. In effect, the money "buys" the same nutrient reduction every year, or the nutrient reduction benefit ends.

Fisher said he would like to see more money steered toward practices such as streamside forest buffers or water-filtering wetlands which, once established, can clean water for decades.

"We really believe it is a question of how this money is getting spent," he said. "Over the long-term for this plan to succeed, we think a greater share of these funds needs to go these more permanent practices."

Although Pennsylvania has more agricultural land and more farms — and more related runoff — than any other state in the Bay watershed, it has long lacked any reliable cost-share programs to help farmers install conservation practices. The farms tend to be small, so the outreach challenge in the state is huge.

Planting cover crops is one of the management practices used to control nutrient pollution runoff from farms. (Dave Harp)

Its plan outlines a variety of ways to help close a projected $324 million annual funding gap. Several of the options would require support from the General Assembly, which has been reluctant to provide much aid in the past.

"Agriculture is an integral part of the commonwealth's culture and economy," said Harry Campbell, CBF's Pennsylvania executive director, who noted that many actions in the plan would help both farmers and local waterways.

Still, he said, "Pennsylvania's elected leaders have failed to adequately invest in helping implement those practices on the more than 33,000 family farms in the watershed."

The development dilemma

Stemming the flow of nutrients from developed land is equally problematic throughout the region. Except in the District of Columbia, which has spent hundreds of millions to address it, that source of runoff has been gradually increasing.

In its plan, Maryland actually slashed actions it expects from its largest counties in half for the next several years. Virginia's stormwater permits would not achieve the state's goals until after 2025. Both states are expecting overperformance from wastewater treatment plants to help make up for shortfalls in the stormwater sector through 2025.

But the plans acknowledge that this strategy will only work for a while. The surplus reductions from wastewater plans will diminish as the region's population continues to grow and treatment facilities have to handle more sewage.

Another problem, and a potentially bigger one, is controlling runoff from developed lands outside of towns and cities whose runoff is covered by stormwater permits.

Those are often more rural areas, where runoff is increasing as development sprawls over the countryside. Such places account for a substantial amount of the runoff from developed lands in both Pennsylvania and Virginia.

Joe Wood, CBF's Virginia staff scientist, said he was hopeful that areas with stormwater permits would ultimately reach their goals, and that some might do so before 2025. But in areas without those permits, "I can't say with confidence we will get there."

The WIPs have helped to highlight the importance of managing runoff from unregulated areas, which has generally been overlooked in the past. "Now, at least, there is discussion about it," Wood said.

Virginia and Maryland still hope that wastewater — the workhorse of the cleanup effort so far — may continue to overperform in coming years and help meet watershed implementation plan goals if other sectors fall short.

Reductions likely wouldn't be as great as in the past. But, Wood noted, "every little bit helps."

The question is, with such an upstream struggle ahead, whether little bits will be enough.

Pivoting Toward Agriculture: By the Numbers

	MD	PA	VA	DE	NY	WV
2018 nitrogen load to the Bay	52.75 M lbs.	107.36 M lbs.	58.16 M lbs.	6.66 M lbs.	14.27 M lbs	7.72 M lbs.[3]
2025 nitrogen load to the Bay as outlined in state WIP	44.72 M lbs.	83.29 M lbs.[1]	49.57 M lbs.	4.46 M lbs.	12.53 M lbs.[2]	7.49 M lbs.
Avg. annual nitrogen reduction from ag, 2009-18	93,600 lbs.	47,700 lbs.	68,100 lbs.	67,700 lbs.	100,500 lbs.	16,200 lbs.
Avg. annual ag nitrogen from ag needed from 2019-2025	595,900 lbs.	3.2 M lbs.	950,000 lbs.	313,600 lbs.	80,060 lbs.	55,700 lbs.
% of total remaining nitrogen reduction needed from ag	55%	92%	77%	99.9%	27%	90%

Source: Figures are from the Chesapeake Bay Program's Chesapeake Assessment Scenario Tool.
Note: The District of Columbia is not included in the table because it has no agricultural land and has already met its 2025 goal.
WIP = Watershed Implementation Plan submitted to the US EPA in August 2019
M = million
[1] Does not meet 2025 Bay target of 73.2 million lbs.
[2] Does not meet 2025 Bay target of 11.53 million lbs.
[3] West Virginia has already met its 2025 goal but opted to achieve additional reductions.

Chesapeake restoration goals a greater challenge for PA

≈ The state's latest Bay cleanup plan still fails to meet pollution objectives

By Karl Blankenship

Perhaps it was fitting that on a morning when he felt an illness coming on, and a marching band was creating an unrelenting din outside the window, Pat McDonnell sat down to explain Pennsylvania's Chesapeake Bay cleanup plan.

After all, nothing about the state's Bay involvement has been easy. The state doesn't touch the Chesapeake, but is its largest polluter. Half of its landmass drains into the Bay, but less than a third of the state's population lives there.

Nonetheless, when asked how much of his time the Chesapeake consumes, McDonnell, the state's environment secretary, replied: "A lot."

"I came into this job as an air and energy guy and have primarily been a water quality guy for the last three years in terms of the work," he said.

The state has fallen so far behind in its Bay cleanup obligations that it has threatened the success of the regional effort and spurred the U.S. Environmental Protection Agency to ramp up its oversight in recent years.

It's unclear whether the state's latest cleanup plan will help the situation. Released Aug. 23, it fails to meet the state's pollution reduction goal for nitrogen by more than 9 million pounds a year.

The plan also outlines a $324 million-a-year shortfall in the funds needed to meet its goals.

The EPA established goals for reducing nutrient pollution in each jurisdiction in the Bay watershed in 2010, when it issued the Chesapeake Bay Total Maximum Daily Load, often called the Bay's "pollution diet." The TMDL targets the nutrients nitrogen and phosphorus, which are responsible for algae blooms that cloud the Bay's water and fuel its oxygen-starved "dead zone." Nitrogen has proven the most problematic to control.

The TMDL allows for more federal oversight than earlier cleanup plans that first aimed at cleaning the Bay by 2000 and then by 2010. Both fell well short of their goals.

If the EPA concludes that Pennsylvania's new plan does not provide reasonable assurance that it will reach its goal, the agency can take a variety of additional actions. Among the options are increasing oversight, extending regulatory authority over more entities, and requiring more pollution reductions from dischargers with permits, such as wastewater treatment plants.

Under the TMDL, the state needs to reduce the amount of nitrogen it sends to the Bay from 112.71 million pounds a year in 2009 to 73.18 million pounds in 2025.

Pennsylvania's Department of Environmental Protection Secretary Pat McDonnell has spent considerable time working on the state's cleanup plan. "I came into this job as an air and energy guy and have primarily been a water quality guy for the last three years in terms of the work." (Dave Harp)

Through 2018, Pennsylvania had taken only enough actions to reduce nitrogen runoff to 107.36 million pound a year, according to computer model estimates from the state-federal Chesapeake Bay Program. Most of that enters the Bay through the Susquehanna River and a smaller portion from the Potomac.

Because of its poor performance, the state's remaining reduction is more than is required from the rest of the watershed combined from now through 2025.

In an interview, McDonnell acknowledged the state's shortfall in meeting Bay commitments, but he disputed that its plan was incomplete.

"I disagree with the characterization," McDonnell said. The state, he insisted, is not getting credit for some actions that are helping to reduce pollution, such as reclaiming abandoned mine lands, fixing streams tainted by acid mine drainage or constructing wetlands for mitigation projects. "The projects that we have done have been undercounted," McDonnell said.

Further, he said farmers and others have implemented far more runoff control practices than the state is getting credit for. Other states also contend in their plans that they are not getting enough credit for cleanup actions already taken.

McDonnell said, and others agree, that Pennsylvania's new plan has put a huge effort into working with local governments to develop county-based plans to garner local support for initial implementation. Many criticized the cleanup plan Pennsylvania created after the TMDL was first issued in 2010 as a top-down document drafted by officials out of touch with on-the-ground realities.

It contributed to the Pennsylvania Farm Bureau helping to initiate an ultimately unsuccessful suit challenging the TMDL.

Now, the Farm Bureau has been an active participant in developing the latest plan, along with conservation districts, local governments and others.

"We are going to have to engage in this parcel-by-parcel and site-by-site, which is why the county action plans and the local engagement are so important," McDonnell said. "It is bringing exactly the people we need into the discussion, into the room, to help both drive the message and drive the action."

It's a major challenge. Less than a tenth of Pennsylvania's nitrogen comes from wastewater treatment plants — which have been the go-to source for pollution reductions in Virginia and Maryland — and most of Pennsylvania's plants have now been upgraded.

That means Pennsylvania must engage thousands of farmers and hundreds of local governments to secure future nutrient reductions. Pennsylvania has 33,000 farms, more than any other state, as well as more runoff from developed land, much of it coming from small communities not covered by stormwater permits.

But the first four county plans to be completed, covering Lancaster, York, Adams and Franklin counties, failed to meet their nutrient reduction goals. Still, if they implement actions outlined in their plans, it would reduce the amount of nitrogen reaching the Bay by almost 10 million pounds — nearly twice what the state as a whole has accomplished since the TMDL went into effect.

Pennsylvania's plan has been more specific about financial needs than plans of other states. About $197 million a year in state and federal money has gone toward Bay-related efforts, but the plan says another $324 million a year is needed.

McDonnell said the funding gap includes not only state money, but also federal and local funds, as well as investments from farmers who share the cost in implementing runoff control practices. But, "we do need funding," he added.

Getting money from the Republican-dominated legislature, which has often been at odds with the Democratic governor, has been a challenge and funding for environmental programs has been declining over the years. Even legislation that has passed in both Maryland and Virginia to regulate lawn fertilizer has languished in the Pennsylvania General Assembly for eight years.

But the state has had self-inflicted problems, too, including trouble getting millions of dollars in federal grant money out the door to support cleanup work. On Sept. 10, the EPA sent a letter to McDonnell dictating how unspent money was to be used.

McDonnell said the state is trying to do a better job of targeting where money is spent, putting initial emphasis on the first four counties that developed pilot plans.

"With Lancaster County, it's no secret it is almost a quarter of the lift," he said. "We are very focused on providing resources in these kinds of areas to not only improve the water quality in those counties, but to meet our Bay obligations."

Indeed, McDonnell contends that if the state can start getting more conservation practices on the ground, and people see improved local stream health, it will spur more action.

"We are having positive impacts in terms of programs we are having," he said. "There is a need to accelerate that for sure, and that is what the plan gives us."

Turkey Hill Trail stuffed with views of Susquehanna, birds

A couple and their dog enjoy a late-summer view of the Susquehanna River at the Star Rock overlook in the Chestnut Grove Natural Area section of the Turkey Hill Trail in Lancaster County, PA.

Story & Photos
By Ad Crable

Where can you find the largest pawpaw patch north of Maryland, trace an old railroad bed along the Susquehanna River, hear the swoosh of wind turbines and meander through vast flowering meadows?

And where, on the same hike, can you get a bird's-eye view of one of the most important migratory stops for shorebirds and take in two killer views of the Susquehanna at its widest point, one in the exact spot where the architect of the U.S. Capitol stood and took brush to canvas in 1802?

Well, surprisingly, on either end of Lancaster County's landfill in Pennsylvania.

