CHESAPEAKE
BAY JOURNAL
JULY-AUGUST 2018 VOLUME 28 NUMBER 5

Shells with baby oysters, or spat, growing on them, are washed overboard from the Oyster Recovery Partnership vessel Robert Lee to seed a restored reef in the Tred Avon River in 2018. Lack of funds will prevent more reef construction this year. (Dave Harp)

Corps rejects MD request to fund oyster restoration

≈ Lack of federal funds may halt reef construction in the Tred Avon River.

By Timothy B. Wheeler

Bay Oyster restoration in Maryland, which has been beset by disputes and delays the last two years, appears headed for further delays.

Despite pleas and pressure from the state's congressional delegation, the U.S. Army Corps of Engineers left funding for oyster restoration out of its Civil Works work plan for the current fiscal year, which ends Oct. 1. That decision, disclosed in early June, means the Corps' Baltimore District will have to shelve plans to complete the construction of reefs in the Tred Avon River on the Eastern Shore — at least for now.

Sens. Ben Cardin and Chris Van Hollen, both D-MD, expressed disappointment, noting that funding was needed to continue the large-scale restoration project under way in the Tred Avon. A Cardin spokesman said his office has requested an immediate meeting with Corps leaders to get an explanation.

Feds give qualified OK to dredge oyster shells from Man O' War Shoal. *See article on page 7.*

Cardin had said in April that he was "pretty confident" that the Corps would provide at least some funding for oyster restoration in its Civil Works work plan, even though the budget passed by Congress in March did not specifically allocate any money for such work.

Cardin said he had been optimistic because Congress has approved a larger budget for the Corps than the White House had sought, and members of Congress had expressed support for oyster restoration. Congressional rules prohibited earmarking any of that extra funding for oyster restoration, but the budget bill passed in March contained language urging the Corps to explicitly request restoration funding in future years. Cardin said he reinforced that message with senior Corps leaders when he met with them in early April.

Sarah Lazo, spokeswoman for the Baltimore District, said the District had planned to issue a contract this year to construct the 45 acres of reefs needed to complete reef construction in the Tred Avon River, with a cost ranging from $3 million to $5 million. She said the Corps headquarters provides no explanation for why projects are or are not included in the annual work plan.

Chris Judy, shellfish program director for the Maryland Department of Natural Resources, said state officials would work with the Corps to see "what the next steps are."

"This is exactly what we feared would happen … It's a real setback," said Allison Colden, senior fisheries

Oysters continues on page 9

Exelon sues MD, calls Conowingo requirements an 'unfair burden'

≈ State and utility at odds over who is responsible for pollution entering the Bay.

By Karl Blankenship

The owners of the Conowingo Dam and the state of Maryland have come to legal blows over whether the utility can be forced to pay potentially billions of dollars over the coming decades to help clean up the Chesapeake Bay.

The Maryland Department of the Environment in late April issued a decision that could require the Chicago-based utility to pay up to $172 million a year to help control nutrient and sediment pollution flowing past the Susquehanna River dam as a condition of it getting a new federal operating license.

In late May, Exelon fired back, saying those conditions imposed an "unfair burden" on the 94-foot-high hydroelectric facility that would cost $7 billion over the course of its requested 50-year operating license — a figure the company said was "orders of magnitude" more than the dam was worth.

It asked the MDE to reconsider its decision, and filed challenges in both state and federal courts. Exelon said it went to court at the same time it asked the MDE to reconsider its decision because of the "seriousness of the issues at hand."

"The dam itself does not produce any pollution," Exelon said in a statement issued May 25. "Rather, the science clearly shows that the pollutants that travel down the Susquehanna River, from New York and Pennsylvania, are the source of the nutrients and sediments that flow into the Bay."

In response, the MDE said it would "vigorously defend our comprehensive Conowingo plan to restore the river and the Bay. The Hogan administration is committed to using science, law and partnerships for environmental progress throughout the entire Chesapeake Bay watershed and the Conowingo plan is at

Dam continues on page 27

CHESAPEAKE BAY JOURNAL

BAY JOURNAL is published by Bay Journal Media to inform the public about ecological, scientific, historic and cultural issues and events related to the Chesapeake Bay. The BAY JOURNAL, circulation 35,000, is published monthly except in midsummer and midwinter. It is distributed free of charge. Bundles are available for distribution. Material may be reproduced, with permission and attribution. Publication is made possible by grants through the U.S. Environmental Protection Agency's Chesapeake Bay Program Office, the Campbell Foundation, the National Oceanic and Atmospheric Administration's Chesapeake Bay Office, the Sumner T. McKnight Foundation, the Rauch Foundation, the Fair Play Foundation, the Shared Earth Foundation, the Virginia Environmental Endowment, anonymous donors, and by reader contributions. Views expressed in the BAY JOURNAL do not necessarily represent those of any funding agency or organization.

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Bay Journal Media is a nonprofit 501(c)(3) organization with a mission to further public education and awareness of issues affecting the Chesapeake Bay and the mid-Atlantic environment by creating and distributing journalistic products. In addition to producing the Bay Journal, Bay Journal Media operates the Bay Journal News Service, which distributes BAY JOURNAL articles and original op-eds about the Chesapeake Bay or regional environmental issues to more than 400 newspapers in the region, reaching several million readers each month.

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Editor's Note

We'll be out but still about this summer

Summer is here, so it's time for our combined July-August issue which gives our staff a chance to unwind and head outside, (and our readers a chance to catch up with their *Bay Journals*).

We're leaving you with an issue packed with important stories.

The battle between Exelon and Maryland over how much the Conowingo Dam owner should contribute to the Bay cleanup effort has far-reaching implications for the Chesapeake. The Bay could use some help: The interim 2017 cleanup goal was missed, and the EPA is warning states — especially Pennsylvania — to ramp up efforts if they are to reach their 2025 objective.

But there is some good news. Dolphins are turning up in surprising numbers and in surprising places, while the invasive Chinese mitten crab doesn't seem to be turning up anywhere.

Last fall, Tom Horton and I sat down for a long chat with University of Maryland scientists Walt Boynton and Mike Kemp to talk about their long careers on the Bay, as well as the new signs of hope they see for the estuary in their most recent work, which has just been published. In this issue, Tom writes about their long careers in *Chesapeake Born*, while I write about how their work offers new hints of a Bay recovery.

If you're looking for something to do during the summer, we have an expanded five-page *Bulletin Board* section which offers all sorts of ideas.

While we hope to relax a bit, we'll also be keeping an eye on Bay developments, and posting new material as warranted on our website, at bayjournal.com.

There's several other ways you can keep up with us:

- Sign up for our weekly e-newsletter which each Monday presents everything posted to our website the previous week. Subscribe by going to our site, click the subscribe tab, and fill out the form. (You don't need to give up your hard copy subscription to get the newsletter).
- "Like" our Facebook page, which highlights all new Bay Journal articles as well as other content.
- Follow us on Twitter, which will keep you alerted to new website posts and other Bay-related information.

Welcome to Jeremy Cox

We recently welcomed Jeremy Cox to our staff. Our first reporter on the Eastern Shore, Jeremy comes to us from the *Daily Times* in Salisbury where he has worked since 2012. Jeremy has been covering issues affecting Maryland, Virginia and Delaware, and will help with our coverage of all three states.

Jeremy has been a reporter for daily newspapers since 2002, having previously worked for the *Florida Times-Union* and the *Daily News* in Naples, FL. He's been writing about the Bay since coming to Salisbury, but has plenty of previous environmental reporting; Jeremy won awards for environmental coverage while in Florida and participated in the production of a 15-part series about the Gulf of Mexico while at the Naples *Daily News*.

Jeremy will continue to teach a course in journalism at Salisbury University where his wife also teaches journalism.

— Karl Blankenship

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Clockwise from left:

Guide Bill Burnham explains the wonders of the Onancock Creek (VA) ecosystem to young paddler Charlie Cox. See article on page 30. (Dave Harp)

Mahan Rykiel's Isaac Hametz forges his way through vegetation blocking access to Clement Cove on the north side of Fleming Park, where the local community is behind a plan to use dredged materials to restore the area. See article on page 22. (Dave Harp)

These dolphins were photographed near the mouth of the Potomac River where it empties into the Bay. Dolphins started showing up in Bay waters earlier than usual this spring. See article on page 20 and related quiz on page 34. (Potomac-Chesapeake Dolphin Project, taken under NMFS Permit No. 19403)

WHAT'S INSIDE

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Alliance to honor environmental leaders at annual Taste gala

BY KATE FRITZ

The Alliance for the Chesapeake Bay's annual Environmental Awards and *Taste of the Chesapeake* are just around the corner! This year, our hallmark community gathering takes place Sept. 13 on the Belcher Pavilion's rooftop Conference Center at the Anne Arundel Medical Center in Annapolis.

At the *Taste*, the Alliance, its partners and supporters recognize progress in Chesapeake restoration efforts and celebrate outstanding environmental leaders from across the watershed.

Our top honor, the Frances H. Flanigan Environmental Leadership Award, was established in 2001 in recognition of Flanigan's 23-year career of leadership and partnership-building as the Alliance's executive director. It commends an individual whose longstanding commitment to the Bay's restoration and protection reflects the Alliance mission of fostering diverse partnerships and inspiring environmental stewardship.

The 2018 Environmental Leadership Award honors Nick DiPasquale.

Nick served as director of the U.S. Environmental Protection Agency's Chesapeake Bay Program from 2011 until his retirement in December 2017. He has a vivid memory of what inspired his passion for the environment and remembers exactly where he was the first time he read Rachel Carson's *Silent Spring*. The threat of a spring where no songbirds would sing spurred him to personal action.

Nick's career started when he enlisted in the Navy where he helped to pilot nuclear submarines for six years. There, he began to realize what nuclear energy actually meant to the environment, and upon leaving the Navy, became director of Missouri's Solid Waste Programs.

He next took the post of Delaware's director of Air and Waste Management, before being named secretary of the state's Department of Natural Resources and Environmental Control. It was here, he said, that he "started to appreciate the totality of the environment, not just one piece of it."

Nick's enthusiasm and forward thinking continued during his term at the Chesapeake Bay Program. He said his proudest achievement is the 2014 Watershed Agreement, the first Chesapeake Bay agreement to contain measurable goals and outcomes. He said that he believes the indicators are, for the most part, heading in the right direction toward improvement.

Nick's passion to help ecosystems and habitat during his 30-plus-year career persists in his retirement. He is on the advisory board of ShoreRivers and Chesapeake Legal Alliance, and shares his wisdom during lectures at universities around the watershed. Nick emphasizes that ecosystems respond over a period of years, even decades, and not minutes or months. He believes in a proactive, rather than reactive, approach, which has led to a collective hope of restoring the Bay by 2025.

Clockwise from top left:
Nick DiPasquale (Dave Harp)
Scotty Guinn Dilworth (Submitted)
Matt Kofroth (Submitted)
Beau Breeden (Submitted)

Nick is as resilient as the ecosystem he so enjoys, and won't stop fighting on the Chesapeake's behalf.

We also honor three Watershed Champions for their outstanding contributions of innovative thinking, initiative and the development of impactful partnerships to advance stewardship throughout the Chesapeake region.

Beau Breeden's volunteer work on behalf of his community and the Magothy River make him a true Watershed Champion! He works full-time — as a volunteer — on behalf of the Magothy River. The son of a Navy commander, Beau's love of the water started early in his childhood. His family moved six times by the time he was 9. Once his family landed in Cape St. Claire permanently, he began his lifetime work to improve his forever home for generations to come. Beau was one of the youngest presidents elected to the Board of Governors for Cape St. Claire in 2014, and many of the 8,000-resident community jokingly refer to him as "The Mayor."

Inspired by the peacefulness of the water, the plentiful community beaches and local crabs, Beau's devoted thousands of hours to volunteering in the last six years, including helping with the Alliance's Project Clean Stream cleanups. He coordinated with the Alliance in the implementation of a $100,000 grant from the Maryland Department of Natural Resources' Governors Green Challenge Grant to restore Lake Claire. His participation goes beyond the grants: community volunteer events to clear invasive species; the securing of open burn permits to fight invasive phragmites; and multiple native tree and shrub plantings in the community's stream valleys.

Always seeking the next opportunity to help, Beau is looking at public-private partnerships to help fund seven restoration projects totaling nearly $6 million in Cape St. Claire, where the goals are to save, restore and improve community property that impacts the Magothy.

Scotty Guinn Dilworth's expertise in creating and maintaining resilient and sustainable native plantscapes, rain gardens, pollinator gardens, meadows, and green roofs makes her a worthy recipient of the 2018 Watershed Champion Award. Scotty is a certified Chesapeake Bay landscape professional, Virginia Certified Horticulturist, certified rain garden installer and certified green roof installer. She also works with the Richmond nonprofit Tricycle designing pollinator gardens and urban farm sites. Over the years has worked with hundreds of volunteers to create and maintain multiple sites for Tricycle and their partner organizations.

In 2016–17, Scotty designed and installed green infrastructure practices at Binford Middle School, Boushall Middle School and the Neighborhood Resource Council as a part of the Alliance's River-Wise Education Program. She was part of a team tasked with creating a Green School Initiative and now leads several of Binford Middle School's green infrastructure installations, overseeing the project's budget, designing conservation landscapes, hiring subcontractors and managing vendors — all with a big smile! She is a true believer that collaboration makes a difference in watershed communities. Scotty has been a true friend to the Alliance as a creative, enthusiastic partner, providing amazing ideas and insight to our work. She has worked tirelessly to produce beautiful designs and ensure that they are installed correctly, on time and within budget.

Matt Kofroth's knowledge and "can do" spirit are at the heart of his local watershed work, and the Watershed Champion Award recognizes his incredible impact on each downstream neighbor who has benefited from the many projects and programs he's implemented. During his years of volunteering in watershed efforts prior to his work at the Lancaster County Conservation District, he steadily built a base of understanding about the improvements and best practices needed to help Lancaster County, PA, waterways. As the watershed specialist at the district for almost 20 years, Matt has coordinated volunteer monitoring programs, helped to organize local watershed associations, reviewed and written grants for restoration projects and created resources for county homeowners to improve their water use. His innovations in watershed education have empowered numerous volunteers to make a difference in their own watershed. Recognizing that one person can't do it all, he guides and serves as a resource to enable others to excel and complete goals broadening the ripples in the stream, so to speak. Matt has contributed to the Alliance's Pennsylvania work, including our READY program and Restoring the Octoraro Reservoir project, as well as serving as a guide for our state team in writing a watershed implementation plan. Matt has been involved in countless Alliance efforts and is a resident watershed expert for many groups in Lancaster County and beyond.

We invite you to join us at the 2018 *Taste* to celebrate these inspiring environmental leaders and to support the Alliance's critical Chesapeake restoration work. For information, visit allianceforthebay.org.

Kate Fritz is executive director of the Alliance for the Chesapeake Bay.

Ellicott City officials reflect on how to weather future storms

≈ As both development and weather become more intense, hard decisions will have to be made.

By Timothy B. Wheeler

As repair crews labored to clear mud and debris from Ellicott City's Main Street in late May, Jonathan Dillow led a team of scientists through the woods searching for clues to quantify the devastating flash flooding that had just ravaged the community for the second time in two years.

Stopping by a tree beside the now-placid Tiber River, Dillow peered at the trunk, then pointed to a green speck clinging to the bark several feet off the ground.

"I think I'm onto something," he called out. "A little bit of a shred of a leaf."

Like crime scene detectives, Dillow and his U.S. Geological Survey colleagues made their way to the historic mill town west of Baltimore a few days after the May 27 flood. They wanted to gather evidence, before it faded or washed away, to determine just how high the water rose and how fiercely it came roaring downstream before tearing through buildings on its way down Main Street to the Patapsco River.

Sarah Queen, hydrologic technician with the U.S. Geological Survey, pins orange ribbon to an apparent high-water mark of the May 27 flood in Ellicott City. Pink tape lower on tree trunk marked the water height of the 2016 flood. (Dave Harp)

The USGS team won't complete its calculations until later this summer. But Dillow said it was clear from the high-water marks they spotted in the stream valleys leading to town that the flood that Memorial Day weekend afternoon was even worse than the previous deluge on the evening of July 30, 2016.

That comes as no surprise. The National Weather Service reported that more than 8 inches of rain fell on Ellicott City in a couple of hours May 27, compared with 6 inches during the previous flood.

In any case, the community, which had been determined to return and rebuild in the wake of the first deluge, has been shaken by the one-two punch. Local officials are taking a harder look at Ellicott City's future in the face of climate change likely bringing more intense storms while development in the surrounding watershed increases runoff.

"There's some very large emotional, financial and political decisions to be made," said Jim Caldwell, Howard County's director of community sustainability. "There's a lot of work that needs to be done and a lot of soul-searching (by) folks that live there."

The first flood claimed two lives, damaged 90 businesses, displaced nearly 100 residents and put hundreds out of work. Main Street remained closed for two months so businesses, residents and government could repair buildings, utilities, streets and sidewalks. But by early this year, county officials said that 96 percent of the businesses there before the 2016 flood had returned, as had 72 percent of the residents forced to leave.

The May 27 flood hit days before a new emergency warning system could be activated, and it took the life of a 39-year-old National Guardsman swept away as he tried to rescue a shopkeeper. Many of the same businesses and homes got hit again, and the estimated damage to roads

Floods continues on page 6

FLOODS FROM PAGE 5

and other public infrastructure totaled $20 million, twice the toll of the 2016 flood.

The recovery this time has been quicker, at least superficially. Though 81 residents were still in temporary housing by late June, all but a block of Main Street was reopened to traffic and 10 of the 120 damaged businesses were up and running, according to Phil Nichols, Howard County's assistant chief administrative officer. But the similarity ends there. Some merchants have made it known they're relocating or closing for good. "What's changed now is there are a bunch of folks who are not coming back," said Howard County Councilman Jon Weinstein, who represents the Ellicott City area. "They've decided for a number of reasons (that) financially or physically, they can't come back."

After the 2016 flood, the county commissioned an engineering study to see what could be done to shield Main Street from more devastation. The consultant proposed $85 million in projects to reduce flooding severity, including creating or expanding three large stormwater retention ponds, an underground "pipe farm" to hold more water, and a variety of other measures to keep streams in their banks. County Executive Allan Kittleman included four of the flood mitigation projects in his fiscal 2019 budget at an estimated cost of $18 million.

But the new flood hit before any of those projects got off the drawing boards. Now, local officials, merchants and residents are pondering what more can be done to keep the nearly 250-year-old community viable in the face of more frequent severe thunderstorms, as well as how to better control runoff in the heavily developed watershed.

"It's a different conversation this time," Nichols acknowledged.

Ellicott City has been flood-prone since its founding as a grain mill community in 1772. It was built where four streams come together before flowing into the Patapsco River; some buildings actually sit atop stream channels. Over the years, Main Street has been inundated by floodwaters dozens of times, but there have been three major floods in the last seven years, including Tropical Storm Lee in 2011.

Many residents are convinced the flooding has worsened because of continued development of the heights above town. Roughly two-thirds of the land in the 11-square mile watershed is developed, and around 30 percent is covered by hard surfaces such as pavement and rooftops.

Weinstein agreed that development has aggravated flooding problems, given the age of the community. Roughly two-thirds of the homes and stores in the watershed were built before any stormwater management was required, he noted.

Ellicott City's Main Street was closed following the May 27 flood until authorities could clear debris and repair streets, sidewalks and utilities. (Dave Harp)

Main Street resident Joey Hamblin said he managed to get his vehicles to higher ground before floodwaters got too high, thanks in part to video cameras his landlord had put up to provide early warning after the 2016 flood. (Dave Harp)

"We have entire neighborhoods that don't have storm drains," he said. In the last few decades, runoff control requirements have become increasingly stringent, Weinstein said, but apparently weren't always applied. "In some cases," he said, "there were variances allowed that may not have been appropriate, given the sensitivity and topography of the watershed."

After the 2016 flood, Weinstein introduced legislation to impose a temporary, 12-month building moratorium in the Tiber-Hudson watershed while the county studied what could be done to reduce the risk of a repeat. But the council refused to act. Late last month, Weinstein reintroduced his moratorium proposal, and said he now expects the majority to back it.

"Before, it was primarily an issue with stormwater management," the councilman said, "but…it's become a public safety issue."

Weinstein added "that regardless of our current regulations, I'm not sure they're reflective of what's clearly a change in our weather patterns." The 2016 downpour was characterized as a 1,000-year rainstorm, meaning there's a one in 1,000 chance of it happening in any given year. Those long odds hit again on May 27.

Hours after a video of Ellicott City's recent flood went viral, Katharine Hayhoe, a climate scientist at Texas Tech, tweeted that the "U.S. Northeast has seen the greatest increase in heavy precipitation of any region in the country."

High-intensity, heavy rainfall events have increased in frequency in the Northeast by 71 percent from 1958 to 2012. The Maryland Commission on Climate Change has warned that in developed areas, "large quantities of runoff may quickly overwhelm the capacity of stormwater drainage systems."

It's not just an Ellicott City problem. Intense storms elsewhere around the same time produced severe flooding in Frederick and Washington counties and in Ocean City.

"It's happening all over," Weinstein said, adding that he wants county officials to re-examine the consultant's study from the 2016 flood to see if the latest storm changes or adds to the list of proposed mitigation projects.

But while flood controls may be upsized or tweaked to capture more runoff, Weinstein said he doesn't see that as a cure-all. "If we get another 8.5–10 inches of rain in a couple-three-hour period I hate to say it, but there will be flooding."

He said he thinks it's time to take a closer look at future development and consider changes in where and how it occurs. "There are a few hundred units that are currently planned, and the ability to do up to 1,000 units," he said. "I'm not so much concerned about the unit numbers as the volume of imperviousness."

Caldwell, the county community sustainability director, said after the flooding caused by Tropical Storm Lee in 2011, he thought of three big changes that could help reduce damage from future storms – buying out some property owners and removing their buildings to open up the flood plain, "daylighting" stream channels now buried under streets and buildings, and getting vehicles off Main Street. During the 2016 flood and again in May, cars became battering rams as they washed down the street, and a few plugged up one of the culverts.

It's unclear if a vehicle ban on Main Street would fly with merchants and residents, but the idea of buyouts is at least being considered. "A lot more property owners have come to us as a result of this storm and asked us to purchase their property," Nichols said.

Weinstein said the decisions by some businesses and property owners to abandon Ellicott City, however painful, presents an opportunity to see if future flooding damage could be alleviated or even prevented by removing those buildings.

Meanwhile, Nichols said, the county is going ahead with the four projects already budgeted, and is taking another look at what else can be done.

What's clear, Nichols said, "Ellicott City is not going to look the same moving forward. …We definitely have a new future in front of us."

Some have suggested even more radical change, such as abandoning lower Main Street and converting it into a living history museum, sort of like Harper's Ferry, WV. But Weinstein said no one's seriously contemplating anything that extreme.

"It will change," he said, "but this town has changed a lot in the 250 years it's been around.…It's still the same town, and people who are here still feel the same."

Joey Hamblin typifies the grit and determination of many residents. As the USGS team worked last month to spot high-water marks for later surveying, Hamblin paused to chat while walking his dogs. His rented Main Street home got flooded in both storms, he said, though he had a little advance warning the second time, thanks to a network of live-streaming video cameras his landlord put up shortly before May 27. Hamblin said he's sticking around, despite the risk.

"We ain't going nowhere," he said. "[There are] three generations in that house. We're not leaving."

Feds give qualified OK to dredge oyster shells from Man O' War Shoal

≈ Move is opposed by some watermen, environmentalists, recreational anglers who say it will harm habitat for white perch, striped bass.

By Timothy B. Wheeler

After years of scrutiny, federal regulators have given a qualified green light to a controversial Maryland plan to dredge old oyster shells from an ancient reef near Baltimore — a project intended to enhance oyster habitat elsewhere in the Chesapeake Bay and help the sagging commercial fishery.

The Baltimore District of the U.S. Army Corps of Engineers issued a provisional permit on May 17 to the state Department of Natural Resources to take up to 5 million bushels of shells from Man O' War Shoal just outside the mouth of the Patapsco River and use the shells to replenish or rebuild oyster reefs at other Bay locations.

The Corps' conditional approval comes after nearly three years of effort by the DNR to address questions and concerns raised about the project, which is opposed by environmentalists, recreational anglers and even some watermen.

But now, having won the federal go-ahead, state officials appear in no hurry to act on it. They haven't even informed those in favor of dredging the shoals about the Corps' decision.

Lucidity Information Design, LLC

Man O' War Shoal harbors up to 100 million bushels of shells in its 446-acre footprint, according to a 1988 survey. Though productive long ago, it has relatively few live oysters now, despite repeated efforts to reseed it.

In a natural setting, baby oysters, known as spat, attach to and grow on other oyster shells. But with Maryland and Virginia both embarking on large-scale efforts to restore oyster reefs in a total of 10 Chesapeake Bay tributaries, there's a much greater need for shell substrate than in the past. With the commercial harvest today far smaller than it was decades ago, fresh oyster shells for reef replenishment are in short supply — and costly.

For that reason, the DNR wants the shoal's shells to replenish oyster reefs in waters open to commercial harvest, restore other reefs in sanctuary areas and help private oyster growers. State officials hope that once the newly issued five-year permit runs its course, they can renew it to take a total of 30 million bushels, or about 30 percent of the reef.

DNR officials — and some watermen — say the shell cache in Man O' War is just the ticket to rebuild the Bay's lost oyster habitat and sustain the traditional wild harvest.

"That's a lot of shell," said Talbot County waterman Jeff Harrison. It's far more, he noted, than watermen's groups have been able to buy from shucking houses to plant on harvestable reefs. Most of those plantings are funded publicly via the DNR, drawn from $2 million paid annually by the Maryland Port Administration to mitigate impacts of shipping channel-dredging in the Bay.

But anglers say that Man O' War is one of the best fishing spots in the Upper Chesapeake for white perch and striped bass, and that dredging could ruin it and the rich underwater habitat. Conservationists also argue that other materials can be used to rebuild reefs.

A recent report by the National Oceanic and Atmospheric Administration's Chesapeake Bay office points out that granite and concrete have been successfully used as substrate on reef restoration

Shoals continues on page 8

SHOALS FROM PAGE 7

projects, attracting abundant spat.

But many watermen believe that natural oyster shell is the best and only suitable substrate for reefs, and they persuaded the Hogan administration to delay work on a federally funded restoration project in the Tred Avon River because of its use of granite to build reefs. Ultimately, watermen and the DNR lifted their opposition to granite, but only for that project, after the Army Corps of Engineers warned that the work was in jeopardy because there weren't enough clam shells — the specified alternative — to finish in a timely fashion.

Opponents of dredging Man O' War vastly outnumbered supporters at public hearings in 2016 on the DNR permit application. Critics also warned that, even if dredging is approved, 5 million bushels of shell wouldn't be enough to meet all of the needs in state waters, especially if alternative substrates are ruled out. The DNR has estimated that about 11 million bushels would be needed over the five-year life of the permit for supporting reef restoration, replenishing harvest reefs and aiding aquaculture. That's more than twice the amount of shell the state is seeking to obtain at Man O' War.

Another issue is how the shell would be used.

Allison Colden, senior fisheries scientist with the Chesapeake Bay Foundation, acknowledged that the Annapolis-based environmental group once supported dredging Man O' War Shoal. But that was nearly a decade ago, she said, when the DNR specified that 90 percent of the shell to be taken would be used in restoring oyster habitat in sanctuaries.

In its latest application, the DNR has not spelled out how the shell would be distributed, offering instead three scenarios with widely different splits. Without assurances that the dredged shell would be reserved for restoration, Colden said, the CBF no longer supports it. And it makes no sense, she added, to whittle away one of the last large reefs sticking up off the bottom in the Bay to provide short-term relief for the commercial fishery.

"We are embarking on this large-scale effort to restore oyster reefs to what they used to be," Colden said. "That's our last remaining example of what oyster reefs can and should look like in the Bay."

In response to questions and concerns voiced by Corps reviewers, the DNR has tweaked and revised its dredging plans repeatedly since resubmitting them in 2015 — so much so that critics contend the project ought to undergo a fresh review.

As now planned, the DNR would extract shell using a hydraulic dredge to carve a total of 10 trenches, which would extend about a third of the way into the reef and measure about 500 feet wide, disturbing no more than 32 acres. The DNR agreed to steer clear of a 61-acre oyster sanctuary on one portion of the reef, even though it hasn't had any measurable oyster reproduction in recent years.

Some watermen claim that oyster shells, above, are the only suitable substrate for baby oysters, or spat, but monitoring on Harris Creek reefs built three years ago has found a much higher density of new oysters on granite reefs than on those covered with shells. (Dave Harp)

Among other conditions imposed by the permit are limitations on when dredging can occur. It's prohibited from Feb. 15 to June 15 to protect spawning migratory fish from the noise and turbidity generated by excavating shells from the bottom.

Dredging is also generally outlawed from June 1 to Sept. 30 to prevent harm to any wild oyster larvae or spat that might be in the water at the time. But the DNR can seek a waiver from the latter blackout if the dredged shell is to be immediately planted at sites that are expected to take advantage of natural oyster reproduction, according to Sarah Lazo, spokeswoman for the Baltimore District.

Under the terms of the permit, the DNR would be required to spend the first year monitoring water quality and fish populations around Man O' War, after which it could dredge 2 million bushels. There would then be a two-year hiatus for more monitoring and analysis and, if that showed no harm, the DNR would be allowed to dredge another 3 million bushels by the fifth year. If all goes well, the DNR could then apply to continue dredging for a total of 30 million bushels.

Chris Judy, the DNR's shellfish division manager, said state officials hadn't announced the Corps' permit approval or even notified stakeholders because they considered it "pre-decisional" until it receives approval from state agencies.

The Corps specified that the permit won't take effect until and unless the Maryland Department of the Environment provides a certification that the project won't harm water quality or coastal resources. The MDE said in October that it had made those determinations. But those certifications won't be made until the project receives a license from the state Board of Public Works.

The three-member board, made up of Gov. Larry Hogan, Comptroller Peter Franchot and Treasurer Nancy Kopp, decides whether to grant state licenses to dredging projects such as this. The board issued a request for public comment on the Man O' War project in November but has yet to set a date for deciding the case.

"I don't think that it will move forward in the near future," said William Morgante, the board's wetlands administrator. When asked why, he said he'd have to get guidance on what more he could say. He later referred further questions to the board members.

Amelia Chasse, the governor's communications director, said that the Hogan administration continues to support dredging shell from Man O' War Shoal.

"Some local stakeholders have raised questions to the Board of Public Works," she added, "and we are working to look into their concerns and attempt to resolve them so we can move forward with this important project." She provided no specifics.

Len Foxwell, the comptroller's chief of staff, said Franchot has already made clear his opposition to dredging Man O' War out of concern for the project's ecological impacts.

Suzanne Brogan, deputy state treasurer for public policy, said Kopp had also raised concerns about dredging the shoal after meeting with the DNR secretary and recreational fishing and conservation groups opposed to the project.

Harrison, the waterman, suggested that given the controversy around the project, the Hogan administration may be holding off on pressing for board action until after the election. But he said Maryland's oyster industry needs help now, as the wild harvest has declined significantly over the last three years.

"I don't want to wait for anything," he said. "I wanted it to happen last year."

Oysters from page 1

scientist with the Chesapeake Bay Foundation. "We have people willing and ready to plant oysters there, and there's no progress to be made."

As part of the federal-state Bay restoration effort, Maryland and Virginia each have pledged to rebuild oyster habitat and populations in five of their tributaries by 2025. Maryland has completed one — Harris Creek — with work ongoing in the Tred Avon and Little Choptank rivers. The Little Choptank restoration is state-funded. Late last year, the DNR identified its last two tributaries to undergo restoration work, the St. Mary's River and Breton Bay.

The lack of federal funding will not only delay completion of oyster restoration work in the Tred Avon, but it could also postpone planning a similar project in Breton Bay, which state officials have said they would like to be federally funded. Federal agreement to take on the project depends on surveys under way to determine if water quality and bottom habitat are sufficiently good to support restoration.

Colden said the loss of funding has its roots in disputes in Maryland over the use of granite and other alternative substrates to build oyster reefs in the Tred Avon and other tributaries

From the mid-1990s through 2016, the Army Corps regularly received funding to build oyster reefs in the Bay. Cumulatively, the Baltimore District got $29 million, while the Norfolk District of the Corps got $22 million, according to Cardin's office. But the annual flow of funding ended when then-President Barack Obama requested no money for oyster restoration in the Corps' fiscal 2017 federal budget.

That cutoff came on the heels of the Hogan administration's call to halt work in the Tred Avon. A small group of watermen complained in December 2015 to Lt. Gov. Boyd Rutherford about the use of granite in restoration projects there and in Harris Creek. The watermen complained that granite reefs snagged crabbing gear and that improperly constructed granite reefs in Harris Creek were damaging boats.

The watermen also contended that reefs should be made exclusively of oyster shells, arguing that those are the only suitable surface on which spat, or baby oysters, can settle and grow. Scientists say research has shown that oyster spat will do well on other hard surfaces in the water, and monitoring on Harris Creek reefs built three years ago has found a much higher density of new oysters on granite reefs than on those covered with shells.