The 6.3-mile Turkey Hill Trail loop manages to compress all of those experiences in the unlikeliest of settings. The trail, which is rated easy to strenuous with a couple of steep climbs, revolves around Turkey Point (known locally as Turkey Hill), a Lower Susquehanna landmark that juts into the river, causing it to curve gracefully around it.

It's one of the highest points on the river and is becoming even more so as the Frey Farm Landfill expands vertically. To minimize its impact on the river viewshed, the landfill, when closed, will be cloaked in trees and grasses.

It would have been easy enough to let Turkey Point become known as just a dump, but the Lancaster County Solid Waste Management Authority has spent considerable money and effort to preserve and even create new natural areas on either side of the landfill.

Using easements from the waste authority and Norfolk Southern Corp., the Lancaster Conservancy created the Turkey Hill Nature Preserve. A steep, initial 1-mile section of the Turkey Hill Trail through the preserve leads to the top of Turkey Point. A short side trail along the landfill fence leads to a wooden observation deck.

Here, in 1802, architect and artist Benjamin Henry Latrobe sat with his easel and painted a watercolor of the view at the Susquehanna's widest point. You can view an image of the painting on a plaque on the deck.

The view hasn't changed much. Still visible are the string of small islands and mudflats known as the Conejohela Flats. Each spring and fall, tens of thousands of shorebirds rest and dine on buried insects on the islands as the birds wing to and from breeding grounds in Arctic Canada and Alaska and wintering grounds in South and Central America. It's a birdwatchers' mecca, and the islands have been designated an Important Bird Area by the National Audubon Society.

On the platform, you also are dwarfed by two wind turbines just beyond a fence. You are so close you can hear the distinctive swishing sound of the 135-foot-long blades cutting the air. Most visitors, when standing almost underneath the 397-foot-tall turbines, are surprised to learn just how big the windmills are.

Beyond the turbines, barely visible, are a few rooftops of the Turkey Hill Dairy, famous for its ice cream and iced teas.

From the summit of Turkey Point, the trail follows the wooded ridgetop of the River Hills for about a mile, paralleling and looming above the Susquehanna. Parts of it follow a grassy swath outside the landfill perimeter. It's an opportunity to observe a landfill up close and personal, if you care to. It's still active, and hikers occasionally complain of odors when the wind is out of the east, which it rarely is. There is one crossing of Mann's Run, but hikers generally don't find it difficult to hop rocks across the small stream.

Suddenly, you emerge from woods at a high point to find a vast sea of grasses, flowers, wetlands, copses of trees and a shallow pond carved from the expanse. This unexpected open area is the Chestnut Grove Natural Area, a 170-acre preserve with another unusual story.

This is the site of a former farm that the waste authority bought before scraping off 7 feet of topsoil to cover trash at the adjacent landfill. With the top layer of earth gone, the site underwent a three-year ecological restoration. The focus was to establish 85 acres of undulating prairie grass-

The Turkey Hill Trail in Pennsylvania has the largest pawpaw patch north of Maryland.

The overlook atop Turkey Point on the Turkey Hill Trail in Lancaster County, PA, has a view of the Conejohela Flats mudflats and islands in the Susquehanna River. The flats are a celebrated rest stop for shorebirds. The overlook is also the exact spot where the architect of the U.S. capitol painted the view in 1802.

lands seeded with thousands of native grasses and wildflowers. Other features include wet meadows and oak savannas. About 30 acres of farm fields are being reforested.

In the fall, showy summer flowers give way to more muted autumn displays and colorful grasses. The River Hills that border the meadows will don foliage colors and take over the limelight.

The variety of habitats and nearness to the Susquehanna — a major migratory flyway — have made the natural area a favorite stop for birders. Case in point: the Lancaster County Bird Club has identified 218 species of birds so far in 2019 at Chestnut Grove.

The morning I was there, I studied a migrating yellow-legged shorebird marching stiffly across the pond's shallow waters. Drunk on the cornucopia, various songbirds feeding on flower heads and grasses flitted constantly ahead of me at eye level. The droning of cicadas, grasshoppers and other insects blended with birdsong for pleasant background music. Melded with the moving vegetation, the natural area became an animated place indeed.

Even the area's namesake has been brought back, with an experimental grove of young American chestnut trees tended to by the American Chestnut Foundation.

One stop not to be missed is Star Rock Overlook, a collection of rocks that jut from a wooded knoll on the property and afford a 180-degree view up and down the Susquehanna. Both sides of the Susquehanna are mostly undeveloped here, thanks to a private-public initiative that has seen thousands of acres of former utility lands protected for the public.

The natural area's draw is eclectic. On a weekday morning I met only a few other visitors. One was there for the first time because he heard it was a good place to find snakes. Another was there for the first time also and was hoping to have the place to himself. He nearly did.

The third encounter was nearby resident Cabell Kladky, getting in a brisk walk with her chocolate Lab in training.

"I mean, is there a prettier place in Lancaster County?" she asked. "You've got easy trails, you've got hard trails. You have a mix of terrain. You have geocaching, runners, dog people. It's so freaking wholesome!"

The natural area is roughly the halfway point of the loop. The trail leaves the natural area abruptly and takes a short but steep jaunt to yet another strikingly different setting. You emerge from the woods onto the Enola Low Grade Rail Trail.

This wide, pressed-stone rail trail takes you back 2.5 miles to the trail terminus between the Susquehanna and sheer cliffs. Unlike the rest of the Turkey Hill Trail, there are no dramatic ups and downs, or even turns. That's because when this Atglen and Susquehanna spur of the old Pennsylvania Railroad was built between 1903 and 1906, it was an engineering marvel. Blasted from riverside cliffs, the 29-mile Low Grade has no slope steeper than 1% and no curve greater than 2%. At the time, it was celebrated for being second only to the Panama Canal for the amount of earth moved.

Around 200 immigrant laborers were killed during construction, many by premature dynamite blasts or flying debris.

The trail section has many open views of the river and bald eagles are common. Look for where Mann's Run crosses. There are several little waterfalls skittering over bedrock before the stream is abruptly shot into the river by a concrete viaduct.

You know you're nearly back at your car when you pass a restored 1947 Pennsylvania Railroad caboose.

What a diverse trip it's been.

The 170-acre Chestnut Grove Natural Area has a sea of native grasses and flowers and 4.5 miles of trails.

Tackle Turkey Point

The most popular starting point for the 6.3-mile Turkey Hill Trail circuit hike in Lancaster County, PA, is from the large parking area of the Enola Low Grade Rail Trail, located at 2501 River Road, Conestoga, PA. There are restrooms at the trailhead.

The trail can also be accessed at its midpoint in the Chestnut Grove Natural Area. A parking lot is located at 43 Chestnut Grove Road, Conestoga, PA. The purple-blazed Meadow Trail leads to the Turkey Hill Trail in less than 1,000 feet. The natural area has 4.5 miles of trails to explore. Some trails are suitable for handicapped visitors.

The Turkey Hill Trail and Chestnut Grove Natural Area are open from dawn to dusk seven days a week. Both permit dogs on a leash.

For information on the Turkey Hill Trail and Chestnut Grove Natural Area, go to lcswma.org/waste-gives-back/public-recreation. You can find information on the Turkey Hill Trail at lancasterconservancy.org/preserves/turkey-hill.

Sinuous, woodsy Barren Creek is fit to be plied

Lisa Wool, executive director of the Nanticoke Watershed Alliance, slips her kayak through a stand of spatterdock in Maryland's Barren Creek.

By Jeremy Cox
Photos by Dave Harp

A street lined with homes built in the early 1900s slopes downhill to the fraying edge of town. A two-lane bridge carries traffic across a ribbon of flat water. There's a boat ramp on the opposite side with one of those newfangled kayak launches with rollers.

The ramp supplies the only public access to Barren Creek, so it is where most paddlers initially meet the waterway. It is not a breathtaking first impression.

To be sure, no marinas, condominium towers or trendy restaurants crowd the waterfront in Mardela Springs, population 347, on Maryland's Eastern Shore. But the signs of civilization along this stretch of Barren Creek are conspicuous: the residential roofs winking above the banks; the freshly clipped lawns; the rumble of old school buses, now laden with watermelons instead of children.

Paddlers, however, will be rewarded once they round the first bend downstream. Barren Creek is one of those riverine destinations — increasingly hard to find — where the physical trappings of modern life are so near yet seem so far away.

The creek drains into the Nanticoke River, a major Chesapeake Bay tributary that forms much of the boundary between Dorchester and Wicomico counties. But it by no means is in a hurry to get where it's going; the 4-mile journey from the boat ramp to the river twists and turns like an aquatic version of San Francisco's famous Lombard Street.

The snaking is a feature, not a bug, said Lisa Wool, executive director of the Nanticoke Watershed Alliance, a community-based conservation group.

"I sometimes get bored [kayaking] in a pond, but every 50 feet here [on Barren Creek] you have a brand-new view," she said. "Even if there's nothing around the corner, you're still wondering what's around the corner."

Wool joined me for a trip down the creek on a day when summer seemed on the verge of autumn. The morning air was cool but soon gave way to mild sunshine. With some notable exceptions, the summer's flowers had packed it in for the season. The broad, flaglike leaves of spatterdock, a type of water lily that grows abundantly along much of the creek, had gone brittle and yellow.

A few paddle strokes into our journey, a bald eagle, as if on cue, appeared overhead.

"I hired him," Wool joked. "There's a handler on the other side" of the trees.

It didn't take long for nature to take center stage. The growl of traffic on U.S. Route 50 — unseen but certainly heard near the boat ramp — gave way to a gentle hum of crickets and splashing of paddles. The occasional boom from a nearby rifle range was the only audible reminder of humanity's presence.

The wildlife made its presence known in ways alternately subtle and dazzling. Belted kingfishers darted around us, painting blue reflections on the surface of the rippling water. Great blue herons stood like statues, waiting for their meals to come to them.

At one point, something swished violently near the starboard side of my humble vessel. Because most of my outdoors experience hails from Florida, my brain quickly interpreted the eruption as an angry alligator, and I yelped like a scorned puppy. Rarely has someone gotten so worked up over a fish (in this case, probably a gar).

A mound of sticks suggested that beavers can be found in these waters. We lingered at the site, but, seeing no furry little heads pop up, we plied on. Around another curve, a flock of mallards took flight.

Barren Creek offers three distinct landscapes along its serpentine path.

From its headwaters just east of Route 50 to right around the boat ramp, the atmosphere is suburban. The waterway is wide, almost resembling a pond in places. And it's shallow. At low tide, expect to find too little water east of Mardela Springs to support even a kayak.

While the section upstream from the ramp is decidedly

Iris bloom along Barren Creek on Maryland's Eastern Shore, where paddlers will find a surprisingly tranquil haven not far from U.S. Route 50.

Lower Barren Creek makes a wide, serpentine path through the marsh as it approaches the Nanticoke River on Maryland's Eastern Shore. A paddle trip from a launch at Mardela Springs to the mouth of the creek takes about 2 hours. Paddlers who don't want to make a return trip can leave a car at nearby Vienna.

front country, there are no outfitters nearby. Exploring Barren Creek is strictly BYOB (Bring Your Own Boat).