The Hogan administration lifted its hold on the Tred Avon project in 2016, and work resumed in April 2017, more than a year after it had been interrupted. But the state insisted at the time that the Corps not use any more granite in constructing reefs. So the Corps opted to build the remaining reefs with clam shells from a processing plant in New Jersey. But the contractor hired for the project couldn't get enough shells, and only six of the 10 acres of reefs planned that year were completed.

Last November, Col. Edward Chamberlayne, the Baltimore District's commander, made a personal appeal to the DNR Oyster Advisory Commission, warning that the Tred Avon project and future federal funding for any other oyster restoration were in jeopardy if the state did not relent in its opposition to the use of stone in building reefs. Oyster shell is too scarce and expensive to be used for such large-scale construction projects, Chamberlayne explained, and there aren't enough clam shells, either.

By that time, delays and construction interruptions had added $133,000 to the $11.4 million estimated overall cost of the Tred Avon project. If forced to continue using only clam shells, Chamberlayne warned, it could take another four to five years to finish the job — and at that rate, he added, Congress and Corps leadership may be unwilling to keep funding oyster restoration.

The Oyster Advisory Commission responded by recommending that the Corps be allowed to use stone to finish the Tred Avon reefs. The four acres of reefs left from last year were completed in March, but 45 more acres of reefs are needed.

After the funding cutoff initiated by the Obama administration, the Trump administration has not included oyster restoration in the Corps budget for fiscal 2018 or 2019. Cardin, Van Hollen and others in Congress had hoped to remedy that by appropriating more money for the Corps and by explicitly supporting oyster restoration.

Angela Sowers, a water resources management specialist with the Corps' Baltimore District, informed the advisory commission that the Tred Avon project is on hold for now.

"We found out just today that we are not getting any funding this year to do that work," she said. "So, the next opportunity will be next year."

Lazo, the Baltimore District spokeswoman, said District officials have a chance to seek oyster restoration funding in the Corps' fiscal 2019 work plan, assuming Congress can come together to pass a budget for that year. Army Corps Headquarters is required to annually submit a work plan to Congress after a budget passes. Working with the Office of Management and Budget, Corps leaders determine how to spend discretionary funds not specifically designed for projects listed in the budget.

Bay scientists: Offshore oil drilling would put Chesapeake Bay at risk

≈ Many fear a spill would be inevitable and could reach the Bay and its resources under the right conditions.

BY JEREMY COX

After the Trump administration proposed allowing oil and gas exploration off the East Coast in January, the debate has largely focused on the potential harm to the Atlantic Ocean's water quality and marine life.

That is, after all, where any new oil rigs would sprout if the administration has its way.

But what about impacts to the Chesapeake Bay? Could the United State's largest estuary — the subject of a federal and multi-state program centered on reducing nutrient and sediment pollution — be at risk?

Yes, say some of the Bay's top scientists.

"I don't think there are any places in the world where they have developed oil and gas where they have been able to avoid spills," said Carl Hershner, director of the Center for Coastal Resources Management at the Virginia Institute for Marine Science.

The Bay's inland location may not help to shield it from oil pollution. Its water is linked to that of the Atlantic, and the effects of an offshore oil spill could be shared with the Chesapeake, scientists say.

The five-year offshore leasing proposal calls for opening not only the length of the Atlantic Seaboard but also virtually all other U.S. coastal waters to oil and natural gas exploration and potential drilling. A final decision is expected this fall and could go into effect as early as 2019.

The administration argues that expanding offshore leasing opportunities could relieve some of the country's dependence on foreign oil and pour billions of dollars into the economy. Offshore sources currently represent 18 percent of the domestic production of oil and 4 percent of natural gas.

Increased offshore oil production also could be an indirect boon to Bay restoration. Portions of federal receipts from offshore drilling flow into the Land and Water Conservation Fund, which provides matching grants to state and local governments, as well as funds to federal agencies to acquire land for public recreation and the protection of natural resources.

All of the governors in the Bay watershed's coastal states — Maryland, Virginia, Delaware and New York — formally denounced the administration's proposal. Keying in on Interior Secretary Ryan Zinke's public vow to nix Florida from consideration, several states have asked for the same treatment.

For clues about what might happen to the Bay, look no further than the Gulf of Mexico's Deepwater Horizon spill, said Don Boesch, a marine scientist and former president of the University of Maryland Center for Environmental Science. Above, fire boat response crews battled the blazing remnants of the oil rig Deepwater Horizon off the Louisiana coast in the Gulf of Mexico, April 21, 2010. . (U.S. Coast Guard)

House Republicans are fighting back, proposing in May that states attempting to block the administration's move face a fee equal to at least one-tenth the government revenue the lease would have generated.

Dr. Brian Stacy, a National Oceanic and Atmospheric Administration veterinarian, prepares to clean an oiled Kemp's Ridley turtle after the Deepwater Horizon event. The animal was one of many young turtles captured 20–40 miles offshore as part of animal rescue and rehabilitation efforts. Will Baker, president of the Chesapeake Bay Foundation, noted that "One ill-timed oil spill in the (Chesapeake) region could wipe out an entire year-class of Chesapeake blue crabs." (NOAA & Georgia Department of Natural Resources)

Off the mid-Atlantic coast, oil drilling would likely take place dozens of miles offshore along the Outer Continental Shelf, experts say. But under the right meteorological conditions, wind and ocean currents could carry a large spill into the mouth of the Bay and beyond, perhaps as far north as Baltimore, Hershner said.

If that happens, expect a "significant environmental impact" that would be impossible to clean up entirely and linger for several years, he added.

For clues about what might happen to the Bay, look no further than the Gulf of Mexico's Deepwater Horizon spill, said Don Boesch, a marine scientist and former president of the University of Maryland Center for Environmental Science.

In 2010, a BP rig exploded 50 miles off Louisiana's coast, killing 11 workers and unleashing 4 million barrels of oil into the Gulf's waters.

The environmental effects ranged widely immediately after the spill. There was a substantial rise in dolphin and sea turtle strandings, a large die-off of seabirds and a temporary shuttering of the commercial shrimp fishery.

Portions of the spill floated north, covering nearly 1,400 miles of coastline from Texas to the Florida Panhandle, exacerbating the decline in salt marsh set into motion by sea level rise, scientists discovered. By one study's estimate, as much as 40 percent of the oil settled onto the seafloor, damaging coral reefs and other bottom-dwelling creatures. Tourism industry economic losses in the region were estimated as high as $22.7 billion.

An Atlantic spill, if it were to happen, almost certainly would be of a smaller scale, Boesch said, because drilling there would be in much shallower waters. The weight of deeper water, like the 5,000-foot depth where Deepwater Horizon operated in the Gulf, exerts more pressure on subterranean oil, increasing the potential intensity of a blowout.

The Chesapeake Bay Foundation, an early and tenacious advocate for restoring the Bay, stands firmly against offshore drilling.

A spill would be especially devastating to blue crabs, said Will Baker, the group's president. During the early stages of their lives, crabs float out of the mouth of the Bay into the Atlantic's waters. The larvae then develop fins and make their way back into the estuary.

"One ill-timed oil spill in that region could wipe out an entire year-class of Chesapeake blue crabs, and that would be a disaster," Baker said.

Once spilled, oil is extremely difficult to clean up, Hershner said. Dispersants can break down lighter chemicals at the surface, but they have environmental consequences of their own. And sending crews to physically remove oil from slick-covered marshes can cause more harm than good, he said.

"The bottom line is [that] once you've spilled the oil, it's out there and it's going to have an impact," Hershner said, adding that, in many cases, it may be best just to allow the oil to break down over time on its own.

Boesch, who has been studying the Bay for nearly three decades, said the potential environmental costs of drilling for oil in the Atlantic far outweigh the economic benefits.

OIL CONTINUES ON PAGE 11

Oil from page 10

"Why are we having all these fights when the resource base is not so huge and takes so long to bring on line?" he asked.

Although the federal government is working to finalize its offshore leasing program by this fall, it would likely take at least another 15 years for companies to start extracting oil.

Any oil operation would have to undergo a lengthy federal review. What's more, companies would have to perform seismic tests to determine whether the oil is available in large enough quantities to justify a multibillion dollar effort to bring it to the surface.

So far, drilling in mid-Atlantic waters has fueled little commercial interest. The only federal leases for the area were sold from 1976–1983. Companies drilled dozens of wells, but all were abandoned for lack of commercial returns.

But interest has continued flaring off and on over the years, typically in concert with the price of crude oil.

About 2.4 billion barrels of oil and 23 trillion cubic feet of gas can be recovered off the mid-Atlantic, a region stretching from the Delaware Bay to the North Carolina-South Carolina border, according to U.S. Bureau of Ocean Energy Management estimates.

Those totals are dwarfed by the 45 billion barrels of oil and 130 trillion cubic feet of gas available for potential lease beneath the western and central Gulf of Mexico, the only areas off the continental United States where offshore drilling is currently permitted.

Oil from the Deepwater Horizon oil spill approaches the coast of Mobile, AL, May 6, 2010. "I don't think there are any places in the world where they have developed oil and gas where they have been able to avoid spills," said Carl Hershner, director of the Center for Coastal Resources Management at the Virginia Institute for Marine Science. (© Petty Officer 1st Class Michael B. Watkins / U.S. Navy)

Oil industry advocates, though, argue that the mid-Atlantic's waters probably yield far more energy than those estimates suggest. Since the most recent seismic surveying took place in the early 1980s, technological advances have enabled companies to pinpoint oil reserves in many places previously thought to contain no oil, said Dan Kish, a senior fellow at the Washington DC-based Institute for Energy Research.

"It may turn out there's nothing and everybody can settle down or it can turn out there are huge amounts," he said.

It's telling, he added, that the fiercest opposition to the Trump drilling plan has been tied to regions where oil rigs have never loomed on the horizon.

Residents along the western and central Gulf Coast, Kish said, "know about the trade-offs and the problems that can occur. They know about the terrible spill that happened with the BP Horizon. Yet they are very supportive of offshore drilling and exploration."

The backlash to the lease proposal shows no signs of letting up in the mid-Atlantic.

When Sen. Chris Van Hollen asked Zinke to exempt his home state of Maryland, as Zinke had done for Florida, Zinke responded that Florida is "a little different" because Congress has placed a moratorium on drilling in waters off the state's west coast. The ban, which expires in 2022, protects one of the largest military air and water training areas in the country.

But Zinke also ticked off several conditions that make Maryland's offshore area a poor candidate for drilling. There are no known oil reserves in its waters, and a lack of industry infrastructure on land ensures that ramping up production will be complicated, he said.

Further, state officials would have the final say over whether any oil collected offshore could be transported in state waters.

"I think you're going to be very happy with our planning process as we go through," Zinke told the Democrat.

Scientists scrutinize virus, contaminants in smallmouth bass die-off

≈ With multiple stressors present in dead fish, federal researchers try to determine if chemicals in the water made bass more vulnerable.

BY DONNA MORELLI

Biologist Vicki Blazer sorts slides holding tissues of smallmouth bass from the Susquehanna River in Pennsylvania. At the USGS Leetown Science Center near Kearneysville, WV, she's studying the effects of parasites, disease and contaminants on young fish. (Dave Harp)

For more than a decade, biologists have been picking away at a mystery: What caused a years-long decline of smallmouth bass in Pennsylvania's Susquehanna River starting more than a decade ago?

Some think they may have finally cracked the case. The results of recently published research, lauded by some as "the smoking gun," points to a virus once thought not to affect smallmouth bass. In a series of laboratory experiments, scientists from Michigan State University found that largemouth bass virus can indeed be fatal to young smallmouth bass.

Others are not ready to stamp "case closed" on the mysterious die-off, saying the full explanation is much more complicated.

Biologist Vicki Blazer of the U.S. Geological Survey Leetown Science Center is one of them. Blazer has been leading a long-term study of wild bass from the Susquehanna. Her team of federal and state researchers has been working on the premise that multiple infections of disease and parasites caused the widespread deaths of young smallmouth bass that was first observed in 2005.

Those infections, she argues, may have been triggered by a brew of chemicals polluting the Susquehanna that weakened fish immune systems.

"The bottom line was, from site to site, there was no one pathogen that we were finding," Blazer said. "Most of the places that had mortality had multiple pathogens. That led us to think that something was going on to be immunosuppressing those fish and making them more susceptible to disease."

That's not to say that largemouth virus isn't the cause of the fish kills.

"The research has shown that the largemouth bass virus is capable of killing smallmouth bass at water temperatures that continue to exist in the Susquehanna," said Coja Yamashita, a fisheries biologist with the Pennsylvania Fish and Boat Commission who worked with the Michigan lab during the study. "The virus is one piece of the puzzle, just a much larger part than we originally thought."

Yamashita said that while there's no way to remove the virus from the river, educating anglers and boaters is needed to help stop its spread. The virus was most likely transported by boats and equipment from other waters into the Susquehanna.

"As far as what Vicki Blazer is doing, there's no doubt that contaminants in the water aren't helping the situation," he said. "Identifying which toxins are the worst for fish health — that's something we can do something about."

A new technique to analyze the immune response in fish tissue is helping Blazer's research.

Using the new process, Blazer's team can expose the tissue of healthy, laboratory-raised fish to one stressor at a time — whether chemical, parasite or disease —and view the type of cells that it produces. Researchers compare the results with fish tissue collected in the wild to gauge the severity of the effects each stressor has on the ability to fight disease. The process may also reveal whether certain stressors play a larger role in immunosuppression.

"It is very complicated to understand these things in the wild," Blazer said. "But until you start looking at them in the wild, we will never understand them."

When the problem first became evident in 2005, young fish hatched in the spring were found dead and dying in July and August in the middle and lower sections of the river. The number of young that never grew to adulthood led to fewer fish being "recruited" into the population, said Geoff Smith, Susquehanna fisheries biologist for the Pennsylvania Fish and Boat Commission.

"This was not a typical crash," Smith said. "Populations bounce back pretty quickly. What happened in 2005 was not a one-off thing. We were waiting until the next year for it to be all over with, but it [was not] over by 2006 or 2007."

The affected area stretched nearly 100 miles from the confluence of the West and North branches to York Haven near the Maryland border. Deaths also occurred in the lower Juniata River, the Susquehanna's largest tributary.

To stem the loss, the Pennsylvania Fish and Boat Commission allowed only catch-and-release fishing for smallmouth bass starting in 2011. The next year, the commission also banned fishing during the spawn, when female bass lay eggs and males guard the nest — to alleviate the stress of being hooked while reproducing.

The population began to rebound in 2016 but, as with the deaths, the cause is unclear. According to annual commission surveys, the prevalence of disease and parasite infections has declined in the last five years, and more fish are surviving past their first year. From 2005 to 2012, up to 70 percent of the fish surveyed were visibly sick, compared with up to 10 percent from 2013 to 2018.

Biologists sampling the river with electrofishing gear saw nearly four times as many adult smallmouth bass last year in the middle Susquehanna than in any one year since 2005.

The U.S. Environmental Protection agency gathered experts in 2015 to brainstorm theories on the possible causes of the population crash. Participants came from state and federal government, nonprofit organizations and academia. Using available data and research, the group narrowed down the likely causes to the presence of endocrine disruptors — many of which originate in pharmaceutical and health care products— and herbicides in the water, as well as pathogens and parasites.

Blazer led a group of researchers from 2007 to 2012 who examined Susquehanna smallmouth collected from four basins of the river. A paper compiling those data was published in April, about the same time as the Michigan State University study.

Research from the Blazer team established that the 2– to 3-month-old fish had been exposed to a plethora of substances, diseases and parasites. The diseases ranged from parasitic flat worms, commonly found in rivers, to multiple bacterial infections and largemouth bass virus. Few young fish were found with only one infection; in fact, many had three or more different infections.

Passive water monitors collected samples at the same time fish were collected in spring and early summer. Thirty-four chemicals were found in the water. Of those 34 chemicals, 32 were found in the tissues of fish. Some contained as many as 10 to 34 compounds.

Blazer still sounds surprised when she talks about the amount of contaminants picked up by these fish. "Remembering these fish are only 2– to 3 months old, they are accumulating contaminants very quickly," she said. "Yet we don't know, what is the level of a PCB or a pesticide that is going to cause disease?"

Blazer and her team found that the number of "co-infections" differed between sites on the river. Also, the fish with more diseases also had a greater number of chemicals in their tissue. For example, young-of-the-year from the Juniata River and lower and middle Susquehanna River had both more co-infections and more agricultural chemicals than those in the West Branch. Fish from the West Branch and its tributaries had some of the lowest rates of co-infections, skin lesions and infections, and there were fewer hormones and agricultural chemicals in their tissue.

BASS CONTINUES ON PAGE 13

Bass from page 12

The results of these tests were compared with those of fish collected from a test pond, where no disease has been reported. The fish collected in those waters had a much lower occurrence of disease and contaminants.

"Throughout this whole process, we've come at the problem with the assumption that this is the link, that there is some kind of immunosuppression," said Smith, the Fish Commission biologist. "They didn't have a way to test that, until now."

According to Blazer, there are 400 different types of land-use attributes in the Susquehanna River valley. From the small river towns on the Juniata River to the cities of Harrisburg, York and Lancaster along the lower Susquehanna, stormwater runoff carries debris and chemicals into waterways.

Staff from the USGS are compiling and mapping the data on each of those land uses — including pesticide, herbicide and fertilizer use — to compare them with the results of water quality sampling that will take place every two weeks this summer. This information will be further combined with weather data, to examine the impacts of stormwater runoff, as well as new data gleaned from studies on stressors to young fishes' immune systems.

The goal is to cross-reference what happens on the land with the presence of chemicals in both water and fish tissue.

Added to this round of research is the examination of nutrient levels in the water. An abundance of nutrients can affect which organisms thrive and which ones suffer, including algae and bacteria. Nutrients can also cause infections within the fish to grow faster, further degrading their tissue.

Nutrients, combined with warm summer weather and the relatively shallow waters of the river, create the perfect recipe for an explosion of some pathogens that could compromise fish health. In fact, in 2005, fish commission biologists first thought that the bass were dying from an outbreak of *columnaris* — a common infection fish contract when water is low and warm. That year the water was low enough to reach 85 degrees in the summer. It also followed two years of high rain — and increased runoff. *Columnaris* was found in the earlier study but never by itself.

Young smallmouth in an experimental pond at Leetown Science Center are used to compare tissue samples with other smallmouth bass caught in the Susquehanna River that experienced unusually high mortality rates for a period of time. All fish are captured and humanely euthanized to look for pesticides, herbicides, parasites and diseases in the tissue of various organs under a microscope. (Dave Harp).

Researchers will also explore whether young, contaminated fish are born from contaminated eggs or whether they acquire the contaminants from the water column. Some chemicals, like the herbicide atrazine, do not build up in fatty tissues like eggs. If a fish tests positive for atrazine, then it came from the water column.

But tracking the source of contaminants is still difficult; the pollutants may not originate in areas of the river where the fish are found. Adult bass tend to move long distances, Smith explained. A female who breeds in the river near Harrisburg could potentially carry her eggs to another river segment and bring the contaminants with them.

Blazer's team is trying to pinpoint what management options could possibly relieve some of the stress on the fish. In looking at many risk factors at once, Blazer said, the possibility increases of learning which pollutants or diseases have the greatest impact on smallmouth bass — if any.

People get caught up in finding a single cause, Blazer said, but "from what our data tells us, there is not one cause. I just hope I get to finish this thing before I retire."

Debate ensues over role of tree clearing in Fones Cliff landslide

≈ 100-foot-plus slide occurred along section where trees had been cut down without required permit, protections along historic site.

By Whitney Pipkin

A landslide on a historically significant stretch of Fones Cliffs in Virginia has sparked debate over whether a developer's land clearing caused a strip of remaining trees to topple into the water more than 100 feet below.

A swath of the cliffs that form the northeast bank of the Rappahannock River near Warsaw sloughed off into the river at the end of May after several days of rain. The landslide occurred on the edge of a property where more than 13 acres had been cleared of trees in the fall of 2017 without the required environmental protections in place. Some groups argue that the clearing caused the landslide, but regulators say it is difficult to pinpoint an exact cause at a site where several factors contribute to erosion.

Conservation organizations have spent more than a decade trying to protect the land along the 4-mile stretch of cliffs, which have remained largely undeveloped for 400 years and are home to high concentrations of eagles. When a Richmond County board rezoned the property in 2012 and 2015, its members vowed to keep a close eye on a pair of projects whose backers said they would be protective of the environment.

Those who oppose the larger of those projects — a 1,000-acre luxury golf course planned by the Virginia True Corp. along the cliff's edge — were quick to call the landslide evidence that the flawed land clearing process has hastened erosion. County and state officials, as well as shoreline erosion experts, though, said that while the clearing could have contributed to the landslide, more than 10 inches of rain over several days in May might have been too much for the site to absorb regardless of the recent tree loss.

The landslide, covering a 120-foot-wide section of the cliffs, came to the attention of the Friends of the Rappahannock on May 22, when a local waterman photographed the landslide and sent the image to Richard Moncure, the group's tidal river steward. The photo showed toppled trees, laying with their crowns in the water at the bottom of a freshly scoured cliff face.

The Friends of the Rappahannock used drones and a small plane to take aerial photos soon after the landslide occurred that showed the proximity of the cleared land to the landslide which, they said, was "no coincidence." Moncure also took guests onto the river to view the erosion first-hand: Richard English, Richmond County's environmental compliance agent, and Jeff Howeth, an engineer hired by Virginia True to get the property into compliance.

An aerial photo taken on May 24 shows the proximity of a landslide at Fones Cliffs to an area of land that was cleared of trees in the fall of 2017. River advocates are concerned that the clearing, associated with a proposed luxury golf course development on the property, contributed to severe erosion on the vulnerable, 100-plus-foot cliffs. (Courtesy of Friends of the Rappahannock)

English wrote in a report that the landslide occurred below a section of the property that had been cleared, where runoff can flow in sheets through a 50-foot-wide forested area on the cliff's edge. A portion of the silt fencing that had been erected to prevent runoff in that area failed because it was not designed or required to withstand the high volumes of rain, English wrote in the report.

"The cause of the erosion of the cliffs during these latest rain events cannot simply be pinned down to be completely natural or completely man-made," he wrote. "The change in the land cover condition most likely did play a factor, it's just very difficult to say to what extent."

The county issued a stop work order at the end of November after finding that the property owners had begun clearing trees without attaining the required permits, which would have included measures to prevent runoff and erosion. Virginia True's owners have been working with contractors since then to erect silt fencing, catch sediment and grow grass on the property to prevent polluted runoff, regulators say.

County administrator Morgan Quicke said that the erosion and sediment control plans for the project, which the county oversees, have been approved, and the stop work order was lifted earlier in May — though additional permits will be required for clearing or construction to take place.

An inspection report completed by English on May 24 states that sediment control measures on the site had failed and the problems would need to be corrected. Howeth, the engineer, did acknowledge that changes in land use could have contributed to the slide but attributed it primarily to soils that had become saturated with rain.

Ann Regn, a spokeswoman for the Virginia Department of Environmental Quality, said state inspectors found rainfall overwhelmed the silt fences in several places but didn't attribute the sloughing to those shortcomings alone. Inspectors saw no evidence, for instance, of runoff scouring out large quantities of soil, and they cannot say for sure that the land clearing caused the cliff face to slough off.

The agency issued two notices of violation to Virginia True earlier this year, the second of which included undisclosed fines and a consent order, after the clearing proceeded without a stormwater management plan. Regn said the site's plan was finally approved on June 21 and a consent order was signed that will go out for public comment on July 9.

Moncure said he remains concerned that, even if the proper controls are in place to prevent stormwater runoff and erosion while the land is being developed, "a silt fence isn't a suitable replacement for the forested buffer that had protected that area of the cliffs before the clearing."

Michael Vanlandingham is a shoreline engineer with the Virginia Department of Conservation and Recreation's Shoreline Erosion Advisory Service, which provides free consultations to landowners looking to prevent erosion. He completed a report for the Virginia True property in January that recommends that the property owners either stabilize the cliffs with costly engineered solutions at their base or keep any development 280 feet away from the edge of the cliff and separated by a vegetated buffer.

The shoreline erosion report recommends the setback length be twice the height of the 140-foot bank to prevent erosion, and that stormwater be directed away from the bank with a piping system. The program does not have a regulatory role, but the recommendations come from a team of engineers, biologists and natural resource specialists.

None of the recommended steps were taken before Virginia True cleared land in the fall not far from the cliff's edge.

Vanlandingham said that Fones Cliffs features some of the steepest banks in Virginia, which will naturally try to erode back to a more stable slope.

"Leaving it in the wooded riparian condition that it was in is probably the best thing you can do, but it's been in that condition for a long, long time, and it's still erosive," Vanlandingham said.

"To stabilize and protect a shoreline, you need to address all the issues that are causing it to be erosive while also keeping in mind the owner's goals," he continued. "In the end, he's the person writing the check to stabilize the property."

Having a layer of Fones Cliffs slough off is exactly what advocates feared would happen after the land was cleared. Without the proper stormwater controls in place before the trees were removed, rainwater could easily pick up speed and sediment on the sloped landscape. The cliffs are composed of crumbly diatomaceous soils that are known for their instability as much as their orange-and-white beauty.

In their statement, the Friends of the Rappahannock urged officials to enforce existing regulations and bring the property into compliance to "create a level playing field for all land development activities."

Richard Pemberton, District 4 member of the county's Board of Supervisors, said in a statement that he is "deeply disappointed" that the project — permitted under a controversial rezoning approved by the board — has resulted in environmental damage.

Timothy B. Wheeler contributed reporting to this article.

Scientists predict 'dead zone' will be larger than average this summer

≈ Heavy spring rains flushed more nitrogen than normal into the Bay to fuel algae blooms

By Jeremy Cox

The Chesapeake Bay's infamous "dead zone" will be larger than average this summer, scientists suggest in a new forecast that breaks with a wave of encouraging signs about the estuary's health.

If their prediction is correct, 2018 will be the fourth year in a row that the size of the Bay's oxygen-starved area has increased. The forecasted expansion can be chalked up to nutrients flushed into the Bay during the spring's heavy rains, according to researchers at the University of Maryland Center for Environmental Science and the University of Michigan.

"The size is going to go up and down every year depending on the weather," said Don Scavia, a University of Michigan aquatic ecologist and one of the report's authors.

A dead zone is a popular term for waters that have no or very little oxygen. Fish tend to flee, and any marine life that can't escape — usually shellfish — could suffocate.

New evidence seems to arrive almost daily suggesting that humans are turning the tide against the Chesapeake Bay's many woes.

Despite recent good news about blue crabs and underwater grasses, scientists predict that the Bay's oxygen-starved dead zone will be larger in 2018. (Dave Harp)

Bay grasses are flourishing. Waters are less murky. Despite a harsh winter, the blue crab population's rebound appears undaunted. Officials and scientists at a press conference on June 15 celebrated the Bay's ability to maintain moderately healthy conditions in 2017 for the third year in a row.

But the dead zone has remained persistently large over the years, though it has been disappearing slightly earlier at the end of the summer.

According to the U.S. Geological Survey, higher than average spring rains brought more than 85 million pounds of nitrogen gushing into the Bay from the Susquehanna River, the primary source of nutrient pollution in the main portion of the Chesapeake. The Potomac River delivered another 30 million pounds to the Bay.

As a result, the dead zone is expected to be an average of 1.9 cubic miles this summer, a 5 percent increase over 2017, according to the forecast.

That area of "hypoxic," or low oxygen, water represents about 15 percent of the Bay's total volume. Those numbers haven't changed much over the years, said Jeremy Testa, an UMCES researcher and co-author.

Dead zones form when rain washes nutrients into large bodies of water, causing algae to bloom. Ultimately, the algae die and sink to the bottom where they are decomposed by bacteria in a process that uses up the oxygen in the water.

Low-oxygen waters are found throughout the world, from the Gulf of Mexico to the Baltic Sea.

The Chesapeake's dead zone has ballooned since recordkeeping began in the 1950s as growing cities and farm fields shunted more nitrogen into the Bay, researchers say. One of the main goals of the federal-state Chesapeake Bay restoration program is to reduce nitrogen and phosphorus loads — and shrink the dead zone.

The typical summer dead zone has measured about 1.7 cubic miles of water since 1985, according to the Chesapeake Bay Program. The largest recorded was 2.7 cubic miles in 2011.

While hypoxic water remains stubbornly abundant, anoxic conditions — the very worst areas where there is virtually no oxygen — are gradually improving, Testa said. This year's anoxic portion of the Bay is expected to be 0.43 cubic miles.

Testa attributes the improved anoxic conditions to gradual reductions in the Susquehanna's nitrogen concentration that began in the 1980s.

Scavia said this year's forecasted expansion isn't too concerning because rain appears to be the main culprit.

"It's the long-term trend that really matters," he said.

MDE reverses Eastern Shore poultry farm permit after judge's ruling

≈ Agency had been faulted for not adhering to its own regulations when making compromise with 61-acre operation.

By Jeremy Cox

A decade ago, Maryland's environmental regulators greatly expanded their scrutiny of densely packed animal farms, including the chicken houses that crowd much of the Eastern Shore's landscape.

Since then, the Maryland Department of the Environment has approved scores of new industrial-scale operations without ever turning down an applicant.

That has changed, though, since the MDE declined to contest a Maryland administrative law judge's recent ruling that a permit the agency issued last year violated its own rules.

Judge David Hofstetter, in Maryland's Office of Administrative Hearings, urged the MDE in a May 30 order to reverse its August 2017 approval of a stormwater permit for a Worcester County farm that would be one of the largest of its kind. The ruling cited the MDE's failure to hold the 61-acre operation, owned by Apna Farms LLC, to some of its regulations for stormwater management.

Apna will have to submit a new plan to address nutrient runoff for approval, MDE spokesman Jay Apperson said. In the meantime, the eight chicken houses Apna has already built won't be allowed to raise any birds.

The two environmental groups that brought the case to court say that with Hofstetter's ruling, they expect the MDE to enforce pollution-control measures more consistently.

"I hope this is going to set a precedent," said Kathy Phillips, executive director of the Assateague Coastal Trust, which challenged the permit along with the Environmental Action Center. "No more short cuts. Let's do this right."

To shield waterways from nutrient-laden runoff, the state requires farmers to build separate sheds to store manure and dead birds. A state cost-sharing program aimed at improving the Chesapeake Bay's health typically helps defray much of those construction costs, but Apna ran into a delay getting the money.

Instead of making the farm wait to go into business, MDE officials brokered a compromise: Apna could start raising flocks as long as it used "temporary measures" to manage its waste. The deal gave the farm up to two years to build the proper structures.

How Maryland regulates — and doesn't regulate — its poultry industry will play a starring role in the federal and multi-state effort to clean up the Chesapeake Bay, said David Reed, executive director of the Environmental Action Center, the other plaintiff in the case

"Poorly sited, poorly situated and oversize operations like this are a direct threat to water quality," Reed said.

The U.S. Environmental Protection Agency and the Bay's watershed states are just beyond the halfway mark in a 15-year campaign to clamp down on pollution.

Agriculture, according to the EPA, is the biggest single contributor of nutrients and sediment to the Bay. Millions of taxpayer dollars have been flowing onto farms from Virginia to New York to help their owners reduce runoff with actions such as planting vegetative buffers and digging storm ponds.

Flood waters surround a chicken house complex west of Berlin, MD, where owners have constructed eight houses but haven't started raising birds because of a permit challenge. (Tim Preziosi)

> *"I hope this is going to set a precedent."*
>
> — Kathy Phillips
> Executive director, Assateague Coastal Trust

That work has coincided with an unprecedented wave of poultry house construction on the Delmarva Peninsula, home to one of the densest concentrations of broiler operations in the country.

Many farmers are taking old chicken houses offline, limiting the actual growth to just a percentage point or two per year, according to industry estimates. But the new houses are substantially larger than the older generation of structures. What's more, owners say they have to squeeze more houses onto each site to offset the higher development costs from the new regulations, which call for more elaborate stormwater structures, among other measures.

Until the last decade or two, most farmers — and their lenders — were satisfied with two or three chicken houses per operation. Now, there are groups of five, seven or more.

Projects like the embattled Apna Farms, which is under contract to raise birds for Tyson Foods, are so large that they are regulated as concentrated animal-feeding operations, or CAFOs. The state has permitted more than 400 such poultry growing operations.

When Worcester County resident Paul Bishop first heard the details of the CAFO that Apna wanted to build on neighboring land, he was concerned, but not surprised.

"The way I look at it, that's not really farming," said Bishop, whose father owned and operated a farm with two chicken houses. "They put eight houses on a small lot there. That's just crazy. These are the biggest houses you can build, and they just stuck them in there."

He and his wife, Mary Lou, ended up formally joining the two environmental groups in appealing the MDE's decision.

Ishfaq and Zaheer Ahmed, Apna Farms' owners, are seeking to install more than 2 million broilers per year in the houses, generating more than 1,300 tons of litter, manure and wastewater annually, according to documents filed in the administrative hearing case. Zaheer Ahmed couldn't be reached for comment, and Ishfaq, who is a partner in at least one other Worcester poultry operation, declined to comment.