In the middle, where Wool and I spent most of our time, the banks shift inward. The homes are replaced by red maples and loblolly pines. It feels like a wilderness hike — on the water.

So, it was jarring when we were greeted on one bank by a cantaloupe patch instead of trees. Later, a Google Earth search betrayed broad sheets of cropland lurking within a few dozen yards of the creek for most of its length. The trees show up as a buffer of varying, dark-green widths.

The last segment finds the creek opening into a vast marsh.

Those who travel this far often continue onward into the Nanticoke, where they make a right turn upriver and paddle another half-mile to the quaint town of Vienna on the opposite shore. That is, if they're willing and able to fight the current in the much-larger river. Drop off a car here beforehand if you don't want to double back to Mardela Springs by kayak.

If Barren Creek's distinguishing trait is its contradictions — a celebration of nature amid town life and farms — it's not without consequence.

The water was a silty, brownish color during our trip, and, Wool said, that's pretty typical. Nutrients and soil tend to run off the surrounding land during heavy rains. Ten years of water-monitoring show that the creek's health is improving, but 2018's record-breaking rainfall reversed some of that progress, she said.

A change for the better may already be under way, though. In 2016, floodwaters washed out the only dam on the waterway. The privately owned structure, located just east of Route 50, had separated the upper end of the creek from the lower end for more than two centuries. County officials plan to replace the road that once topped the dam but allow the water to flow through culverts beneath instead.

In many waterways, dam removal can have myriad benefits, including the restoration of wildlife habitat and sediment flow. It's unclear whether Barren Creek is heading toward a rebirth, Wool said.

But she hopes so.

"Within five minutes of leaving the dock, it is so peaceful and so quiet," she said after we'd gotten back ashore. "It is still really pristine and so full of wildlife and so full of fish. You feel like you're in the middle of nowhere."

A turtle takes a sun bath on a log in Maryland's Barren Creek.

Paddling Barren Creek

- Where to go: The lone public access point is a boat ramp at 500 Bridge St. in Mardela Springs, MD.
- Distance: 4 miles from the boat ramp to the mouth of the creek (a one-way, 2-hour paddle)
- Information: Barren Creek is part of the federally designated Nanticoke River Water Trail. You can find details at PaddleTheNanticoke.com.

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Resurrection ferns grow on the limbs of a cypress tree in The Nature Conservancy's Nassawango Creek Preserve in Snow Hill, MD. The creek is the subject of a forthcoming Bay Journal film. (Dave Harp)

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Asters bloom along the bank of Maryland's Nassawango Creek, a tributary of the Pocomoke River. The creek is the subject of a forthcoming Bay Journal film. (Dave Harp)

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Let's go to bat for the Little Brown Bat!

Bay Naturalist, on page 40, highlights the importance of bats and, unfortunately, gives us the lowdown on white-nose syndrome, which has killed millions of bats in North America since it was first documented here in 2006–07. The disease has been particularly devastating for the little brown bat. How much do you know about the little brown bat and white-nose syndrome? Answers are on page 33.

1. *Just how little is a little brown bat?*
A. 1.5 to 3 inches with a 9-inch wingspan
B. 2 to 3.5 inches with a 10-inch wingspan
C. 2.5 to 4 inches with an 11-inch wingspan
D. 3 to 4.5 inches with a 12-inch wingspan

2. Little brown bats can eat up to half of their body weight each night. (Nursing females will eat up to 110% of their weight.) How much does a little brown bat weigh?
A. Up to 0.5 ounce
B. Up to 0.75 oz.
C. Up to 1 oz.
D. Up to 1.25 oz.

3. A little brown bat can eat 1,200 insects in an hour. How does it capture them?
A. Directly with its teeth
B. It uses its wing tips to capture insects and bring them to its mouth.
C. It uses its tail to capture insects and bring them to its mouth.
D. All of the above

4. Little brown bats can fly as fast as 21–22 miles per hour. What is their usual speed?
A. 6 miles per hour
B. 9 mph
C. 12 mph
D. 15 mph

5. How do little brown bats prevent mid-air collisions when they are hunting in the same area?

A. They honk.
B. They fly in a formation.
C. Their keen sense of smell warns them when they get too close.
D. They pick up the infrared heat from each others' bodies.

6. The name, white-nose syndrome, comes from the furry white growth on the infected bats' noses, ears and wings. What are other symptoms of this disease?
A. Hibernating bats wake up several times during the winter, which raises their metabolism and burns fat that was supposed to sustain them during the winter.
B. Bats fly outside in daylight.
C. They cough up white phlegm.
D. Both A & B

A healthy little brown bat (Peter Pearsall / U.S. Fish and Wildlife Service)

7. White-nose syndrome is caused by a…
A. Bacteria
B. Fungus
C. Parasite
D. Virus

8. How can people help to prevent white nose syndrome from spreading?
A. Stay out of caves or mines where bats roost.

This little brown bat has white-nose fungus on its wings as well as its nose. (Marvin Moriarity / U.S. Fish and Wildlife Service)

B. Help protect bat habitat by minimizing light around your house, reducing tree clearing and getting involved in projects that protect or restore wetlands and waterbodies, which attract insects that, in turn, attract bats.
C. If there are unwanted bats in your house, contact your local natural resource agency. They know how to remove or exclude bats without harming them.
D. Report unusual bat activity to your state natural resource agency.
E. All of the above

Want to help by building a bat box? Download plans at
dnr.maryland.gov/wildlife/Pages/plants_wildlife/bats/batboxes.aspx
potomacriver.org/resources/get-involved/water/build-a-bat-box
shaverscreek.org/2017/06/09/help-bats-build-a-bat-box

– Kathleen A. Gaskell

Bat Week is celebrated the last week in October. The last night in October is Halloween. What do these two things have in common? Bats play an important role in pollinating cacao plants, from which we get chocolate. Can you imagine a Halloween without chocolate bars? Talk about scary! This quiz treats you to other bat facts. How many will trick you? Answers are on page 33.

1. *Only vampire bats are able to easily move on the ground. How many of the three vampire bat species live in the Chesapeake watershed? (Those living in zoos don't count!)*
A. 0
B. 1
C. 2
D. 3

2. Bats have not changed much since they first appeared in the fossil record around 50 million years ago. The ancestors of what other mammal appeared around this time?
A. Camels
B. Elephants
C. Rhinoceroses
D. All of the above

3. Bat droppings were used to make gunpowder during the Civil War. What are bat droppings called?
A. Battling
B. Glittering
C. Guano
D. Turpido

4. Why do some bat droppings sparkle?
A. They contain the undigested exoskeletons (outer covering) from the insects they eat.
B. The bat's digestive juices contain chemicals that glow in the dark.
C. They are extra wet and reflect moonlight.
D. Scientists haven't figured it out yet.

5. Only one Bay state has an official state bat. It is the:
A. Maryland moth bat
B. Pennsylvania pipistrelle
C. Virginia big-eared bat
D. West Virginia flying weasel

6. Bats are NOT blind. In fact, some species have better eyesight than humans. What can these species see that we can't?
A. Ghosts
B. Infrared light (colors below the light spectrum that are emitted by heated things)
C. Ultraviolet light (high-energy colors above the light spectrum that is visible to humans)
D. X-rays

7. True or false? Bats hear better than any other land animal.

8. How are bats like cats?
A. They have belly buttons.
B. They groom themselves — a lot.
C. Although it is very rare, they might carry rabies. Leave bats (and cats you don't know) alone and you should be fine.
D. All of the above

9. How are bats different from birds?
A. When compared to their body sizes, bats' brains are larger than birds.
B. Both are warm-blooded.
C. When flying, birds flap their entire forelimbs, while bats flap their spread-out fingers.
D. A & C

10. When bats hunt, they make a noise (that humans can't hear) then wait for it to bounce back. If the sound bounces back, the bat is able to determine if it detected prey and pursue it or move on if the sound doesn't bounce back. What is this form of communication called?
A. Back wavelength
B. Echolocation
C. Prey radar
D. Sonar bounce

11. Bats provide many services for humans. Which of these is true?
A. Some bats can eat thousands of insects in a single night.
B. A colony of 150 big brown bats can eat up to 18 million or more crop-devouring root worms each summer.
C. Devices to help the blind navigate are based on bats' ability to detect prey in the dark.
D. Unless some seeds pass through the digestive tract of a fruit-eating bat, they will not sprout.
E. All of the above

— Kathleen A. Gaskell

Forum

Commentary • Letters • Perspectives

Ignoring science won't make looming climate calamity go away

By Tom Horton

Always, I've assumed knowledge equals power. If you do the science that makes sense of a mysterious world, it enables you to comprehend your problems and you'll eventually solve them.

I've seen it work here on the Chesapeake Bay to restore rockfish, stabilize blue crabs, improve water quality and make the case for protecting oyster reefs and wetlands.

The progress is always messy, involving politics and economics, and never as "clean" as the underlying science. But, warts and all, it's progress.

Knowledge equals power. It has sustained me through some dark environmental times. But what if it's not always, or no longer, true? *What if knowledge turns out to have no sway* over the two overarching environmental crises of our time — climate change and the exhaustion of natural resources — both of which will erode hopes for a saved Bay?

I'll start with climate change, the subject of a discussion-provoking, 49-page work of fiction that we give our Environmental Studies students at the university where I teach.

I hope it's fiction, anyway, because it's called *The Collapse of Western Civilization*, authored in 2014 by highly regarded science historians, Naomi Oreskes and Erik M. Conway.

It's a tale told by a Chinese historian in the late 24th century who is trying to understand how the world could have let it happen. Great civilizations, he knows, have risen and collapsed for millennia, from the Byzantine to the Mayan and Roman.

But this collapse, which unfolded through 2093, was unlike any other, because we had the knowledge to prevent it. The horrific potential of runaway climate change was long and accurately predicted, the causes well documented, along with solutions. And yet we were powerless to stop it.

China came out relatively well. (Collapse, you'll be heartened to know, is not extinction; merely mammoth suffering and dying and centuries of clawing back to civilization.) The heavy-handed, centralized Chinese style of government proved most capable of ameliorating the impacts of climate change (quickly relocating 250 million people as seas rose 25 feet); the Chinese were also best able to quell social turbulence as famine, disease and calamitous weather became the new normal.

Events like tidal flooding on Hoopers Island could become more common in the future, despite scientific knowledge about the factors that cause it. (Dave Harp)

Chesapeake Born

This is ironic, the authors say, because it was arguably the opposite style of government — the hyper-capitalist, free-market-worshipping regimes — that proved most vulnerable to denial of climate change, to letting the corporate titans of the "carbon combustion complex" discredit science.

These countries conflated unfettered economic growth with personal liberties. They abhorred limits, and climate change mitigation seemed a giant limit to economic expansion and therefore, freedom.

But as the crises grew, it demanded more and more of the reviled limits — rationing, one child per couple, forced relocation and martial law.

The *Collapse of Western Civilization* is only partly a critique of unregulated capitalism. Its authors are experts on the history of science, and they offer insight as to how Western science also let its knowledge be overpowered by a free-market ideology and too much faith in technological solutions.

The scientists had become too "siloed," too reductionist to be skilled at the systems analysis that sees broader patterns. Under pressure from well-funded doubtmongers, climate scientists became ultra cautious in sounding alarms until it was too late, insisting on "scientific rigor" in the extreme to put off controversial conclusions.