The proposed farm is tucked off a country road just west of the antique store-dotted community of Berlin. About a mile farther to the west lies the Pocomoke River, a Bay tributary connected to the farm site by a network of agricultural ditches and streams.

The MDE's regulatory process enables virtually anyone to request a public hearing on a CAFO permit. Over a span of nearly two years, Phillips and Reed have brought a dozen projects to a hearing before MDE officials but with little success until now. Reed, an attorney, would work with Phillips to draft written arguments against the CAFO, citing the potential for ammonia-tainted air emissions, groundwater degradation and nutrient-laden runoff. The MDE would grant the permit anyway.

In some of the cases, Phillips said she noticed that the MDE was allowing farmers to avoid immediate compliance with some requirements to build the storage buildings for manure and composting facilities for the disposal of dead birds.

The leniency grew out of a budgeting bind, said Louise Lawrence, head of resource conservation for the state Department of Agriculture. During the 2017 fiscal year, Gov. Larry Hogan nixed a portion of the cost-share funding set aside for environmental upgrades on farms that had helped CAFO operators pay for the manure storage and composting buildings.

PERMIT CONTINUES ON PAGE 17

Permit from page 16

That left the program with $3 million, or just less than one-third of the total funding requests it received that year.

"We've been good for 30 years," Lawrence said. "That was the first year we got caught up in what was going on" in Annapolis.

At Apna Farms, the two giant manure sheds normally required would have been replaced by a practice known as windrowing — shoveling the waste into long, narrow piles inside the chicken houses to allow natural composting to take place. After a couple weeks, the material is spread back over the floor and another flock of chickens placed on top. The process is repeated with each new flock.

Meanwhile, the mandatory composting facility would have been replaced by an 18-foot by 25-foot temporary steel shed.

State regulators justified the changes in a memo last year, arguing that the alternative measures they approved would "enable poultry farmers to construct new [animal feeding operations] or expand existing operations, and still meet applicable federal, state and General Discharge Permit requirements."

Phillips disagreed.

"We said, 'This time we're going to contest it,'" she said. It was just the second case they brought before a judge. The first died a paperwork-related death.

Paul and Mary Lou Bishop live next to a proposed poultry operation in Worcester County, MD, and joined the Assateague Coastal Trust and Environmental Action Center to challenge the operation's state-issued permit. (Jeremy Cox)

Hofstetter's subsequent 18-page ruling took a "letter of the law" approach to the case. The federal government empowers the state to make farmers draft nutrient management plans to keep them in compliance with the Clean Water Act, he wrote. Those plans must follow a specific set of U.S. Department of Agriculture policies designed to mitigate pollution.

To accept anything less than those minimum standards, Hofstetter wrote, is "legally inconsistent" with the state's water-quality laws.

While administrative hearings involve cross-examination and evidence, they differ from typical courtrooms in one critical way: The judge's ruling amounts to a recommendation, and an agency can choose to follow it or not. The MDE decided to comply.

Farmers aren't backing down in the face of this new breed of opposition.

James Fisher, a spokesman for the Delmarva Poultry Industry trade group, said a recent USDA assessment has shown that farmers have made some of the biggest strides toward meeting the Chesapeake Bay's nutrient-reduction goals. The Berlin farm's opponents are "outside the mainstream" view that cost-sharing represents an "efficient, effective" way to accomplish that goal, he said in a statement.

Meanwhile, farmers no longer have to wait for funding. The state has set aside $10 million for the fiscal year that begins July 1.

For her part, Phillips said she plans to continue closely watching the state as it balances restoring the Chesapeake with supporting its farmers.

"The Maryland Department of the Environment is supposed to protect the environment," she said. "They're not the Better Business Bureau or the Chamber of Commerce."

Public asked to be on the lookout for 'missing' mitten crab

≈ Once-abundant invasive species hasn't been reported in a couple of years.

By Whitney Pipkin

The Smithsonian Environmental Research Center, between 2005 and 2014, asked the public to submit photos of any Chinese mitten crab, above, that they found in the Chesapeake to the center's Mitten Crab Watch website. Researchers are asking citizen scientists to be on the lookout for the invasive species this year, which they haven't seen in the Bay in four years. / Flyers, right, will be posted at fishing docks throughout the Chesapeake as researchers ask boaters and fishermen to keep an eye out for the crab. They suspect it might no longer have a presence in the area, but the species is also known for boom-and-bust population cycles elsewhere. (Photo & illustration / SERC)

You won't see the Chinese mitten crab's mugshot on a milk carton, but researchers want you to keep an eye out for it anyway.

The mitten crab (*Eriorcheir sinensis*) gets its name from claws that appear to be clothed in algae. Like dozens of other species that have made their way into the Chesapeake Bay via ballast water or other methods of human introduction, the mitten crab is considered an invasive species earmarked for eradication.

But a renewed campaign to report sightings of the crab this summer isn't geared at counting their abundance. Instead, scientists are asking the public to help confirm what they are beginning to suspect: This species has disappeared from the Bay altogether — and possibly from the East and West coasts, too.

From Maryland to Connecticut, more than 150 sightings of Chinese mitten crabs were reported after a fisherman caught the first specimen in the Maryland portion of the Chesapeake Bay in 2005. But no one has reported catching or seeing a Chinese mitten crab on the East Coast since 2014.

The species is known to have boom-and-bust population cycles, but scientists say that four years is a long time for such a prolific invader to hide its beady-eyed face.

"This is the mystery we're trying to solve," said Gregory Ruiz, a senior scientist at the Smithsonian Environmental Research Center in Edgewater, MD, where he runs a marine invasions lab. "It would be very unusual to have a crab or marine invader that was so abundant go extinct."

Unlike the Bay's native blue crab, young mitten crabs prefer low-salinity water, so experts say the animals could lurk in riverbanks up to 50 miles inland from the Bay. Mitten crabs are also catadromous, meaning they migrate from brackish portions of rivers into saltwater environments to reproduce — the opposite direction of anadromous fish species such as striped bass and American shad.

The mitten crab's cute name belies its disturbing potential impact on local ecosystems and economies. They are voracious eaters of aquatic plants, algae and fish eggs and can displace local species.

Native to the East Coast of China and Korea, the mitten crab made the leap to Europe decades ago and has been spreading its territory there since the 1970s.

The palm-sized crab features long legs for walking sideways across land or along the riverbanks where it creates a home by burrowing holes. During its population booms in Britain, high concentrations of these holes have made the banks less stable in some areas and resulted in flooding.

On the West Coast, where the crab was first spotted in 1992, an outbreak of the local population by the end of the decade saw mitten crabs clogging water intake pipes along the coast as they made makeshift homes in infrastructure. The crab was abundant in the San Francisco Bay by the late 1990s, boring as many as 30 holes per square meter in some places, according to a study in 2000 by University of California researchers.

"Our findings suggest that the mitten crab is here to stay as yet another member of San Francisco's evolving non-indigenous communities," the study stated.

But, a decade later, the crab was nowhere to be found on the West Coast, with the last reported sighting in 2010.

Ruiz, who runs a lab and research group in the San Francisco Bay as well, said having a species once so abundant on both coasts fly under the radar for years — or go extinct — could be a first.

On the Delmarva Peninsula, a South American aquatic rodent that destroys wetlands, the nutria, has been virtually eradicated through a hunting program that began in 2002 and will complete its verification phase in 2019. There have also been nonnative species brought to the United States in the past that never got established and faded away, such as clams imported for aquaculture.

Efforts to control invasive fish, such as the blue catfish and snakehead, have hinged on their edibility, encouraging fishermen and consumers to catch-and-eat as many as possible. But they are not disappearing.

"The mitten crab is unusual because it was so abundant on both coasts, and it has a strong record of being an invader in many other parts of the world," Ruiz said. "In the San Francisco Bay, there were hundreds of thousands caught in some years. So we're really interested in trying to find out if people are seeing any of these crabs on both coasts."

To that end, SERC's invasions lab has been spreading the word.

"Have you seen me?" reads one of the flyers circulating on social media with a photo and description of the crab. Others will be posted at fishing docks along the Chesapeake Bay with instructions for what to do if one is found: Freeze the crab rather than throw it back, note the exact location where it was found and take as many photos as possible.

Photos and other information can be submitted to SERC's Mitten Crab Watch website. The website was established soon after the first Chesapeake Bay sighting in 2005, and is still a good place to click through mug shots of the furry-clawed creature that members of the public have sent in over the years.

Researchers say that the mitten crab is easy to spot. The creature's claws, covered with algae-like hairs, set it apart from the Bay's other crabs. Other distinguishing features include four small spines along the front of a brownish-green carapace, which measures 3–4 inches across.

The crabs can be eaten and are grown on aquaculture farms in Asia for that purpose, but their small frames make them a lot of work for a small amount of meat.

It once seemed inevitable that the mitten crab would go the way of the blue catfish, the zebra mussel or the emerald ash borer, slowly but surely taking over an ecosystem to the potential detriment of native species, fisheries and infrastructure. But that doesn't seem to be happening — and it could change researchers' assumptions about invasive species.

"We tend to think about what the impact will be when it arrives, but population dynamics are unpredictable," Ruiz said. "It doesn't change our approach, but it broadens our perspective about what's possible with how a species will play out in a location."

Ruiz said another lesson from the mitten crab case is the importance of engaging the public. When an invasive species has just been introduced or possibly eradicated, research can benefit from a wide swath of people keeping their eyes peeled for it.

Almost all of the records of the mitten crab in the Chesapeake Bay were reported by the public, not scientists collecting samples. Now, researchers hope that crowdsourcing will help them close the case of the missing mitten crab, for good.

If you find a mitten crab, fill out a report on the Mitten Crab Watch website at mittencrab.nisbase.org. If you think you have a Chinese mitten crab, but aren't sure, contact the Mitten Crab Hotline at 443-482-2222 or email SERCMittenCrab@si.edu.

PA bill seeks fraction of a cent fee for largest water users

≈ Money collected those using more than 10,000 gallons a day would help cleanup efforts, avert need to raise fees elsewhere.

By Donna Morelli

Pennsylvania could generate up to $500 million annually to help clean polluted streams and the Chesapeake Bay by charging large users of water a fraction of a cent per gallon. That's the findings of a report released June 6 by a joint committee of the Pennsylvania General Assembly.

The bipartisan Legislative Budget and Finance Committee conducted the study to look at the costs and revenues should a new water use fee be enacted.

Three attempts to pass such a water fee bill have failed, but Rep. Michael Sturla, D-Lancaster, introduced another such bill during the 2017 budget season.

Just before the bill's introduction, the five Pennsylvania members of the Chesapeake Bay Commission — a body of state legislators, cabinet secretaries and citizens from Pennsylvania, Maryland and Virginia — stressed the need for a dedicated fund to address Pennsylvania's water pollution woes and its lagging performance in Bay cleanup efforts. Sturla is a member of the commission.

The new report lists the industries that use most of the water withdrawn from Pennsylvania's surface and ground sources each year. According to the state Department of Environmental Protection, that number in 2015 totaled 25.8 trillion gallons. Hydroelectric power, thermoelectric power and public water supplies accounted for 98.4 percent of the withdrawals. Hydroelectric power, alone, accounted for 92 percent. The remaining 1.6 percent of withdrawals served commercial, agriculture and recreational land users, such as golf courses and ski resorts.

Sturla's bill would levy a fee of 0.001 cent per gallon on water withdrawals greater than 10,000 gallons per day, with the fee reduced to 0.0001 cent per gallon if similar amounts of water withdrawn are returned to the source. Under the bill, agricultural, municipal and nonprofit withdrawals would be exempt.

Safe Harbor Dam, one of two hydroelectric dams on the lower Susquehanna River, is owned by Brookfield Renewable. (Brookfield Renewable)

Based on 2015 usage data, those fees would raise about $2.6 billion per year, with most of that amount — $2.4 billion — coming from hydroelectric plants along the Susquehanna.

"The impacts of the legislation on existing hydropower resources is unclear and could be wide-ranging and, as a result, we will continue to monitor it," said Andrew Davis, a spokesman for Brookfield Renewable, which owns several energy facilities in Pennsylvania, including the Holtwood and Safe Harbor dams on the lower Susquehanna.

Instead of solely focusing on the proposed bill, the report evaluates various scenarios of rates and revenue, all based on 2015 withdrawal rates. For example, the report breaks down how much per gallon would be charged to each of 11 sectors of industry — such as commercial, agriculture and public water — should the fund raise $100, $300 or $500 million a year.

"I'm still trying to digest it — there's a lot of data to be sorted through," said Marel King, Pennsylvania director of the Chesapeake Bay Commission, soon after the report was released. King took on the task of summarizing the findings for commission members. "The combination of rates and exemptions at this point seem infinite."

Research for the report included reviews of water use programs in 11 other states. According to the report, only three of them charge an annual fee for water withdrawals: Minnesota, Wisconsin and New Jersey.

"However, no state imposes a fee that would generate anything remotely close to what is being contemplated in [the bill]," said Christopher Latta, deputy executive director of the Legislative Finance and Budget Committee. For example, he said, approximately $4.7 million is generated in Minnesota, $5.1 million in New Jersey, and $1 million in Wisconsin.

The study did not research or speculate on whether those costs would be passed on to electric consumers or to people buying lift tickets or enjoying a round of golf.

Sturla's bill would support water protection programs across the state that impact not only the Chesapeake, but also the Ohio River and Delaware Bay, although most of the water use is in the Susquehanna Basin.

About $65 million would go to state environmental agencies, some that have seen budget cuts for nearly 16 years. That includes $5 million for the Fish and Boat Commission, which has been at the center of a legislative battle to allow the agency to close an estimated $2 million gap in revenue by raising the fees for fishing permits.

John Arway, executive director of the commission, told the committee that the funds would "remove the need to raise the fishing license fees and take the burden off the backs of the boaters and anglers that spend $1.2 billion a year in Pennsylvania."

Rep. Garth Everett, a Republican representing parts of two counties in the northern part of the state, said that conceptually there isn't anyone in the general assembly who is against clean water. Everett, also a member of the Bay Commission, said last year that he was going propose another water use fee bill. He decided not to bother, and he doesn't think the Sturla bill will get any traction because of the opposition of the Republican-dominated legislature to increased taxes or fees is too strong.

"The political reality — even if Mike Sturla's bill is the most perfect bill that was ever drafted — the chances of it passing with the current membership is less than zero," Everett said. "Even if we put it in my name it would be, 'Oh here comes Garth and the Chesapeake Bay again.' We need someone who is viewed more moderately. We put the snowball together — we just need someone to throw it."

Dolphin-spotting season begins even earlier in the Bay this year

≈ Researchers want boaters, beachgoers to report sightings of the marine mammal in the Chesapeake and its tributaries.

BY WHITNEY PIPKIN

These dolphins were photographed near the mouth of the Potomac River where it empties into the Bay. (Potomac-Chesapeake Dolphin Project, taken under NMFS Permit No. 19403)

This spring, when pods of dolphins crossed the threshold into Chesapeake Bay waters, the scientists were ready for them.

The dolphin tracking website that went online in June 2017 was already up and running for the season, ready to record as early as the end of April that a few Atlantic bottlenose dolphins had arrived near Cove Point.

By mid-May, participants logging onto the Chesapeake Dolphin Watch website, run by the University of Maryland Center for Environmental Science, had reported 16 dolphin sightings in Bay waters in places as far north as Shady Side and Dundalk, MD. Researchers hope to see that number grow throughout the summer as more people become aware of the popular creatures' presence.

Since the site was launched last summer, dolphin-watchers have used it to report 1,000 sightings throughout the Bay and its rivers. The crowd-sourcing project blew researchers' expectations — that maybe a few dozen dolphins frequented these waters in the summer — out of the water.

"We knew anecdotally that dolphins were seen in the Chesapeake, but I still wasn't anticipating anything like the number of sightings we've seen reported," Helen Bailey, an associate research professor at UMCES Chesapeake Biological Laboratory, said last year. "It's just been incredible."

Bailey has been studying dolphins in the Patuxent and Potomac rivers with underwater microphones, called hydrophones, to better understand what causes them to travel. But she and her team wondered where else dolphins were wandering in the Bay. That inspired the crowd-sourced website, which will launch a mobile application later this month.

While dolphins frequent the Lower and Middle Chesapeake Bay and southern coastline of Virginia in the summer, they were not often seen venturing into the Bay's rivers until recent years.

The apparent return of dolphins to the Potomac interests scientists who see their presence as a good omen for local water quality. Historic accounts indicate that the creatures once swam as far north as the Aqueduct Bridge near Georgetown University in the District of Columbia.

The local crew of dolphins began capturing more media and public attention in 2016 after Georgetown University researcher Janet Mann began studying how far they were venturing into the Potomac and other Bay tributaries. That research, along with reports from local citizens, indicates that dolphins are traveling farther and in greater numbers, although scientists are still trying to understand why and to what extent.

Chesapeake Challenge & Bay Buddies test your knowledge of dolphins on page 34.

Mann, who has spent three decades studying dolphins in Australia's Shark Bay, is continuing to study a local population of more than 500 individual dolphins spotted near the mouth of the Potomac as part of the Potomac-Chesapeake Dolphin Project, which was started by the Georgetown researcher. The team has named many of them after U.S. presidents and first ladies.

Mann kicked off this year's dolphin-spotting season with an editorial in The *Washington Post* and last year published a book about the behavior of cetaceans, a family that includes dolphins, called *Deep Thinkers: Inside the Minds of Whales, Dolphins, and Porpoises.*

In the book, Mann points out that much of the current research about these marine mammals has been gleaned from studying them in captivity. But, as the public has soured on the spectacle of sea creature shows at theme parks — and the sentient creatures have gained increasing legal protections since the 1960s — more research in natural settings is under way.

As part of that trend, seven dolphins located at the National Aquarium in Baltimore could soon be relocated to a seaside sanctuary in Florida, according to the Associated Press. The aquarium has begun a three-year program, including raising water temperatures in the dolphins' indoor tanks, to teach the mammals new behaviors and prepare them to move.

"The species we exploited so heavily for centuries now command our attention," Mann writes in the book's introduction.

This summer, the species — in the wild — could continue to captivate Chesapeake Bay audiences, who are just beginning to realize that they might spot a dolphin breaching near Baltimore.

Last year, people used the tracking website to report dolphins as far north in the Bay as the Magothy River and off Hart-Miller Island east of Baltimore, with several other sightings just west of Rock Hall on Maryland's Eastern Shore. Bailey said she tries to follow up on the reports and was able to verify about 450 of those sightings.

The northernmost confirmed sightings in the Potomac last summer were near the Gov. Harry W. Nice Memorial Bridge, where U.S. Route 301 crosses the river just south of Popes Creek, MD. The Dolphin Watch map, which can be viewed by creating an account on the site, recorded a couple of citizen sightings there on the morning of July 4, and at least one more after that.

The updated website now allows contributors to add photos and videos to their reports and include descriptions about whether they spotted the creatures from a boat or shoreline and other relevant details. Camera icons will appear next to the dolphin images on the site's map to indicate where sightings have been confirmed.

Ann-Marie Jacoby, a field investigator who worked on the Potomac-Chesapeake Dolphin Project last year, said she hoped the dolphin would become a flagship species of the Bay. But she didn't imagine how quickly they'd become popular with boaters and beachgoers who helped spread the word.

"We wouldn't be able to find out [about their presence] so quickly if it hadn't been for the public reaching out and being so interested," Jacoby said.

To see where dolphins have been spotted so far, visit ChesapeakeDolphinWatch.org. Learn about Mann's research at PCDolphinProject.org.

Putting roads on a salt diet also healthy for nearby streams

≈ Northern VA creek gets region's first chloride TMDL.

By Whitney Pipkin

A creek in Northern Virginia is going on a pollution diet, and residents might feel the belt-tightening this time. That's because it could lead to limits on a compound that's as beloved on U.S. roads as it is in our meals: salt.

After spending decades studying Accotink Creek — which drains a 52-square-mile swath of midsize homes and commuter-crowded roads in Fairfax County, VA — scientists couldn't ignore the impacts that road salts were having on a freshwater creek whose critters weren't accustomed to the brinier waters.

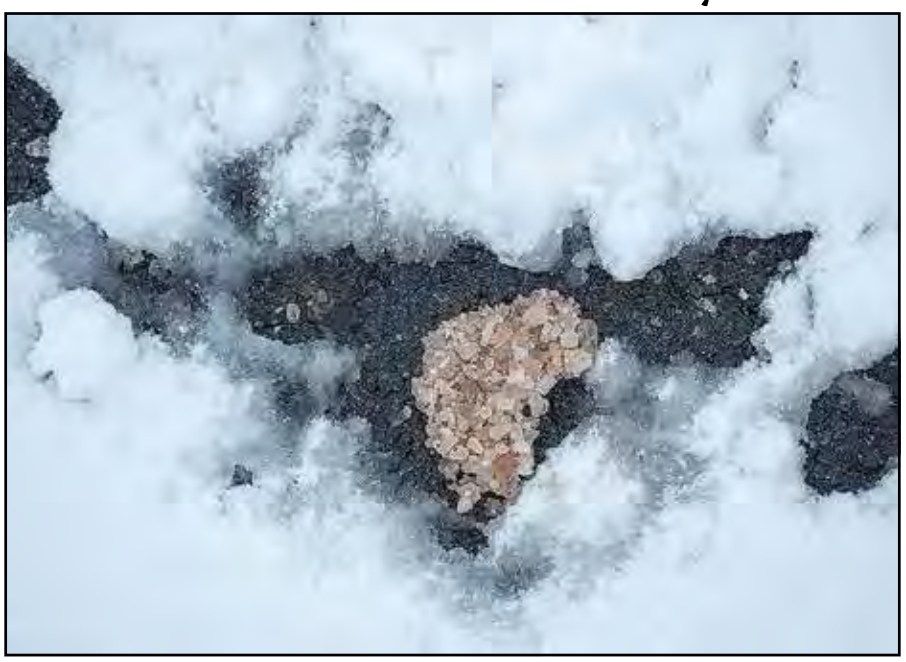
At the end of May, the state Department of Environmental Quality approved a pair of new pollution limits for the creek, called total maximum daily loads, or TMDLs. One aims to reduce the amount of pollution-carrying sediment that runs through the creek, which is a tributary to the Potomac River. The other addresses the waterway's high chloride concentrations — in what appears to be the first salt-related TMDL in the Chesapeake Bay watershed.

The salt that is spread on roads in winter is sodium chloride, typically made up of about 40 percent sodium ions and 60 percent chloride ions. As it washes off roads and into streams and groundwater, the compound not only increases salinity but also concentrations of chloride in the water. Studies around the country have found that, as indicators of salt increase, streams begin to lose their most sensitive species first, insects like mayflies, then amphibians and fish.

This is not the first attempt to regulate the pollutants plaguing Accotink Creek. In 2011, the U.S. Environmental Protection Agency imposed a TMDL on the Accotink watershed, but, in a lawsuit brought by the Fairfax County Board of Supervisors and the Virginia Department of Transportation, a federal judge invalidated the TMDL, ruling that the EPA's methodology for measuring sediment flow was flawed. Opponents of that TMDL also said that stormwater retrofits would have been too costly for homeowners and businesses in the creek's watershed.

But the high stakes decision made Accotink Creek one of the most extensively monitored watersheds in the region — and the first to show the statistical symptoms of road-salting routines that are common throughout the Bay region.

In developing their own TMDL for the Accotink — which will require some permit holders in the watershed to address their salt use — state regulators are casting a wider net. They want the entire region to reconsider how it spreads salt and how that affects local streams.



As it washes off roads and into streams and groundwater, salt not only increases the salinity but also concentrations of chloride in the water, making it inhospitable for many of the animals that live there. (Dave Harp)

"You don't stop applying salt at watershed boundaries, so the problem is more widespread," said David Evans, nonpoint source coordinator at the DEQ. "We started looking at water quality data throughout the region, and the patterns were the same as in the Accotink."

Early in the process, Evans said his team reached out to more snow-laden U.S. regions where officials are a few years ahead on treating road salt as a pollutant. Minnesota's Twin Cities, for example, adopted a chloride management plan in early 2016 that addresses salt application in the metro area, where 39 waterbodies are listed as impaired by chloride.

The DEQ decided to take a similar approach, convening a group of nearly 70 stakeholders from across Fairfax and Arlington counties to develop a salt management strategy that will benefit more than the Accotink.

The key, officials learned from other regions, is to get everyone who cares about road salt in the same room to rethink how they use it. The effort can also help regulators understand what's feasible without putting public safety at risk.

"This project comes with a lot of expectations, not only from you guys in this room but also from the public and politicians," said Will Isenberg, TMDL and assessment coordinator with DEQ, at the outset of a meeting in June. "The more thorough we can be in these recommendations, the better."

The strategy document that results from these meetings will be a reference point for officials regulating chloride in streams. It will also recommend how cities or private contractors could benefit their bottom lines by rethinking salt applications.

Joe Wood, Virginia staff scientist with the Chesapeake Bay Foundation, commended the state's approach to a problem that is "likely ubiquitous across Virginia's urban watersheds."

"I think the DEQ recognizes that, if they had the resources to go assess all the watersheds, they'd have lots of impairments," Wood said. "This process helps us get a feel for who the stakeholders are and what the logistical challenges are going to be for those people."

Wood said one obstacle is that scientists in this region haven't studied chloride as a pollutant as much as they have nitrogen or phosphorus. One study by scientists from Virginia Tech and Maryland's Towson University found that some of the stormwater management practices that curb nutrient pollution, such as planting forested buffers alongside streams, don't have the same effect on chloride.

Two of the salt management strategy's workgroups will focus on creating a suite of practices aimed at keeping chloride out of the water. But it will be up to residents and cities — and the agencies that spend millions of dollars spreading salt each year — to implement them.

"In terms of how this might affect our operations, it's potentially huge," said Scott Crafton, MS4 program manager for the Virginia Department of Transportation's maintenance division.

VDOT budgeted more than $210 million for its anti-icing program last winter, which covers almost 130,000 miles of roads in nine districts. Virginia has the third largest state-maintained highway system in the country, behind Texas and North Carolina.

Crafton said VDOT has been "very progressive" in adopting best management practices, some of which are filtering down from the Northeast, to reduce salt's impact. One of those practices is spreading liquid salt brine, which contains less chloride than rock salt, on roads to keep snow and ice from sticking and make easier work for plows.

He thinks some of the low-hanging fruit for reducing salt applications could be in the hands of private contractors that are hired by homeowners' associations or mall parking lots to spread salt. A few contractors have been involved in the salt strategy meetings so far, and DEQ officials said they are continuing to reach out to get more of them involved.

VDOT, along with Fairfax County, the city of Fairfax and the U.S. Army's Fort Belvoir, could be required to do more when the new chloride limits for Accotink Creek are worked into their permits, which will be up for renewal in a couple years. But plenty of other organizations have a stake in how much salt is on the roads or in the waterways.

The water authorities in Fairfax and Loudoun counties, for example, want to make sure their sources of drinking water aren't laden with salt, which can corrode pipes, affect taste and require additional processing. Agencies that spread salt to keep the roads safe for drivers also see the compound's corrosive impact on roads and related infrastructure as it piles up in the winter months, damaging vegetation and vehicles.

"We are learning as we go," said the DEQ's Evans, "but [reducing salt applications] does seem to be a true opportunity for a win-win if public safety can be maintained and environmental and other harm can be reduced — while providing cost savings to public and private organizations."

Any win-wins that come out of this process are likely to be hard-fought, as the group tries to balance the concerns of environmental organizations, such as the Friends of Accotink Creek, with the political pressures facing county decision makers. Not having the roads ready for icy conditions has felled more than one politician.

The DEQ wants more of those decision makers to get involved in the strategy process. They also hope they'll spread the word, even among residents who might not know the impact of spreading salt on a sidewalk near a storm drain.

The message? Too much salt is not only bad for your body. It could also be bad for your local water body.

Fleming Park could rise from the weeds by dredging up spoils, funds

≈ Community welcomes materials from shipping lanes to restore Turner Station's shoreline habitat, playground and access to water.

BY TIMOTHY B. WHEELER

When Larry Bannerman was a kid, he and his friends used to go crabbing in a cove off Bear Creek, a tidal tributary of the Patapsco River that bordered their Baltimore County neighborhood.

That was more than five decades ago. These days, you almost need a machete to reach the water at Fleming Park in Turner Station, a historically African-American community southeast of the city, just inside the Baltimore Beltway. Other than a pier jutting out into the creek at one spot, the rest of the shoreline is walled off by dense stands of phragmites. The invasive wetlands grass obscures some wooden pilings, all that remains of a boardwalk that once skirted the water.

"We'd come down here in the morning and by lunchtime we'd have a bushel of crabs," he said. "Right over there, there was a boathouse," he recalled, pointing toward Clement Cove on the north side of the park. "They used to have dances and everything when we were little."

Today, community leaders hope to reclaim their waterfront access and enhance the park, using a material that's historically been shunned by other communities — sand and silt dredged from the shipping channels in Baltimore's harbor.

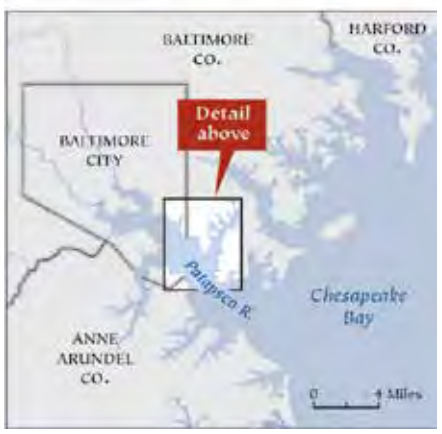
"I'd like a boardwalk and the shoreline enhanced, where we can get back on the water," said Gloria Nelson, president of the Turner Station Conservation Teams, recently as she and Bannerman, chairman of infrastructure, traffic and safety for the group, walked around the 16-acre park and talked about the plan for giving it a makeover.

With design help from Mahan Rykiel Associates, a landscape architecture firm, they propose to use sediment pumped in from the harbor bottom to transform the reedy, rocky shoreline into a marsh that would support native vegetation, waterfowl and other wildlife. They also want to use some of the dredged material in a playground in the park, to give children some low mounds to run up and down.

"Essentially, you don't have a waterfront park here because you don't have access to [water]," said Isaac Hametz, Mahan Rykiel's research director, who's working with the community on the plan — which has the support of a host of public agencies, area companies and the nonprofit Chesapeake Bay Foundation.

If the community and its partners can secure the funding and regulatory approvals needed for the proposed park upgrade, it would mark the first time that material dredged from the harbor's bottom has been placed back on land in a residential neighborhood — and in this case, at the residents' request.

Isaac Hametz (right), of landscape design firm Mahan Rykiel Associates, reviews park upgrade plans with (from left) Doug Myers of the Chesapeake Bay Foundation and Larry Bannerman and Gloria Nelson of the Turner Station Conservation Teams. (Dave Harp)



Lucidity Information Design, LLC

That level of acceptance has been a long time coming. The Maryland Port Administration has been toiling for decades to melt public resistance to placing the harbor's dredged material on land anywhere near people. Part of that hostility has been sensory — the muck can give off a rotten-egg sulfur smell when it first comes out of the water. But there's also been concern about contaminants from two centuries of shipbuilding and manufacturing along Baltimore's waterfront.

It took the port 14 years to overcome lawsuits and public opposition to using dredged material to create Hart-Miller Island, which sits out in the Bay just off the Baltimore County shore. The port now has approval to place harbor material in a pair of diked containments at Masonville Cove in industrial southern Baltimore and at Cox Creek, near the mouth of the Patapsco.

Masonville Cove was a precedent of sorts. The port won the nearby community's approval to use dredged material by pledging to reclaim what had once been a recreational beach used decades ago by residents. Port contractors removed tons of debris and contaminants along the shoreline, then created a waterfront nature park with an environmental education center. But unlike the Fleming Park plan, Masonville Cove is physically separated from Curtis Bay by busy highways and rail lines. It's reachable only by vehicle and has limited hours for use by the public.

It's notable that Turner Station would be the place to push the envelope on public acceptance of dredged material. The community developed after World War I, as black steelworkers found themselves excluded from new housing built elsewhere in the Dundalk area of Baltimore County. It has hung together, despite decades of abuse and neglect — an injustice that in some ways is being belatedly acknowledged. The county recently posted signs there honoring Henrietta Lacks, of recent book and movie fame. A resident of Turner Station, she unwittingly gave her cells for use in medical research that's led to some life-saving breakthroughs, though she never benefited herself or even knew about it.

Today, the neighborhood is sandwiched by industry, with Dundalk Marine Terminal to the northwest and the former steel mill complex on Sparrows Point across Bear Creek, now being redeveloped as a hub for shipping, manufacturing and distribution. It's a community that might understandably be suspicious of being dumped on again, of being taken advantage of.

This project, though, came together with the consent and even encouragement of community leaders. It grew out of a design research collaborative that Mahan Rykiel led last year in partnership with the port administration and other public and private entities. The firm enlisted four graduate student interns to think creatively about how and where to use material dredged from shipping channels.

"They brought a landscape design lens to what for us has been an age-old challenge — finding places to put the stuff," said Kristen Fidler, chief of outreach, policy and permits in the port administration's office of harbor development.