Its title notwithstanding, *Collapse* is a lively read, invoking satire like the enactment of "sea level rise denial" legislation as well as exploring why it's so easy to "sell" doubt.

And while one can take comfort that it's only fiction — at least for a little while longer — Oreskes and Conway recall an earlier work that sadly is not fiction and which questions even more profoundly whether knowledge is power: *Limits to Growth*, published in 1972 and updated in 1992 and 2004.

The team of scientists who penned that seminal book coined the term "overshoot": humans living unsustainably, beyond the resources of the Earth to accommodate them. Even more directly than climate change, the book challenged the "grow or die" ideology that permeates every aspect of most nations' economic policies.

In the decades after *Limits* was published, it was often dismissed as having predicted a disaster that never happened. Indeed, it didn't happen in those few decades, and the authors never said it would. In their worst-case scenario, our unsustainable ways wouldn't begin to degrade prosperity until 2015. More likely, it wouldn't begin until much later in the 21st century.

Despite decades of science amply documenting the unsustainability of humanity's consumption and population growth, "we failed totally to get the concept of "overshoot" accepted as a legitimate concern for public debate," wrote Dennis Meadows, one of the authors, in the 2004 update.

I called Meadows a few years ago, hoping he'd speak at a *Bay Journal* conference examining the impact of growth on the Chesapeake Bay. He politely declined. He no longer felt it was worth working on anything but the local environment where he was retired.

The global population was 4 billion when *Limits* was first published. It's close to double that now, yet scarcely a single environmental group, let alone our political leaders, wants to talk about it.

And, wouldn't ya know, population increase is also well-documented as a major driver of greenhouse gases, like CO_2, that cause climate change.

I still have faith in science, because what else would I advocate — "unscience"? But I have less faith in science's ability to win the day absent profound changes in our economic ideology of endless growth.

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

Forum
Commentary • Letters • Perspectives

EC meeting recognizes innovation, acknowledges work ahead

By Rachel Felver

Once a year, members of the Chesapeake Executive Council gather together to discuss the successes and challenges of restoring the Chesapeake Bay. A mere 30 miles from the shores of the Bay, this year's meeting site, Oxon Hill Manor, played host to representatives from Delaware, the District of Columbia, Maryland, New York, Pennsylvania, Virginia, and West Virginia (watershed jurisdictions), as well as the U.S. Environmental Protection Agency and the Chesapeake Bay Commission, on Sept. 5.

Oxon Hill Manor not only overlooks the Potomac River, one of the major tributaries flowing into the Bay, but is at the intersection of three significant stakeholders in Bay restoration — Maryland, Virginia and the District of Columbia.

As the coordinator of the Executive Council meeting planning committee, I have the unique advantage of seeing all of the components that go into making this meeting a success each year. The planning committee is made up of representatives from all the Bay watershed jurisdictions, the EPA, Bay Commission and the three Chesapeake Bay Program advisory committees representing scientific and technical, citizen, and local government interests. This year, we knew that our number one focus would be on the Phase III Watershed Implementation Plans. The 2019 meeting came at a pivotal time as the watershed jurisdictions had submitted their final Phase III WIPs to the EPA only two weeks earlier.

The Phase III WIPs outline the actions that each watershed jurisdiction intends to take to reduce pollution flowing into the Bay. Each has a specific target, or the amount of pollution that needs to be reduced for a clean and healthy Bay, to meet by 2025 under the Chesapeake Bay Total Maximum Daily Load, or Bay TMDL.

In addition to the Bay TMDL, the partnership is governed by the Chesapeake Bay Watershed Agreement — 10 goals and 31 outcomes that offer the full spectrum of what is needed to ensure a healthy watershed and restored Bay. These outcomes detail everything from brook trout to environmental literacy, and the majority of them offer multiple benefits in addition to helping to improve water quality. While Bay Program partners are making significant progress in meeting many of the outcomes, there are a few that need some help.

Queen Richardson, RiverSmart Homes program assistant with the Alliance for the Chesapeake Bay in Washington, DC, speaks during the Chesapeake Executive Council meeting. "My message to the leaders of the Chesapeake Bay Program and all residents of the watershed is that a healthy, resilient ecosystem is not just about the pounds of pollution reduced. It's about connecting youth to their communities and natural places, even in the middle of a city, and creating pathways to careers that will last a lifetime." (Will Parson / Chesapeake Bay Program)

The planning committee chose speakers for this year's meeting that would address some of the outcomes that need attention, while also highlighting some of the more innovative approaches that watershed jurisdictions plan to take to help reduce their pollutant loads.

Most importantly, the chosen speakers would make the connection of the importance of using pollutant reduction strategies in their Phase III WIPs that would meet both Watershed Agreement outcomes and Bay TMDL goals.

Planting forest buffers and restoring wetlands, especially on agricultural lands, are two areas our partnership sorely needs to improve. In 2017, only 56 miles of buffers were planted throughout the watershed, achieving 6% of the goal to plant 900 miles of buffers per year. Also in 2017, only 9,103 acres of wetlands were restored, meeting 11% of the goal to create or re-establish 85,000 acres of wetlands.

Skip Stiles, executive director of Wetlands Watch, reminded the council that "forest buffers are critical for a number of reasons." He touted their importance by listing such attributes as their ability to stabilize stream banks, provide wildlife habitat, cool waters and meet nutrient reduction goals. But he also acknowledged the many road bumps along the way, whether it be permits, funding or other issues.

Stiles remarked that without an acceleration of wetland restoration and buffer plantings, it is extremely unlikely that the watershed jurisdictions would meet their Bay TMDL goals. Additionally, he noted how critical these two practices are for the future of our watershed as climate continues to change.

The District of Columbia took a unique approach in planning their Phase III WIPs, choosing to focus on the importance of investing in their residents through green job training programs to help meet their pollutant reduction goals.

Queen Richardson of the Alliance of the Chesapeake Bay spoke to the Council about her personal experience with DC's green job training programs. Richardson described her experiences with RiverCorps, a five-month job training program aimed at getting young adults, ages 18–24, experience with the green sector, and the Green Zone Environmental summer internship program that further exposed her to critical environmental issues and topics.

These experiences eventually led to her position as a RiverSmart Homes program assistant with the Alliance for the Chesapeake Bay. Richardson reflected that she "did not expect to be doing this type of work" but is so happy that she's been given the chance.

"A healthy resilient ecosystem is not just about the pounds of pollution reduced," Richardson reminded the council. "It's about connecting youth to their communities and natural places, even in the middle of a city, and creating pathways to careers that will last a lifetime."

The resounding message at the meeting was one that celebrated the success of each watershed jurisdiction in their accomplishments of completing their Phase III WIP. But it also carried a reminder that there is still a lot of work ahead of us. Reducing pollution is necessary for a clean Bay, but it's not the only factor. Actions on land have just as much value in restoring and maintaining a healthy watershed, and the impacts of climate change can't be overlooked.

In the end, it was Executive Council Chair and Maryland Gov. Larry Hogan, who said it best, "this partnership stands at a critical juncture, with seven jurisdictional plans and the goal of clean water in sight. After three decades of collaboration with our federal and regional partners, we are witnessing significant improvements toward clean water and increased resiliency, but there is more work to be done."

Rachel Felver is the Chesapeake Bay Program Communications Director at the Alliance for the Chesapeake Bay.

Forum

Commentary • Letters • Perspectives

PA legislators need to put the money where the boots are – on farms

By Bill Chain

Pennsylvania's final watershed implementation plan to clean up the state's portion of the Chesapeake Bay watershed and meet its commitments under the Chesapeake Clean Water Blueprint by 2025 is under review by the U.S. Environmental Protection Agency. Let's be clear: The plan is inadequate in many ways. It doesn't cut nitrogen pollution nearly enough, and there is a significant funding gap that legislators have not identified ways to fill.

But for those who rightly worry about the state's ability to meet its pollution reduction goals, I have some good news. Many Pennsylvania farmers get it.

I manage the agriculture program for the Chesapeake Bay Foundation's Pennsylvania office. I go to a lot of farming events and trade shows, and I stand shoulder to shoulder with a lot of farmers.

By and large, most of the conversations I have with farmers are very positive. Farmers recognize that they have an impact on water quality in their communities and are interested in improving it.

Many farmers are ahead of the game and are really proud of the progress they've made implementing conservation practices. They're excited to stop by and talk about the cover crops they planted and the organic matter they've added to their soil through soil health management.

When we have heavy rains that bring 2 or 3 inches of water down in a couple hours, farmers are proud to see the runoff is basically clear; it's not carrying away their soil.

I can also say there is real commitment from our county conservation districts, the folks who work out of the U.S. Department of Agriculture offices and our local nonprofits to help farmers implement conservation measures. They are working diligently, at capacity, and really want to make a difference.

This is the culture and climate in Pennsylvania farm country right now that makes me optimistic we can meet our Blueprint goals.

But, there's another side of the coin. The fact remains that we lack the necessary commitment and resources from state legislators to finish the job.

Pennsylvania farmers want to help clean up the their waterways. They're willing to invest their time, land and effort. We need legislators to provide the funding and technical assistance that allow them to do so.

Farmers are a lot of things — they practice animal husbandry, they're plant pathologists, they're accountants and they're often conservationists. But they can do none of these things if they can't turn a profit. Bottom line, they are a business. Just like any other business, their decisions need to make financial sense.

The sun sets over a farm in Lancaster County, PA. If the state is to succeed in reducing water pollution in its share of the Bay watershed, it will need to make substantial investments in more 33,000 farms and 1,000 local governments that share the landscape. (Ad Crable)

Without the help of public dollars, conservation practices that can take five, 10 or even 20 years to provide a return on investment to the farmer are a tough sell. Especially now. Low commodity prices and turmoil in international markets are hitting farmers hard. As the *Bay Journal* reported, many are struggling just to make ends meet.

The Pennsylvania Farm Bill signed into law this year provided roughly $6 million for programs to help farmers implement conservation measures. It's a positive improvement we can build on, but legislators still have a long way to go to close the funding gap. In comparison, Virginia is investing $73 million in a cost-share program to help its farmers clean up waterways.

State legislators and the EPA, as the lead federal partner in the Bay cleanup effort, should also work with the USDA to identify ways to direct more federal Farm Bill dollars to Pennsylvania.

Again, there have been positive steps in this direction. Sen. Bob Casey (D-PA) helped to secure new measures in the 2018 Farm Bill that make it easier for farmers to install forested buffers along streams. It is important for programs like these to target key areas in Pennsylvania to reduce agricultural pollution, especially counties — like Adams, Franklin, Lancaster and York — identified as priorities in the state's watershed implementation plan.

In addition, the Keystone 10 Million Trees Partnership, spearheaded by the Chesapeake Bay Foundation, has an important and ambitious goal of planting 10 million new trees before the end of 2025.

But it's not just about the money. We also need to invest in technical staff and resources. We need people working in outreach and education; and we need people with the expertise to help farmers design and build effective conservation practices. Pennsylvania's final watershed implementation plan estimates more than 70 additional agricultural staff and technical assistance specialists are necessary to meet the plan's goals.