Seeking ideas, Hametz and the interns met with several of the MPA's citizen and stakeholder advisory committees. One of the groups they met with was the "harbor team," which advises the port on the placement of dredged material. Nelson and Bannerman, who

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represent Turner Station on that team, suggested doing something at the park, according to Fidler.

"We were thrilled and so pleased that they were open to that possibility and saying that they're a welcome recipient of it," Fidler said. "We've… really worked hard together to address the stigma that harbor-dredged material is scary. Folks are now recognizing that it's a resource of value that can be reused in a variety of different ways."

Per guidelines recently developed by the Maryland Department of the Environment, the Fleming Park dredge material would be tested and screened to ensure that people aren't exposed to contaminants that linger in some sediments, Fidler said. Indeed, Hametz suggested, the dredged material might even help remediate legacy pollution from when Bethlehem Steel occupied Sparrows Point, leaving heavy metals and other contaminants in the bottom mud of Bear Creek. The sediment placement and native plantings, he said, could help keep contaminants from being stirred up by waves.

First, though, the project needs to secure funding and regulatory approvals. Toward that end, the Turner Station Conservation Teams, with the help of Mahan Rykiel, submitted a proposal in March to the U.S. Army Corps of Engineers, seeking inclusion in a congressionally authorized pilot program to demonstrate the beneficial use of dredged material.

The group is asking for $1 million in federal funds, to be matched by $668,000 from other sources, to create the marsh habitat at the park by spreading a thin layer of dredged material in the shallow water along the shoreline. Sediment would be pumped up from navigation channels and deposited in depths of no more than 2 feet, and more likely just a few inches.

The Corps plans to select 10 projects nationwide for funding, out of nearly 100 proposals in the running. Even if Turner Station makes the cut, those funds would only pay for spreading about 2,600 cubic yards of dredged material, which is just a portion of what's envisioned for the park makeover.

Hametz said the overall plan calls for using about 10,000 cubic yards — enough to fill three Olympic size swimming pools — to create marsh along 2,600 feet of shoreline and build some small mounds in the playground. To make the park more resilient to storms and rising sea level, Hametz said, another 10,000 cubic yards could be used to build an earthen berm around the waterfront. The total cost, likewise, would be significantly more.

Getting local funding may be a challenge, though. Baltimore County officials have yet to be persuaded to spend their money on a project like this involving the placement of dredged material.

"It's sort of a nice intent, but we don't think it's practical at this point," said Vincent J. Gardina, county director of environmental protection and sustainability.

The county has budgeted about $750,000 toward shoreline stabilization at Turner Station and one other nearby community. But to date, the county has focused on doing shoreline projects that will control erosion and reduce nutrient pollution. Gardina said he's concerned that using dredged material this way could actually release more nutrients and other pollutants into the water, at least in the short term, and that it could be much more expensive to do and oversee.

Hametz said he and Turner Station leaders hope to meet with county, state and federal agency officials to answer their questions and concerns about the project and persuade them it's worth doing. The elected officials they've met with so far have been interested and supportive, he noted.

If it comes together, the makeover of Fleming Park won't provide much of a solution to the port's need for places to put dredged material. More than 1 million cubic yards gets excavated every year in the harbor alone, Fidler said, and nearly 5 million cubic yards gets dredged annually to maintain the shipping channels serving Baltimore, from the Chesapeake & Delaware canal at the head of the Bay to Cape Henry where it meets the Atlantic Ocean.

But the Turner Station project's value, its proponents say, isn't in the volume of dredged material it would use — it's in the example it can set. Maryland officials hope it will inspire more "beneficial use" and "innovative reuse."

Mahan Rykiel's Isaac Hametz forges his way through phragmites and other vegetation blocking access to Clement Cove on the north side of Fleming Park in Turner Station. (Dave Harp)

Artist's rendering of a portion of an upgraded Fleming Park, with dredged material used to create marsh habitat and access to the water restored by rebuilding an old boardwalk. (Mahan Rykiel Associates)

Indeed, the state Department of Natural Resources is looking to map sites all around Maryland that might benefit from a similar thin-layer placement of dredged material. Jackie Specht, a fellow with the National Oceanic and Atmospheric Administration who's working at the DNR, is spearheading the effort.

"We wanted to take that idea and run with it and do a similar model," she said, "[to find] sites where we do frequent dredging but don't have suitable placement sites."

But for supporters of the Fleming Park project, it's about more than just a physical renovation of a tired recreation site. Doug Myers, Maryland senior scientist at the Bay Foundation, said that's why the Annapolis-based foundation has stepped up to be a partner in the effort.

"The Chesapeake Bay Foundation's vessel, Snow Goose, could dock here and take kids out," he said. "We could do oyster gardening here and place those oysters onto the Fort Carroll restoration site [near the mouth of Bear Creek]. There's a lot of opportunity for us to get engaged more with the community, have the community have more access to the Bay the way they used to."

"There are just so many opportunities for the community in this project," Gloria Nelson said. "We want to bring it to life and hope we see it within our time frame, so that we can have an opportunity to enjoy it."

Whether at Turner Station or somewhere else, Hametz said, something has to be done with all of the material dredged from the bottom of the Bay and its rivers and creeks. Given the difficulties finding places its disposal, it makes sense to try to work out beneficial uses for it like this, he added.

"This isn't just a Baltimore County problem," Hametz concluded. "It's a Baywide problem, and we're going to have to find creative solutions if we're going to continue to live near the Bay."

Boost in underwater grasses earn Anacostia its first passing grade

≈ Officials, river advocates say they are finally seeing the results of billions of dollars and countless hours invested in the 'once-forgotten' river.

By Whitney Pipkin

The Nationals Park baseball stadium, pictured here from the Anacostia River, has become the anchor of several redevelopment projects along the river. A recent report card shows the river's water quality is steadily improving. (Dave Harp)

Decades of work to improve the health of the Anacostia River are beginning to pay off, according to a report released Wednesday by the Anacostia Watershed Society.

The river earned a "D-minus" on its annual report card, its first passing grade in the decade since the nonprofit began issuing report cards for the waterway that runs through Maryland and the District of Columbia into the Potomac River. A significant uptick in underwater grasses — from zero acres a few years ago to nearly 25 acres in 2017 — pushed it over the threshold from "F" to "D-minus."

Advocates say the Anacostia's water quality is likely even better than indicated by the report card, which was compiled mostly with the latest data from 2016. Since then, in March of this year, the first of DC Water's underground tunnels came online to capture 80 percent of the sewage overflows and polluted stormwater runoff in the Anacostia watershed. Instead of entering in the river, the flow is now diverted to the District's wastewater treatment plant.

"This passing grade didn't have anything to do with the tunnel yet, which was a huge milestone," said Jim Foster, president of the Anacostia Watershed Society. "The hard, heavy lifting we've been doing is finally paying off in improved water quality."

When the added improvements from the tunnels are accounted for in future reports, Foster said, "then we're really expecting a great grade."

The report card's grading system is based on the Anacostia's ability to meet certain markers — levels of dissolved oxygen, chlorophyll *a* and water clarity— that support aquatic life. It also looks for reductions in bacteria, toxic contamination and trash that prevent the river from being swimmable or fishable, a milestone advocates want the waterway to meet by 2025.

With an overall score of 63 percent in the latest report card, the Anacostia barely entered into passing-grade territory. But that score is much better than the 56 percent it received in 2017 and the string of failing grades from previous years.

Public officials and river advocates said they are finally seeing the fruit of billions of dollars and countless hours invested in its improvement.

"This is not happening by accident," said Rushern Baker, county executive for Prince George's County, MD, which has taken steps to reduce polluted overflows to the river. "When we signed an agreement to work together to revitalize the Anacostia River a few years ago, it was more than a ceremony."

In the latest report, the river scored 100 percent for underwater grasses which, at nearly 25 acres, exceeded a 20-acre goal for the river set by scientists at the Metropolitan Washington Council of Governments. Foster said more accurate data was added to the report card after the District Department of Environment and Energy conducted a survey of underwater grasses in 2017, which boosted their numbers.

> *"This is not happening by accident."*
>
> — Rushern Baker
> Prince George's County Executive

Surveys indicate that the Anacostia had healthier populations of underwater grasses in the 1980s and 1990s than in the last decade, and researchers don't entirely understand why. Though the river was by some measures more polluted during that earlier period than in the 2000s, when the grasses took a turn for the worst, researchers theorize that changes in sediment pollution may have reduced certain types of grasses or that monitoring data had gaps.

The Anacostia Watershed Society and other groups have since deployed volunteers to plant several acres of underwater grasses, such as wild celery, over the years and taken steps to protect them — in one instance culling an outsize number of resident geese in a park along the river. But both native and nonnative grasses appear to be faring well on their own thanks to water quality improvements, Foster said.

Biologists also are tracking the presence of water-filtering freshwater mussels in the Anacostia and are considering propagating them.

The river squeaked into passing grades for having more dissolved oxygen and less fecal bacteria, too. Both measures likely benefitted from DC Water's ongoing efforts to reduce sewage overflows to the river. Less rainfall than usual in 2016, the year the data was collected, also helped.

Once the sewer system — originally designed to overflow into local rivers to prevent urban flooding — is completely retrofitted, the largest sources of fecal bacteria to the system will be wildlife and pets.

The river still earned failing grades for the amount of toxics and trash that plague its waters.

The Anacostia's toxic problems — linked to an industrial past with nearly a dozen plants along the river slated for environmental cleanup projects —have been studied at length, but the projects to remediate them have barely begun.

The District and Maryland counties have each passed legislation to rein in the river's trash problems, but the report indicates more enforcement is needed for littering and illegal dumping.

On water clarity, the river also had a failing grade. Studies indicate that more than 70 percent of the river's sediment pollution is from erosion along streambanks scoured by fast-flowing water.

The Anacostia Watershed Society produced the report card using government data and the EcoCheck assessment system developed by the University of Maryland Center for Environmental Science, which is also used to grade the health of the Chesapeake Bay and several of its tributaries.

In 2014, the society switched to using school-system letter grades to make their reports more understandable to the public. Some river reports consider a 40– to 60 percent score a "C" or passing grade, while schools would use the letter grade "F."

Foster said the Anacostia's 63-percent passing grade means it's getting closer to its goals — but not that the river is safe for fishing or swimming.

"The only thing really separating us from swimming is higher bacteria counts in the river," he said. "We are on the cusp of really being able to say that we're confident that you can swim on a pretty regular basis in the river." But not yet.

Read the full report at anacostiaws.org.

Environmental group warns PA to protect forests or get sued

≈ Foundation challenges plans that permit natural gas fracking on state land

By Donna Morelli

An environmental organization that put the teeth in Pennsylvania's Environmental Rights Amendment is turning its sights on the state agency that manages 2.2 million acres of public forestland.

A lawyer for the Pennsylvania Environmental Defense Foundation sent an "intent to sue" letter to the Department of Conservation and Natural Resources in early June. The letter states that the foundation will take court action if the agency continues with its process of updating local plans under the current 2016 statewide forest management plan.

John Childe, the attorney representing the activist organization, said in the letter that the 2016 plan first must be revised because it fails to uphold the state's Environmental Rights Amendment in its handling of natural gas extraction in state forests.

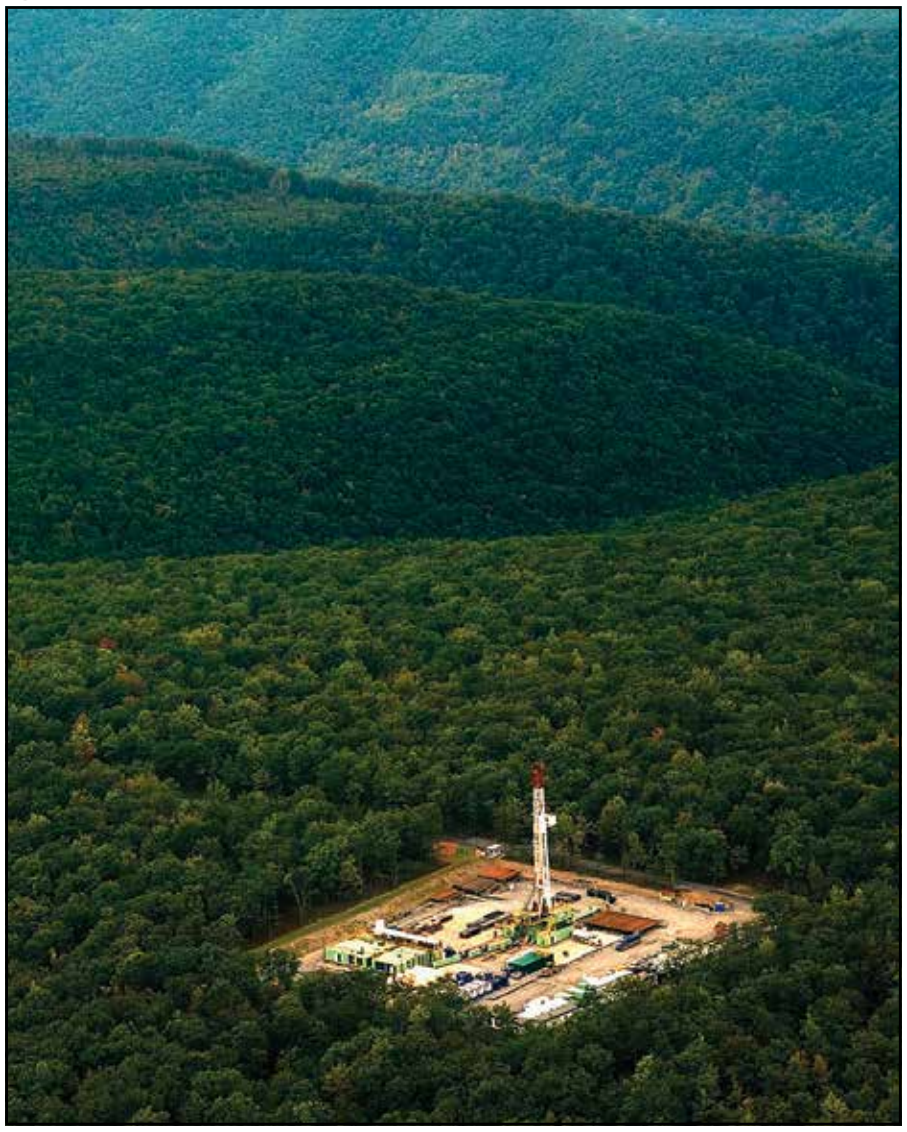
The Environmental Rights Amendment, added to the state constitution in 1971, asserts the public's right to "clean air, pure water and the preservation of the natural, scenic, historic and esthetic values of the environment." The amendment also says that the state's natural resources are the common property of all of the people, including generations yet to come, and that the state must conserve and maintain them.

"Nothing in the 2016 plan does anything to identify and quantify the impact of drilling on the 617,000 acres opened up to natural gas leases," Childe said. "The biggest problem that state forests have is being ignored."

The state forest management plan is the road map for managing all aspects of the massive forest system. Updated periodically, the plan forms the basis for 20 local forest district plans.

By revising the statewide plan now, Childe argues, the DCNR could guide the local plans in ways that better conform to the law.

"Then they would have a whole section on what their [Environmental Rights Amendment] obligations are and how they intend to meet them," Childe said. "They need to tell how well they are doing across the entire forest system."



A hydraulic fracturing rig is set deep in the Loyalsock State Forest in Pennsylvania's northern Endless Mountains region. An environmental group is asking for a revision of the state's forest management plan to reflect Pennsylvania's Environmental Rights Amendment. (Martha Rial / Provided by DCNR)

Cindy Adams Dunn, DCNR secretary, said in a written statement that the agency and its staff "fully embraces" its role as a trustee of the state's natural resources and that the "DCNR vehemently disagrees with [the foundation's] position."

The DCNR is conducting a series of meetings, scheduled through November, to gather public input on updates to the district plans. "[DCNR] encourages all to read the plan and take advantage of these public meetings as an opportunity to help set management priorities and meet the men and women who serve as trustees for the public forests," Dunn said.

About 1.5 million acres of state forests are underlain with the Marcellus Shale formation that harbors natural gas. Most of it is located in a north-central region called the Pennsylvania Wilds, which includes some of the most pristine forestland in the state. To date, the DCNR has issued three shale gas leases on a total of 138,866 acres.

The 2016 state forest management plan states that "the economic use and sound extraction and utilization of geologic resources is part of the bureau's mission." The foundation contests this.

"Nothing in the plain language" of the Environmental Rights Amendment, Childe wrote in his letter, allows for the sale of public natural resources for economic use or benefit, the use of proceeds from the sale of natural resources for DCNR operational expenses, or "balancing" the economic gains of gas extraction with the long-term ecological health of state forests. If a conflict exists between the agency's mission and constitutional law, Childe argues, the law must win.