Everyone wants Pennsylvania's farmers to succeed. Agriculture is one of Pennsylvania's most important industries, and many people move to Pennsylvania because they enjoy the rural charm of farm country. The boots on the ground — the farmers and the conservation community — are leading the way. It's time state legislators invest in them

Bill Chain is senior agriculture program manager for the Chesapeake Bay Foundation Pennsylvania Office.

Let Us Know

The Bay Journal welcomes letters pertaining to Chesapeake Bay issues. Letters should be no more than 400 words. Send letters to: Editor, Bay Journal, 619 Oakwood Drive, Seven Valleys, PA 17360-9395. E-mail letters to: bayjournal@earthlink.net

Letter writers should include a phone number where they can be reached. Longer commentaries should be arranged in advance with the editor. Call: 717-428-2819.

Views expressed are those of the writers and do not necessarily reflect those of the Bay Journal or Bay Journal Media.

Chesapeake Challenge

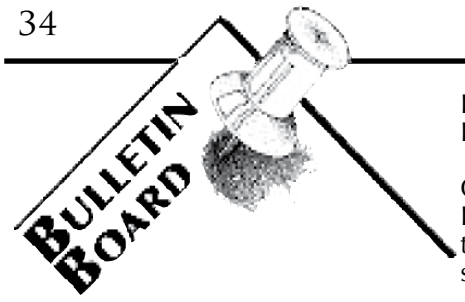
Answers to
Let's go to bat for the little brown bat!
on page 30.

1. C. 2. A. 3. D 4. C. 5. A
6. D 7. B. 8. E

Bay Buddies

Answers to Bats! on page 30.

1. A. 2. D. 3. C. 4. A. 5. C
6. C 7. True. 8. D. 9. D.
10. B. 11. E



VOLUNTEER OPPORTUNITIES

York County, PA, parks

Volunteer opportunities at Nixon County Park near Jacobus, PA, include:

≋ *Exploration Forest:* The Nature Play Area needs to be monitored on a regular basis for hazards such as thorny plants or poison ivy.

≋ *Project FeederWatch:* 9 a.m.–4 p.m. Nov. 12, 13, 19, 20, 26 & 27 and Dec. 3, 4, 10, 11, 17 & 18. Nixon Park near Jacobus. Project FeederWatch is a citizen science program in which participants count the number and identify species of birds visiting the feeders from November through early April. The data is forwarded to Cornell Laboratory of Ornithology and becomes part of a nationwide data set that tracks winter bird population trends. Beginners are welcome. Volunteers are asked to commit to one hour every other week.

Info: Andrew at 717-428-1961.

Help with watershed education

The Prince William (VA) Soil and Water Conservation District needs help with *Meaningful Watershed Education Experiences* 9 a.m.–1 p.m. Oct. 30 and 31 at Windy Knoll Farm in Nokesville, VA. Help Third- graders cycle through four stations: pollination/pollinators, pond aquatics, soils and stream buffers. Lunch is served after students leave. Would-be volunteers are asked to list their station preference. Info: Pam Popovich at 571-379-7514, mwee@pwswcd.org.

Howard County Conservancy

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

Cromwell Valley Park

Volunteer opportunities at Cromwell Valley Park in Parkville, MD, include:

≋ *Habitat Restoration Team / Weed Warrior Days:* 2–4 p.m. Oct. 12 & 26; and Nov. 2 & 23. All ages (12 & younger w/adult). Help remove invasive species, install native ones and maintain habitat. Service hours available. Meet at Sherwood House parking lot. Registration not required. Info for these workdays: Ltmitchell4@comcast.net.

≋ *Drop in Gardening:* 9 a.m.–12 p.m. Oct. 26. Meet at Children's Garden. Individuals / families, ages 13+ Gloves, tools, water provided. Bring a hat, sunscreen. No registration.

≋ *Project FeederWatch Training:* 10:30–11:30 a.m. Nov. 7. Adults. Learn how to count birds for science. Then, meet at the Nature Center for a 1-hour shift, Wednesdays and Thursdays, Nov. 13 until April 2. No registration.

Info: info@cromwellvalleypark.org, cromwellvalleypark.org, 410-887-2503.

MD Volunteer Angler Survey

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

Thurmont, MD, tree planting

Stream-Link Education is looking for volunteers of all ages to help plant trees 9–11 a.m. Oct. 19 & 26 in Thurmont, MD. Info: streamlinkeducation.org/plantings or Lisa Baird at 443-538-6201, lisa.streamlink@gmail.com.

CBL Visitor Center

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

Volunteer at CBEC

The Chesapeake Bay Environmental Center in Grasonville, MD, has volunteer openings for those who only want to drop in a few times a month or help out on a more regular basis. Openings include: helping with educational programs; guiding kayak trips or hikes; staffing the front desk; maintaining trails, landscapes and the Pollinator Garden; feeding or handling captive birds of prey; maintaining birds' living quarters; and participating in CBEC's team of wood duck box monitors and other wildlife initiatives. Other opportunities include participating in fundraising events, website development, writing for newsletters and events, developing photo archives and supporting office staff. Volunteers donating more than 100 hours of service per year receive a complimentary 1-year family membership to CBEC. Info: volunteercoordinator@bayrestoration.org.

Anita Leight Estuary Center

Anita C. Leight Estuary Center in Abingdon, MD, needs volunteers, ages 14 & older, for its *Invasinators Workday* 2–4 p.m. Oct. 27, weather permitting. Help remove invasive species and install native plants around the center. Wear sturdy shoes, long sleeves and work gloves. Registration is required: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

Little Paint Branch Park

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

Ruth Swann Park

Help the Maryland Native Plant Society, Sierra Club and Chapman Forest Foundation 10 a.m. to 4 p.m. the second Saturday in October, November and December remove invasive plants at Ruth Swann Park in Bryans Road. Meet at Ruth Swann Park-Potomac Branch Library parking lot. Bring lunch. Info: ialm@erols.com, 301-283-0808, (301-442-5657 day of event). Carpoolers meet at the Sierra Club MD Chapter office at 9 a.m. and return at 5 p.m. Carpool contact: 301-277-7111.

Magruder Woods

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

Become a VA Master Naturalist

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

Adopt-a-Stream or Pond

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

American Chestnut Land Trust

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

Creek Critters app

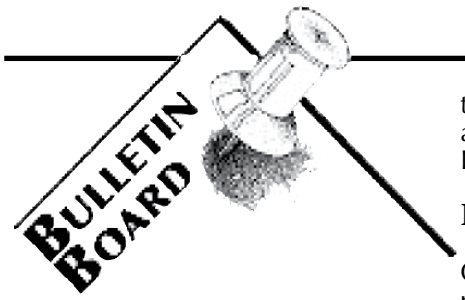
Audubon Naturalist's *Creek Critters* app lets people check their local streams' health through finding and identifying small organisms that live in freshwater, then generating health reports based on what they find. The free app can be downloaded from the App Store and Google Play. Info: anshome.org/creek-critters. To learn about partnerships or host a Creek Critters event: cleanstreams@anshome.org.

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.

BULLETIN CONTINUES ON PAGE 35



Bulletin from page 34

Resources

Boating safety instruction

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

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

Bilingual educator resources

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

Wetlands Work website

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

Stormwater class

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

Watershed education capsules

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

Learn if your yard is Bay-Wise

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

Turf / lawn programs

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

Floatable monitoring program

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

Marine debris toolkit

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

Baltimore Biodiversity Toolkit

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

Wildlife education trunks

The Maryland Department of Natural Resources is offering a variety of wildlife education trunks for use by teachers, home-school educators, naturalists, scout leaders and other instructors. These free, interdisciplinary tools are designed to interest students in local wildlife while building on disciplines like art, language arts, math, physical education, science and social studies. Each trunk contains an educator guide with background information, lesson plans and hands-on K–12 activities, as well as supplies, books, furs, replica tracks, videos and other hands-on items. Trunks subjects include aquatic invasive species, bats, black bears, furbearers, white-tailed deer and wild turkeys. Trunks are available at seven locations around the state and can be borrowed on a first-come, first-served basis for up to two weeks. Info/search engine: Wildlife Education Trunks.

Test for chemicals in water

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

MD Recreation & Clean Water Fund

Anglers, boaters and hunters who obtain registrations or licenses through the Maryland Department of Natural Resources' Compass online registration system can contribute to the *Maryland Outdoor Recreation and Clean Water Fund* to support fish and wildlife habitat, clean water, wetlands and K-12 student field trips throughout the state. When a customer checks out, an additional line in the shopping cart will say "Maryland Outdoor Recreation and Clean Water Fund." The $10 already on the line can be made larger, smaller or zeroed out. The Fund is also available under "Merchandise" on the main menu. The money is equally distributed in grants to nonprofit entities through the Chesapeake Bay Trust and the DNR, with an average of 95 cents of every dollar spent on programs.

Mount Harmon Plantation

Mount Harmon Plantation in Earleville, MD, is booking fall and spring field trips for school groups. *The Early American History* program covers the lifestyle, culture, agriculture and trade of a tidewater plantation with manor house tours, colonial demonstrations, crafts and games and a nature walk to the Prize House. Or, teachers may select the *Tidewater*

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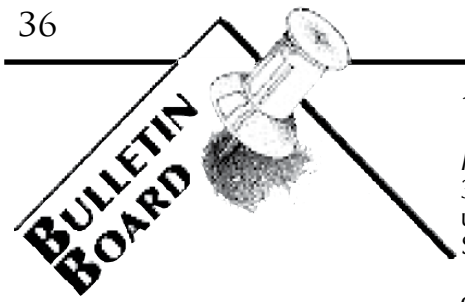
New Submission Guidelines

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

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



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History & Ecology. Both programs run about four hours. Picnic lunches welcome. Fee: $8/student. Info: 410-275-8819, info@mountharmon.org.

EVENTS / PROGRAMS

Paddle trip on Bull Run

The Prince William (VA) Trails & Streams Coalition invites the public to canoe or kayak the Bull Run 9 a.m.–12 p.m. Oct. 19. Paddlers start at the Stone Bridge parking lot in Manassas National Battlefield Park and paddle 5.75 miles to the Bull Run-Occoquan Trail parking area on the Fairfax County side of Bull Run. Currents are present at this part of the run and there is a shallow area where, depending on the water level, participants might scrape the bottom of their boats or even have to get out and pull their boats a short distance. The trip is free; registration is required. Info: pwtsc.org/event/paddling-trip-on-bull-run, secretary@pwtsc.org.

VA film fest accepting entries

The *10th RVA Environmental Film Festival* is accepting entries from around the state for the 2020 *Virginia Environmental Film Contest*. Submissions are due by Dec. 31. The festival showcases films that raise awareness of environmental issues relative to all residents of Earth. Selected entries will be screened Feb. 9 at the Byrd Theater in Richmond. Admission to the festival is free and open to the public. Prizes, including the $1,000 grand prize, will be awarded that day. Info: facebook.com/pg/rvaenvironmentalfilmfestival/posts.

Natural History Society of MD

Upcoming programs offered by the Natural History Society of Maryland include:

≋ *Bird Banding:* 7:30–9:30 a.m. Oct. 15. Observe the capture of wild birds, their banding and release back into the wild. This project works with the Smithsonian Migratory Bird Center to evaluate the health of the avian community. Banding is cancelled if it is raining or temperatures are over 90 or below 50. Free, but a suggested donation of $5 helps to cover materials cost.

≋ *Speaker Series / Cephalopods - Intelligent Magicians:* 7–9 p.m. Oct. 16. Families. Tom Piscitelli will discuss octopuses. Fee: $15/ages 14+; $5/ages 13 & younger.

≋ *Wee Naturalist Preschool Program:* 9:30–11 a.m. Nov. 13. Ages 3–5 w/ adult. Explore nature together under the guidance of a naturalist. Fee: $10/child.

Preregistration is required for each program. Info: marylandnature.wildapricot.org.

Bull & Oyster Roast

Mount Harmon's *Annual Bull & Oyster Roast* takes place 5–9 p.m. Nov. 2 at the plantation in Earleville, MD. The fundraiser also features silent and live auctions, manor house tours and live bluegrass music. Tickets are $70/person; $500/reserved table for eight. Info: mountharmon.org, 410-275-8819, info@mountharmon.org.

Patuxent Research Refuge

Upcoming programs at the Patuxent Research Refuge's North Tract [T] and National Wildlife Visitors Center [C] in Laurel, MD, include:

≋ *Nature Tots / Afraid of the Dark? Not me!* 10:30–11:30 a.m. Oct. 15 [C] Ages 3–4. Learn about nocturnal animals' adaptations.

≋ *Family Fun / Creepy Critters:* Drop-in program runs 10 a.m.–1 p.m. Oct. 18 & 19 [C] All ages. Owls, bats and spiders are not creepy! Learn about them through hands-on activities. No registration.

≋ *Creepy Critters Night Hike:* 7:30–9 p.m. Oct. 18 & 19 [C] All ages. Explore the forest. Look for spiders, moths, bats, nocturnal animals.

≋ *Discovering Lichens:* 10–10:45 a.m. Oct. 19 [C] Ages 10+ Slow walk stops to examine lichens. Bring water bottle, magnifying glass (some magnifiers will be available to borrow). Walk is weather-dependent.

≋ *Forest Discovery Tram Tour:* 11:30 a.m., 1 p.m. & 2 p.m. Oct. 19 & 26 [C] All ages. 45-minute ride highlights how a forest is an interconnected community of plants, animals. Trams stops for discussion of wildlife encountered on the trail. The ride is free, but tickets are required and available on a first-come, first-served basis.

≋ *Owl & Kestrel:* 12:15–12:45 p.m. Oct. 19 & 26 [C] All ages. Learn about the acrobatic American kestrel, the stealthy eastern screech owl.

≋ *Songbird Viewing Area Dedication Ceremony:* 1–1:30 p.m. Oct. 19 [C] All ages. Area will allow school groups, photographers, visitors to see songbirds up close. No registration.

≋ *Story Time:* 10:30–11:15 a.m. Oct. 21. Meet at Education Classroom / Wildlife Viewing Area. Ages 3–5. Nature-themed stories, crafts.

≋ *School's Out Mini-Camp: Habitats & Adaptations:* 9 a.m.–4 p.m. Oct. 22 [C] Ages 8-11. Games, hands-on activities explore various habitats, analyze how animals have adapted to survive. Learn how changes in habitat affect animals, their survival. Dress for short hike, outside activities.

≋ *Bird Walk:* 8–10 a.m. Oct. 23 [C] Ages 16+ Bring binoculars, good walking shoes, water.

≋ *Bicycle Ride:* 10 a.m.–12:30 p.m. Oct. 26 [T] All ages. Take in the natural area's wildlife, plants, historical sites on 12-mile guided tour. Bring a bike, snack, water bottle, helmet. Ride is weather-dependent.

≋ *Whose Clues?* 10–11 a.m. Oct. 27. Meet at Education Classroom at the Wildlife Viewing Area. Ages 5–7. Hike to search for evidence of wildlife in the forest.

≋ *Nature Tots / Colors of Fall:* 10:30–11:30 a.m. Oct. 29 [C] Ages 3–4. Learn about leaves.

≋ *Wildlife Holiday Bazaar:* 9 a.m.–3 p.m. Nov. 2 [C] Baldy's Bargains features new & gently used items, children's activities. Vendors will also sell environmentally themed items. All proceeds support the Wildlife Center and Research Refuge. No registration.

All programs are free, donations are appreciated. Except where noted, events require registration. Programs are designed for individuals and/or families. Let the refuge know if there are any special needs that need to be accommodated. Info: 301-497-5887, fws.gov/refuge/Patuxent/visit/PublicPrograms.html.

Cromwell Valley Park

Upcoming programs at Cromwell Valley Park's Willow Grove Nature Center [N] and Primitive Tech Lab [P] in Parkville, MD, include:

≋ *Bird Walks:* 8–10 a.m. Oct. 19 & 26 and Nov. 2 & 9. Meet at Willow Grove Farm Gravel Parking Lot. Bring binoculars if possible. No registration.

≋ Friction Fire: 1–3 p.m. Oct. 19 [P] Ages 13+ Learn how to make a friction fire. Fee: $5.

≋ *Spooky Stories Campfire & S'mores:* 7:30–9 p.m. Oct. 25 [N] Ages 8+ Swap somewhat scary tales around a campfire. Fee: $5.

≋ *Visit the Nature Center Day:* 9 a.m.–4 p.m. Oct. 26 All ages. Exhibits, animal, talks with the naturalist, apple cider, ginger snaps. No registration. Free.

≋ *Wizards, Wands & Broomsticks!* 1–3 p.m. Oct. 27. [N] Ages 6–13 w/ participating adult. Make a sedge broom, decorated stick wand. No younger siblings. Fee: $7.

≋ *Night Out w/Nature - Falconry:* 7–9 p.m. Nov. 1. Meet at Sherwood House. Adults. Falconer Jenna Krebs will discuss what it takes to become a falconer, how to train a bird of prey. Dessert included. Fee: $10.

≋ *Nature's Medicine Chest:* 1–3 p.m. Nov. 2. [N] Ages 13+ Learn about healing plants during walk. Make balm, tea to take home. Fee: $7.

≋ *Hiking Sticks:* 1–3 p.m. Nov. 3 [P] Adults. Make one of humanity's earliest tools: it digs up roots, defends against snakes, collects fruit, helps hikers. Fee: $7.

≋ *Light My Fire:* 1–3 p.m. Nov. 9 [N] Ages 7+ Learn how to make homemade fire starters out of everyday materials. Test them out on a campfire w/s'mores. Fee: $5.

≋ *LBJs - Little Brown Jobs:* 1–3 p.m. Nov. 10 [N] Ages 12+ Little Brown Jobs — sparrows, finches & wrens — remain active in the fall. Learn about, search for them. Fee: $4.

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

Chesapeake Bay Maritime Museum

Upcoming offerings at the Chesapeake Bay Maritime Museum in St. Michaels, MD, include:

≋ *Open Boat Shop:* 5:30-8:30 p.m., Oct. 17, Nov. 14 and Dec. 12. Novice woodworkers, who can bring a small woodworking project or ideas for a future project, will receive guidance from an experienced shipwright and woodworker, along with assistance with CBMM's machinery and tools. Participants must be 16+ unless accompanied by an adult. Fee: $35 per session. Preregistration required: cbmm.org/shipyardprograms.

≋ *Maryland Dove Blocks:* Two-day workshop meets 10 a.m.–4 p.m., Oct. 19 & 20. Help shipwrights build blocks for the rigging of the new Maryland Dove, Preregistration required. Fee: $100. Info: cbmm.org/pullandhaul. Meanwhile, the CBMM's working Shipyard will be constructing the Dove's successor through 2021, full public view. Info about Maryland Dove and CBMM's efforts to build the new vessel: marylanddove.org.

≋ *Schooner AJ Meerwald:* 3–5 p.m. Oct. 21. The official tall ship of New Jersey, a restored 1928 oyster schooner will offer dockside tours (included w/admission) on Oct. 21. While docked at CBMM (Oct. 21–23), AJ Meerwald will run also joint education programming with CBMM's education staff. Info: cbmm.org, 410-745-2916.

≋ *OysterFest:* Oct. 10 a.m.–4 p.m. 26. The event features oysters served a variety of ways, along with other local fare, craft beer, spirits, live music,

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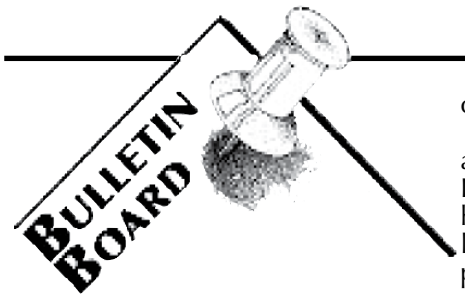

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cruises aboard 1920 buyboat Winnie Estelle; oyster stew competition; cooking presentations; oyster-slurping contest; Chesapeake Bay retriever and oystering demonstrations; children's activities; Chesapeake-themed games; scavenger hunt; building a model boat ($3); the CBMM's exhibit, *Oystering on the Chesapeake;* and Waterman's Wharf, where visitors can tong or nipper for oysters. Admission is $5/active members of the military (with ID); $18/adults; $15/ages 65+ and college students or retired military (both with ID); $6/ages 6–17; free/ages 5 & younger. Food, drinks, cruises cost extra. For safety reasons, non-service dogs must be kept home for this event. Proceeds support CBMM's education, restoration, exhibition programs. Info: cbmm.org/oysterfest.

≋ *Fall Speaker Series / Messing About in Boats:* 2 p.m. Nov. 6. Van Lennep Auditorium. CBMM President Kristen Greenaway shares stories of her boating adventures, from living aboard a 32-foot wooden yacht as a child, to sailing with an all-woman crew in the inaugural two-month Auckland-Fukuoka (Japan) Yacht Race, to competing in the annual 300-mile WaterTribe Everglades Challenge. Fee: $7.50. Preregistration encouraged. Info: cbmm.org/speakerseries.

≋ *Fall Speaker Series / At the Helm of Kalmar Nyckel:* 5:30 p.m. Nov. 13. Van Lennep Auditorium. Capt. Lauren Morgens will discuss her role as the first female captain of Kalmar Nyckel, an accurate replica of a 17th-century Dutch pinas, and the official tall ship of Delaware. Fee: $7.50. Preregistration encouraged. Info: cbmm.org/speakerseries.

Anita Leight Estuary Center

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

≋ *Kayak Cruising on the Creek:* 10 a.m.–12:30 p.m. Oct. 17 & 31. Adults. Explore Otter Creek, upper Bush River. Fee: $12.

≋ *Halloween Hike & Campfire:* 6–9:30 p.m. (Preregister for half-hour time slot to begin 0.75 mile hike. Allow 1 hour for hike, campfire.) Oct. 19. Ages: old enough to handle slightly spooky hike in night woods. Meet real "scary" animals up close, hear their story from a Halloween character. Music, roasted marshmallows await at campfire. Fee: $7, pay at door.

≋ *Pumpkin Chunkin' Hike:* 10–11:30 a.m. Oct. 20. All ages. Walk the Discovery Trail to see what creatures have moved into jack-o-lanterns left from the Halloween Hike. Later, pumpkin chunkin' begins! Free.

≋ *Drop-in Program / Meet a Critter:* 12:30 p.m. Oct. 20 All ages. Up-close encounter.

≋ *Children's Garden Club:* 10:30–11:30 a.m. Oct. 26. Ages 5–8. Cook, create, explore while learning how a garden is connected to humans, the wild world. Fee: $5/child.

≋ *Days Cove Fall Foliage Kayak:* 11 a.m.–2 p.m. Oct. 26. Meet at Mariner Point Park in Joppa. Experienced paddlers, ages 12+ The 4-hour roundtrip paddle visits junction of Big and Little Gunpowder falls to look for eagles, beavers, changing foliage. Fee: $13.

≋ *Pontoon Boat Trip / Halloween Dinner Cruise:* 5–6:30 p.m. Oct. 26. Ages 8+ (16 & younger w/adult) Dress for the occasion for a "spirited" cruise, seasonal dinner on the river. Fee: $15.

≋ *Trail Running Series:* 10–11 a.m. Oct. 27. Ages 10+ (16 & younger w/adult) All skill levels/paces welcome. 2-mile course is an out-and-back, single track. Free.

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.

Oregon Ridge Nature Center

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

≋ *Shoots & Letters:* 10–11 a.m. Oct. 17 (*Acorns*), Oct. 24 (*Bats*), Oct. 31 (*Spiders*), Nov. 7 (*Nocturnal Animals*). Ages 3+ Outdoor adventures, activities. Fee: $2/child. No registration.

≋ *Bookworm Story Time:* 11–11:45 a.m. Nov. 1. Toddlers to age 6. Story, activity, outdoor experience. Free, donations appreciated. No registration.

≋ *Senior Stroll:* 10:30 a.m. Oct. 19; Nov. 2 & 16. Adults. Leisurely walk on paved, 0.3-mile Marble Quarry interpretive trail. Free, donations appreciated.

≋ *Bird Walk:* 8–9:30 a.m. Nov. 8. Adults. Bring binoculars or borrow a pair. Free, donations appreciated.

≋ *Nature QuestFest at Lake Roland:* 12–2 p.m. Oct. 20. All ages. Festival includes live animal encounters, face painting, dam tours, raffles, crafts. Fee: $5. Free for those who have completed 5 or more Nature Quest trails.

≋ *Council Speaker Series / Restoring Creation:* 7–8:30 p.m. Oct. 21. Adults. Charlie Conklin, vice president of operations at the Gunpowder Valley Conservancy, has overseen efforts to plant thousands of trees on hundreds of acres of the Gunpowder watershed. He'll share his journey to live each day contributing to a healthier world for future generations and lead an audience discussion on how our actions impact future generations. Free, donations appreciated. No registration.

≋ *Tricks & Treats on the Ridge:* 1–2:30 p.m. Oct. 26. All ages. Come in a costume for half-mile walk in woods to pick up a plant/animal fact, treat at various spots (bring bag). Participants will be assigned a starting time when registering. Walk-in guests will be accommodated only if there is an open slot. Fee: $5/participating child w/up to 2 chaperones per paid participant. Additional guests $2 each.

≋ *Squirrel Tales:* 1–2:30 p.m. Oct. 27. Ages 4+ Story, outside exploration, craft. Fee: $3.

≋ *Animals in Autumn:* 1–3 p.m. Nov. 2 & 3. Ages 4+ Explore the park, meet the center's animals up-close to learn what they do in fall to get ready for winter. Fee: $2.

≋ *Autumn Campfire & Hike:* 7–9 p.m. Nov. 9. Ages 4+ Take a hike, then meet at fire for apple cider, s'mores, autumn tales. Fee: $5.

≋ *Finding Your Way:* 1–3 p.m. Nov. 10. Ages 10+ Learn the orienteering basics, then test these skills on the trail. Fee: $5.

Ages 15 & younger must be accompanied by an adult. All programs require advance registration unless otherwise noted: info@OregonRidgeNatureCenter.org, 410-887-1815. Payment must be made within one week of registration. Events take place rain or shine unless a rain date is specified. Programs are for individuals & immediate families. Groups can schedule programs by calling 410-887-1815. For disability-related accommodations, call 410-887-1815, 401-887-5370 or 410-887-5319 (TTD/Deaf).

York County, PA, Parks

York County, PA, Parks invites the public to these programs:

≋ *Hawkwatch:* Drop-in from 10 a.m.–1 p.m. Oct. 12 & Oct. 19 Rocky Ridge Park's Oak Timbers Parking Lot, North Overlook in York. Learn to ID hawks in flight. Bring binoculars, field guides, lawn chairs. A few loaner binoculars will be available. Free, no registration.

≋ *Stream Discovery:* 2–4 p.m. Oct. 13. Nixon Park near Jacobus. Hands-on, feet-wet activity includes collecting, examining, discussing stream insects. Rain boots, sneakers, or water shoes recommended. No open-toed shoes or bare feet. Free. Registration required.

≋ *History & Mystery of Raab Park:* 1–3 p.m. Oct. 27. Meet at the parking lot on Hoff Road for 2-mile hike with steep terrain. Learn how miners removed, shipped ore. Learn about the efforts to conserve bats living in mine shafts. Wear proper hiking attire.

≋ *Kids Nature Play:* Drop in any time from 8:30 a.m.-4:30 p.m. Nov. 1, 2, 8, 9, 15, 16, 22 & 23. Nixon Park near Jacobus. Dress-up, use puppets, touch & feel natural objects, take part in short scavenger hunts. Explore play stations inside the nature center.

≋ *Owl Prowl:* 7–8 p.m. Nov. 10. Nixon Park near Jacobus. Ages 10+ Learn about owls, hike to call for them. Preregistration required: 717-428-1961.

Unless noted otherwise, events are free and do not require registration: 717-428-1961.

Irvine Nature Center

Upcoming events at Irvine Nature Center in Owings Mills, MD, include:

≋ *Tales & Tails:* 10–11 a.m. Fridays. All ages. Story, songs, puppet show, animal friend. Free.

≋ *Scout Day:* 10 a.m.–2 p.m. Oct. 20. Stations encourage Scouts to create swaps, go on a geocaching adventure, learn what Irvine has to offer at stations. Visit Irvine's animal ambassadors. Fee: $5/scout; free/leaders & parents.

≋ *Hoot's Halloween Party:* 1–3 p.m. Oct. 20. All ages. Come in costume for games, crafts, trick-or-treating for Hoot-errific Trail Mix. Fee: $10.

≋ *Pumpkins on the Green:* 7–11 p.m. Oct. 25. Irvine's 11th annual casual "un-gala" event includes live music, dancing, wine tasting, live and silent auctions, local food, brews. All proceeds support Irvine's environmental education programs. Bring a smart device for bidding. Tickets are $150. Info: Lindsey at 443-738-9222.

≋ *Drop-in Science Saturdays & Sundays:* 10 a.m.–12 p.m. Oct. 26 (*Nature Stamping*) & Nov. 3 (*Leaf Wreath*). All ages. Explore the natural world of science. Self-guided activities could include crafts, hands-on exhibits. Free.

≋ *Scales & Tall Tales:* 1-3 p.m. Nov. 9. All ages. Visit the Native American site for tribal tales of local wildlife with a spooky twist! Meet some of the animals mentioned in the tales. Fee: $10.

≋ *Lunch & Learn / Marvelous Marshes:* 12–1:30 p.m. Nov. 13. Adults. Join naturalist and Irvine's manager of public programs, Diana Roman, for a look into the world of marshes, swamps, wetlands. Lunch provided. Fee: $20.

Info: explorenature.org.

WOW program helps female forest owners branch out

By Holly May

WOW: a palindrome that behaves like a verb, an interjection or a noun and is typically associated with great excitement, admiration or success.

For landowners in West Virginia, this word serves all three functions: the WV Women Owning Woodlands program, or WOW, is a budding group that provides opportunities for female landowners to learn about sustainable forest management, communicate their experiences and inspire natural resource stewardship on private lands.

Women live an average of 4.8 years longer than their male partners, and the percentage of family-owned forests where a woman is the primary decision maker doubled from 2006 to 2013. But women are significantly less likely than men to participate in land management activities, mostly for lack of knowledge. Female natural resource professionals throughout the United States, in an effort to cut through this unnecessary doubt, are establishing a new generation of informed landowners through WOW and other similar trainings.

In West Virginia, the WOW program is taking root and branching out under the steady leadership of Barb Breshock and the support from key partners, including private forestry consultants, environmental organizations, the state Division of Forestry, the U.S. Department of Agriculture Forest Service and the West Virginia University Extension Service.

Breshock, a retired assistant state forester for the DOF, said that "there was likely a need for women landowners to have resources to draw from and the means to connect and share their experiences. I hope I can convey my expertise and forestry knowledge to other women." She has had experience with other women-focused trainings, and "has seen the benefits."

The kick-off workshop, which took place in late May 2019 at Watoga State Park in Pocahontas County, provided the perfect backdrop for appreciating the woods, water and wildlife of West Virginia. Female forestry professionals provided an introduction to forest ecology, bird watching and a shiitake mushroom propagation workshop.

The introductory chainsaw safety and operation course was led by Johnny King, service forester and chainsaw safety instructor for the DOF, and its participants wholeheartedly agreed that he was the right man for the job.

A field tour through the nearby Calvin Price State Forest gave attendees a chance to practice tree identification, measure the height and diameter of trees and check out different forestry treatments for wildlife habitat improvements.

WV WOW workshop attendees make introductions, talking about their land and experiences with forestry and land management. (Alliance for the Chesapeake Bay)

Barb Breshock, WV WOW organizer and leader, demonstrates how take an increment bore to determine tree age. (Alliance for the Chesapeake Bay)

During my 20 years in the field of natural resources, the majority of my professional relationships are networked through the family patriarch. As one of the instructors for the weekend, I found our conversations insightful and meaningful — strong and intelligent women looking for solutions to overcome barriers and accomplish land management goals on properties that they control. VW WOW, and other comparable programs, will help cultivate an emerging group of women who are ready to make educated decisions for their families and their land.

Steward's Corner

Breshock's intent is to develop a dynamic series of workshops, adapting to meet the educational needs and operational challenges of female forest landowners. In addition to the plants and animals on their properties, workshop surveys indicate that women want to learn more about the financial side of forestry; from estate planning to timber sale contracts to negotiations with consultants and contractors.

The second workshop took place in August at the Zero Grade Trail in Tucker County's Fernow Experimental Forest. Attendees observed the results of decades of applied forest management and learned about basic management systems, types of timber harvests and the role of prescribed fire in oak forest types.

WV WOW aims to create a safe, friendly and nurturing environment, as well as promote communication networks for women who make land management decisions. The workshop design considers inclusivity and equality. The active, and private, Facebook group serves as a platform for education, encouragement and positive action. Examples of Facebook posts include plant identification, herbicide application, grapevine control, wildlife pictures, potential workshop topics and new state and federal assistance programs.

The overarching WOW program is a collaborative project of the National Woodland Owners Association and the USDA Forest Service Cooperative Forestry Office. The project "strives to bring topical, accessible and current forestry information to woodland owners and forest practitioners through news articles, blogs, events, resources and personal stories. We support women in forest leadership, women who manage their own woodlands, and all who facilitate the stewardship of forests." For information, visit womenowningwoodlands.net.

Our own Alliance for the Chesapeake Bay staff member, Jenny McGarvey, shadowed a WOW-TELE (Tools for Engaging Landowners) workshop in October 2017. In fall 2018, both Breshock and McGarvey attended the Women and their Woods Retreat in Pennsylvania hosted by the Delaware Highlands Conservancy and their many partners. Each walked away with new strategies and approaches for engaging landowners.

For Breshock, it helped hone her approach to the WV program. For McGarvey, it included adopting a cognitive mapping exercise to help visualize land management goals and adapting the practice for a wide variety of audiences.

Breshock has been pleasantly surprised by the wide age range of attendees — from 20-somethings to multiple generations of mothers and daughters — as well as their willingness to travel for the chance to improve stewardship and encourage fellowship.

In the future, she would like to incorporate more demonstration and solution-oriented workshops on private forestlands.

As word of WV WOW reaches other areas of the state, Breshock hopes to provide scholarships to cover the travel, food and registration costs for some participants.

Size does not matter for WV WOW — participants need not own big tracts of land; they need only bring their questions, sense of humor and enthusiasm to learn. For information about the WV WOW program, visit wvforestry.com/landowner-assitance or contact Breshock at breshock@hotmail.com or 304-934-6777.

Holly May is the watershed forester for the Alliance for the Chesapeake Bay.

For wren & writer, home is where the birdhouse hangs

By Mike Burke

Well before sunrise in early May it started: a loud chattering, burbling, cascading torrent of notes. From just outside our bedroom window, the birdsong filled the early morning air. It would continue virtually all day and go on well into the summer.

Our avian alarm clock was at it again. The house wren, one of America's most well-known songsters, was busy attracting a mate and establishing his territory. His warbling, trilling song would periodically change to a harsh, raspy scold when anything (or anybody!) approached his prized mate or nest.

House wrens (*Troglodytes aedon*) are small, compact birds. Just 4 inches long and weighing a mere 0.4 ounces, the bird has a remarkably loud voice. The native Chippewa's name for the bird translates to "making big noise for its size." That's an accurate description and one of the reasons so many nonbirders know this tiny dynamo: When males are around, they are hard to ignore.

The house wren's big voice is certainly its most obvious field attribute. Otherwise, the rather drab brown little bird would be easy to miss.

They breed almost anywhere there are trees and shrubs. House wrens can be found throughout the Western Hemisphere, from Canada to Chile. Many of the populations are resident, while others are short-distance migrants.

Ornithologists count 31 separate subpopulations. They inhabit a larger range from north to south than any other songbird in the hemisphere.

Our nesting house wrens were of the eastern variety. They breed from New Brunswick across to Ontario in Canada, and down to Tennessee and over to the Carolinas. In October, they head to the southeastern United States, Mexico or Caribbean for winter.

Light brown with a pale gray chin, neck and belly, eastern house wrens have dark-and-light barring on the wings and tail as well as the back part of their undersides. A hint of cinnamon on the rump and tail are the only concessions to color. A flat head and a tail that is often cocked up accentuate the bird's compact build.

House wrens from other regions look similar, but differ slightly in coloration, with darker birds in cool, humid areas and paler versions in warm, arid regions.

The sexes look alike, and they have similar plumage year-round: no flashy breeding feathers for these birds.

House wrens have an affinity for birdhouses. If none are available, they will use cavities in trees or snags or crevices in rocky outcroppings. (Louis Agassiz Fuertes / U.S. Fish and Wildlife Service)

Our backyard birds were using a birdhouse we had attached to the back deck of our former house in Cheverly, MD. Over the years, that nest box has been home to several generations of house wrens and at least one family of house sparrows.

House wrens have an affinity for birdhouses. If one is not available, they will use cavities in trees or snags, crevices in rocky outcroppings, and so on. They will also use lots of other human "structures," from the pockets of work coats left outside, clothespin baskets, buckets or just about any object that affords them a space to build their nests.

Nest construction starts with the male. He will place a few sticks in possible nesting sites, then show his prospective mate his handiwork. If she is impressed, she will select the best option and further nest construction commences. Both birds work on the nest, with the female putting the finishing soft lining in place: spider webs, hair, feathers, fluff from some seeds and so on.

Many eastern house wrens have two broods annually. They typically don't use the same nest and often don't have the same partner for nest number two. Each nest will have six or seven eggs that are incubated by the female for 12–13 days.

After they hatch, the chicks, which are born helpless, stay in the nest for another 17–18 days. Both parents feed the young an assortment of beetles, grasshoppers, crickets, spiders, ants, and moths and butterflies.

Although they produce many offspring annually, house wrens have a high mortality rate and their longevity is short — probably about 6 years.

Current estimates show a very slight annual increase in numbers. They boast a healthy worldwide population that Partners in Flight estimates at 160 million birds.

In late June, after the first brood of our backyard birds had fledged, we awoke one morning to the familiar cascading song of a male house wren. The birdhouse was about to serve as home to a second brood. The process started with the male pulling out much of the dirty nesting material left behind by family number one. He would add new sticks in a matter of days.

In late June, after the first brood of our backyard birds had fledged, we awoke one morning to the familiar cascading song of a male house wren. The birdhouse was about to serve as home to a second brood.

My wife and I were in the process of cleaning out our own house, getting ready to move to a smaller home. The house wren's second nesting was an especially bittersweet affair for us. We had lived at the Cheverly house for nearly 30 years. This would be our final time hosting a new clutch of birds.

Our yard had seen lots of birds over the years and given us a host of avian memories. But it was time to turn the house over to a younger set. A new generation was waiting.

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

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Bats, our best weapon against insect pests, need magic bullet to fight disease

BY KATHY RESHETILOFFF

With Halloween quickly approaching, images of bats are appearing everywhere. October also happens to be Bat Appreciation Month.

Bats are exquisite animals. No other animal compares to Earth's only flying mammal. Like all mammals, bats have hair and their young are born live and feed on milk. But unlike other mammals, the fingers on a bat's hand are elongated and connected by skin to form a wing.

There are more than 1,300 species of bats that range in size from the bumblebee bat, which weighs less than a penny, to the golden-crowned flying fox, which weighs 2.6 pounds and has a wingspan of up to 5.5 feet. Except for Antarctica, bats are found on every continent, living in caves, temperate forests, deserts and tropical rainforests.

The tri-colored bats perform a great agricultural service by eating grain moths as they emerge from corn cribs. (Ann Froschauer / U.S. Fish and Wildlife Service)

Bats eat vast amounts of insects, including some of the most damaging agricultural pests. Others pollinate plants, ensuring the production of fruits that support local economies. Fruit-eating bats in the tropics disperse seeds that are critical to restoring rainforests. Even bat droppings (called guano) are valuable as a natural fertilizer.

As primary predators of night-flying insects, bats help to control many of our most annoying pests. One insect-eating bat eats as many as 3,000 insects a night during the summer. Some bats consume crop pests, including cucumber beetles, June beetles, leafhoppers, cutworm moths and corn earworm moths. Without these natural bug zappers, farmers would lose billions of dollars in lost crop revenue as well as need to increase their use of costly pesticides.

To hunt at night, bats developed echolocation, which helps detect objects. They produce sounds at high frequencies, and by listening to the echoes of these sounds, bats are able to discern objects. Using the reflected sounds, they form pictures in their brains just like we do when we interpret reflected light with our eyes.

Bats in temperate regions either hibernate or migrate during the winter. More than half of the 47 bat species in the United States hibernate in caves in winter and move to trees and buildings in summer. Some bats live in caves all year but have different summer and winter roosts.

During hibernation, a bat's metabolism slows so that it uses very little of its stored

fat. Heart rates slow drastically and body temperatures drop to 40–60 degrees Fahrenheit. To control body temperature, bats often roost together in great numbers.

Disturbance is a major threat to many bat species. Disturbing a maternity colony can cause mothers to drop their young or move them to a less suitable site. Waking bats during hibernation causes them to burn the precious fat reserves they have stored to survive the winter.

Preventing people from entering maternity caves and winter hibernation caves is critical. Because bats use these caves seasonally, entry may only have to be restricted during certain months. A cave entrance can be gated or fenced, preventing people from entering while allowing bats to fly in and out.

Bats are also threatened by loss of feeding or roosting habitat, usually wooded areas near water sources. As traditional roosts in trees and caves have been destroyed, many bats are seeking shelter in man-made structures. Scientists have studied the roosting requirements of bats in order to provide artificial homes. Some bats use these bat houses quite successfully.

In the last decade a new threat, white-nose syndrome, has emerged. Named for the white fungus that sometimes appears on the muzzle and other body parts of hibernating bats, white-nose syndrome has killed millions of bats in North America. First documented in New York in the winter of 2006–07, the syndrome has spread rapidly. The presence of white-nose syndrome has been confirmed in 31 states and five Canadian provinces.

Researchers associate white-nose syndrome with the fungus, *Pseudogymnoascus destructans*, which thrives in cold and humid conditions characteristic of caves and mines used by bats. Bats with white-nose syndrome exhibit uncharacteristic behavior during cold winter months, including flying outside during the day and clustering near the entrances of hibernacula (caves and mines where bats hibernate during the winter).

As of July 2019, 12 cave-hibernating bats, have been confirmed with the disease: big brown bat, cave myotis, the endangered Indiana bat, eastern small-footed bat, little brown bat, endangered gray bat, long-legged bat, the threatened northern long-eared bat, western long-eared myotis, Yuma bat, southeastern bat and tri-colored bat.

The fungus has also been detected but with no confirmation of the disease, in the western small-footed bat, eastern red bat, silver-haired bat, Rafinesque's big-eared bat, Townsend's big-eared bat, the endangered Virginia big-eared bat, the endangered Ozark big-eared bat and Mexican free-tailed bat.

All of these species range within all or part of the Chesapeake watershed except for cave bats, gray bats, long-legged bats, Mexican free-tailed bats, Rafinesque's big-eared bats, western long-eared myotis, western small-footed bats and Yuma bats.

A network of state and federal agencies, universities and organizations is working to investigate the source, spread and cause of white-nose syndrome to develop strategies to minimize its impact on bats. Scientists have developed ways to detect *P. destructans* on bats and in the environment, using UV light and molecular analyses.

Research is looking at biological treatments, altering hibernation conditions to slow fungal growth or improve bat survival, and vaccines to boost bats' resistance to the disease. Researchers are also looking into molecular and genetic tools to reduce the ability of the fungus to cause disease.

What can you do?

- Minimize disturbance to natural bat habitats by reducing outdoor lighting, curtailing tree clearing and protecting streams and wetlands.
- Build a bat house in your yard.
- Report unusual bat behavior to your state natural resource agency. Unusual behavior includes bats flying during the day when they should be hibernating (December through March) and bats roosting in sunlight on the outside of structures. Bats flying in the middle of the day is unusual. Bats unable to fly or struggling to get off the ground should be reported.
- Do not go into caves and mines where bats are known or suspected to hibernate.
- Honor cave closures and gated caves.
- Researchers and cavers should follow decontamination guidelines to reduce the possibility of spreading the disease.

For news on white-nose syndrome research, visit whitenosesyndrome.org. To learn how to protect bats, call Bat Conservation International, 800-538-2287.

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