Among other requests, the foundation is asking the DCNR to add to the forest management plan an inventory of existing and anticipated degradation of natural resources caused by gas drilling and explain how those impacts can be prevented and repaired.

A DCNR spokesperson said the agency will publish an update to its 2014 Shale-Gas Monitoring Report in early summer and that it will include information similar to what the foundation has requested.

The foundation has a history of challenging the state's handling of gas extraction and won a landmark 2017 decision from the Supreme Court of Pennsylvania, which found that, based on the Environmental Rights Amendment, the use of state revenue from oil and gas extraction to support anything but natural resource conservation is unconstitutional.

The decision also gave unprecedented strength to the amendment by invalidating a prior requirement to consider the economic value of a contested project against the conservation value of natural resources.

State Supreme Court Justice Christine Donohue wrote the majority opinion, in which she stated, "The Commonwealth (including the Governor and General Assembly) may not approach our public natural resources as a proprietor, and instead must at all times fulfill its role as a trustee."

But soon after the court issued its decision, the state legislature and Gov. Tom Wolf approved a 2017–18 budget that uses revenue from gas leases to support general operations and other expenditures. The foundation has challenged it in court.

Bottoms up! Bay's deepest waters showing signs of recovery

≈ Increase in oxygen levels is a catalyst that helps the Chesapeake help itself.

By Karl Blankenship

After mining through decades of data, scientists have uncovered an encouraging new sign that parts of the deepest, most degraded areas of the Chesapeake Bay are not only beginning to respond to cleanup efforts, but starting to cleanse themselves.

The big discovery: Concentrations of ammonium are decreasing in the deepest parts of the Bay.

Admittedly, trends in ammonium — a chemical cousin to ammonia that Wikipedia defines as a "positively charged polyatomic ion with the chemical formula NH_4" — are likely never going to gather as much public attention as, say, trends in underwater grass beds.

Nonetheless, scientists say, even small changes in concentrations of this chemical trigger a chain reaction that helps remove nitrogen from some of the worst parts of the Chesapeake's summer "dead zone" than would be expected from the region's modest nutrient reductions alone. That, in turn, is helping oxygen concentrations to increase.

It's hard to overstate the significance of the findings, which shows cleanup actions are helping the Chesapeake to help itself, say Michael Kemp and Walt Boynton, two longtime Bay scientists and colleagues who were co-authors of the paper and heralded the unexpected findings as "exciting" and "important."

Kemp and Boynton, two recently retired scientists from the University of Maryland Center for Environmental Science who spent much of their careers documenting the decline of the Bay, suggest in a new paper published in the journal *Limnology and Oceanography* that deep areas of the estuary are not only showing signs of recovery from decades of nutrient over-enrichment — something they weren't always sure they would see — but are actually responding better than anticipated.

"There is real progress in the cleaning up of the Bay and the reversal of eutrophication," Kemp said.

To be sure, the improving trend is modest and was not obvious until they examined seasonal monitoring data covering more than 30 years.

It also came as a bit of a surprise. Because there are so few examples of coastal waters recovering from nutrient enrichment, the chemical process they found wasn't previously described in science journals. "If we had known where to look for these trends," they said in their paper, "they would have been available for discovery at least 10 years before the present."

"We've had some modest nutrient load decreases, and we have a responsive Bay. Those modest load decreases have played into causing the patterns that we are starting to see," said Walter Boynton, retired scientist from the University of Maryland Center for Environmental Science. (Dave Harp)

The story starts in the deep waters of the Bay that are plagued by oxygen-starved dead zones each summer, making these areas off-limits to most aquatic life.

Getting more oxygen into those areas has been a main goal of the region's nutrient reduction efforts. Nutrients that wash into the Bay each winter and spring spur the growth of huge algae blooms. When the algae die, they sink to the bottom and are decomposed by bacteria whose rapid metabolisms draw oxygen out of the water.

The problem is particularly severe in deep areas because of a barrier — called a pycnocline — that forms in the summer and separates the warmer, fresher and lighter water on the surface from the saltier, colder and heavier water on the bottom. The pycnocline prevents oxygen-rich surface waters from mixing with low-oxygen bottom waters, effectively leading large portions of the Bay's bottom to become virtually depleted of oxygen — or hypoxic — and unable to sustain fish, clams or even worms.

By reducing nutrient pollution, Chesapeake cleanup efforts aim to reduce algae growth which, in turn, means less fuel for oxygen-consuming bacteria. There are signs that this is working. Recent studies show a gradual trend toward less algal production in saltier Bay regions which, on average, is causing the dead zone to break up earlier at the end of the summer.

As they reviewed decades of seasonal water quality monitoring data, Boynton and Kemp, working with another UMCES scientist, Jeremy Testa, saw the small improving trend in deepwater oxygen concentrations that scientists have noted in recent years. But then they saw something new: In those deep waters of the Bay, ammonium concentrations were decreasing as oxygen levels were slowly rising — and have been doing so for decades.

Ammonium is one of several forms of nitrogen that exists in the environment. Most of the nitrogen that enters the Bay and feeds algae blooms is in the form of nitrate, which comes from farm fertilizers, manure, discharges from wastewater treatment plants and other sources.

But when those algae die and are consumed by bacteria, the stored nitrogen is released as ammonium. That's a problem because ammonium is a favored food for most algae; the same amount of ammonium will grow even more algae than the equivalent amount of nitrate.

For the deep waters below the pycnocline, this was a double whammy. Bacteria were not only using up the oxygen directly, but as they decomposed algae, they were also churning out ammonium that could be moved to surface water to fuel more algae growth, which would die, sink, be consumed and so on — a self-reinforcing loop that worsened conditions.

But as the amount of nitrogen reaching the Bay has modestly decreased in more recent years, so has algae growth, allowing a bit more oxygen in deep waters, especially late in the summer.

"What we noticed when looking at the earlier breakup of hypoxia is that ammonium concentrations were really going down in the bottom water," said Testa, who was the lead author of the paper.

What happened, the scientists say, is that the uptick in oxygen levels caused some of the ammonium to be transformed into other forms of nitrogen — initially nitrite and then nitrate.

"Oxygen is an important molecule for controlling the way a lot of these nutrients are processed," Testa said. "The extra increment of oxygen makes a big difference."

Unlike ammonium, nitrite and nitrate are forms of nitrogen that can be denitrified — that is, they are converted from forms of nitrogen that fuel algae growth into an inert gas that dissipates harmlessly from the water. Denitrification is, in fact, the same process that removes nitrogen from effluent at wastewater treatment plants, but in this case, nature is doing it for free.

Testa, Kemp and Boynton concluded that getting a little more oxygen into the water helps to short-circuit ammonium's ability to fuel more algae. By removing that fuel from the system, they said, less oxygen is used up than would otherwise be the case. It's something scientists call a "feedback loop," where a natural process kicks in and results in greater changes than otherwise expected.

In the Bay, scientists have seen similar progressions in underwater grass restoration, where expanding grass beds improve water quality conditions beyond what would have occurred through pollution reductions alone, thereby allowing the bed to further expand.

To be sure, the initial improvements are small — oxygen levels in deep parts of the Bay remain low enough to be off-limits for most aquatic life much of the summer. But the ammonium trend is clear, and it is reflected in oxygen conditions throughout most deepwater areas, The trends are most pronounced from the mouth of the Potomac River to the mouth of the Rappahannock River.

"The decline of bottom water ammonium concentrations is an extremely sharp trend," the authors noted. "From our point of view, this is probably the strongest statistical relationship that we've ever seen in the monitoring program water-quality data trends."

As they reviewed decades of data, the authors also discovered that the trend in ammonium concentrations actually showed up well before the oxygen improvement was detected. As a result, they say, it's a trend that can foreshadow the improvement in dissolved oxygen concentrations here and elsewhere.

"That is the kind of thing that we want to see," Boynton said. "We've had some modest nutrient load decreases, and we have a responsive Bay. Those modest load decreases have played into causing the patterns that we are starting to see."

Dam from page 1

the heart of our multi-state strategy to deliver the results Marylanders expect and deserve."

Exelon is not the only one challenging MDE's decision. The Lower Susquehanna Riverkeeper Association and Waterkeepers Chesapeake also filed an appeal with the MDE, contending that the agency failed to do enough to address the dam's impacts.

At issue is how to resolve one of the most confounding issues facing Bay restoration efforts — addressing the excess pollution now reaching the Bay because it is no longer being trapped in the 14-mile-long reservoir behind the dam.

The dam was completed in 1928 and for most of the last century has been trapping sediment and nutrients that would otherwise reach the Chesapeake. But scientists say the reservoir reached its storage capacity faster than they expected, and once-trapped pollutants now flow into the Bay just 10 miles downstream.

The state-federal Bay Program partnership has estimated that it will require an annual reduction of 6 million pounds of nitrogen and 260,000 pounds of phosphorus to offset the impact of the dam's lost trapping capacity. That would be roughly an additional 5 percent reduction for a river where upstream nutrient control efforts in Pennsylvania are already far behind schedule.

Bay Program partners plan to write a new cleanup plan to offset that additional pollution, but they have not indicated how those reductions — which come on top of the obligations states already face to meet cleanup goals — would be paid for, or who is responsible for making them.

Exelon is seeking a new operating license from the Federal Energy Regulatory Commission to continue generating power from Conowingo, one of five hydroelectric facilities along the lower Susquehanna. But as part of the licensing process, Maryland has to issue a certification that the operation of the dam will not degrade water quality.

Maryland issued that certification April 27, but it imposed numerous conditions it said were needed to mitigate water-quality impacts from the dam. Along with the requirement that Exelon fund nutrient pollution control practices, it called for other efforts to curb debris that flows downstream and changes to dam operations that the state says affect downstream habitats for fish and wildlife.

On May 25, Exelon appealed the decision administratively with the MDE and in court where, among other things, it contends the proposed conditions are so costly they would put the dam out of business and therefore represent an illegal "taking" of Exelon's property. The utility has asked FERC to put its relicensing decision on hold until the appeals are resolved.

The reservoir behind the 90-year-old Conowingo Dam has filled, allowing nutrients and sediments that were once trapped to enter the Bay. (Dave Harp)

In its filings, Exelon contends that the state certification "departs dramatically" from those issued to other operations around the country, which it contends are more narrowly focused on actions related specifically to the operation of a hydro facility. The company called it unprecedented for a hydroelectric operation to be held responsible for pollution originating upstream.

But some environmental groups say the issue is not so straightforward.

"This is complicated," said Mark Bryer, Bay program director for The Nature Conservancy, which has been involved in the dam's relicensing for years. "The Nature Conservancy works on hydropower around the world, and this is one is unique."

While the Conowingo Dam did not create the pollution, he said, its presence on the river greatly influences when, and in what form, pollution reaches the Bay.

For instance, the dam can affect the types of sediment and nutrients that get washed downstream. Large sediment particles, which can be beneficial downstream, tend to get trapped, while fine sediment, which is more harmful to water clarity, is more likely to get flushed downstream.

Environmental groups contend the utility has done little to address that concern.

"The entire time Exelon has operated this, to their financial gain, it was known that this was going to happen someday and there were no preventative actions taken by Exelon," said Alison Prost, the Chesapeake Bay Foundation's acting vice president for environmental protection.

Prost said she was worried that by going to court, Exelon could delay any action for years. "Saying it has no responsibility isn't appropriate," she said. "Exelon needs to be at the table with those other states to decide what they can do while still being financially solvent."

It's unclear how much Exelon makes from its power generation at Conowingo. A report prepared for the conservancy and the CBF last year estimated that dam revenues ranged from $115 million to $121 million annually — a figure the utility said was too high.

How much Exelon could be willing to pay toward restoration efforts is also unclear. The utility stated in a letter to the MDE on Jan. 16 that "it is open to providing some level of support to improve Chesapeake Bay water quality as part of a settlement agreement."

But in a letter to Exelon on April 20, Maryland Environment Secretary Ben Grumbles said the utility had failed to provide sufficient detail about the level of support it was willing to provide. Shortly after that, the MDE finalized the water quality certification which gave the utility three choices: install offsetting pollution control practices itself; pay a fee for others to install the practices, at the rate of $17 per pound of nitrogen and $270 for every pound of phosphorus that needs to be controlled; or dredge the reservoir.

Meanwhile, the Lower Susquehanna Riverkeeper, along with 18 other riverkeeper groups in the region, contend the certification does not go far enough because it does not address the potentially catastrophic impacts if floodwaters from a severe storm scour vast amounts of built-up sediment and stored nutrients out of the reservoir and flush them into the Bay, as happened with Tropical Storm Agnes in 1972.

A recent study led by the U.S. Army Corps of Engineers and the Maryland Department of Environment discounted that concern, saying the bigger threat to the Bay was the annual increase in nutrients that has taken place under more normal weather conditions since the reservoir filled.

But the riverkeepers said that study underestimated the impacts of very large events which they say are "very likely or reasonably likely" to occur many times during the course of a 50-year license.

They asked that Exelon be required to excavate at least 4 million cubic yards of sediment from behind the dam each year, which they say would offset the roughly 1.5-million–2-million cubic tons that flow over the dam each year while also slowly drawing down what has built up over the decades.

"This is one of the most important decisions in the effort to clean up the

Dam continues on page 29

Midpoint assessment for Bay cleanup: only 40% of nitrogen goal met

≈ Wastewater plant upgrades responsible for most of the gains; states, especially PA, will have to crack down on stormwater, agriculture.

BY KARL BLANKENSHIP

The Bay region has reached the halfway mark toward its Bay cleanup goal in terms of time — but not in terms of accomplishments.

July 1 marked the midpoint to the 2025 deadline for taking all actions needed to stem the tide of water-fouling nutrients into the Chesapeake Bay, which would ultimately result in clearer water, less algae and an end to its summer oxygen-starved dead zone.

But the region only achieved about 40 percent of its nitrogen reduction through the end of last year. Not only was that short of the halfway mark, it was even further away from the actual goal for the end of the year — a 60 percent reduction.

"Unless the states and their federal partners expand their efforts and push harder, the Bay and its rivers and streams may never be saved," said Will Baker, president of the Chesapeake Bay Foundation, which recently released its own analysis of efforts so far.

Making up lost ground and getting to the finish line on time will require ramped-up efforts for pollution sources where progress has been slow — such as agriculture and stormwater — and in places clearly lagging, especially Pennsylvania.

To that end, the U.S. Environmental Protection Agency in June sent a letter to all of the states in the watershed telling them that new cleanup plans to guide efforts through 2025 will need to show how states will make up shortfalls and provide adequate funding and oversight to meet their Bay cleanup obligations.

But the agency singled out Pennsylvania for special scrutiny, saying the state is "significantly off track" to meet nutrient reduction goals and warning that it could take new actions — the EPA has twice temporarily withheld funding — if the state doesn't pick up the pace.

Through the end of last year, Bay Program data indicate that since 2010, Pennsylvania only achieved 18 percent of its nitrogen reduction goal— leaving 82 percent to be achieved between now and 2025. Put another way: In less than eight years, the state would have to reduce 2.5 times as much nitrogen as it has in the last 32 years.

But Bay Program figures show challenges extend beyond Pennsylvania. While other states have mostly done better, they did so in large part by upgrading wastewater treatment plants, a source of reductions that is nearly exhausted, as most plants in the watershed have now installed state-of-the-art nutrient removal technology.

While efforts so far appear to have spurred improvements in the Bay's health, environmentalists called the recovery " fragile." (Dave Harp)

"It's clear that Maryland and Virginia are carrying the (Baywide) improvements, and mostly by tackling wastewater," Baker said. "As the clock ticks down to 2025, we know the second half is going to be more difficult."

The story was better for phosphorus, where the region achieved 90 percent of its goal. But it is nitrogen that largely drives algae growth in the salty Bay during most of the year (phosphorus tends to feed algae in freshwater), and controlling it has long proved to be problematic. Algae cloud Bay waters, causing die-backs of critical underwater grass habitat, and when the algae die, they sink to the bottom and are decomposed in a process that creates an oxygen-starved "dead zone" that is intolerable to most aquatic life.

Though the region is short of its cleanup goals, Baker said there's evidence that pollution reduction efforts are paying off. Underwater grasses last year were more abundant than they had been in decades. Studies have shown evidence of slight improvements in the dead zone. Water clarity has also improved in recent years.

"We are at a critical point in the Chesapeake Bay cleanup. We are seeing some incredible progress," said Chante Coleman, director of the Choose Clean Water Coalition, who joined Baker at a recent news conference to discuss cleanup efforts.

While efforts so far appear to have spurred improvements in the Bay's health, environmentalists called the recovery "fragile," and Baker cautioned against too much optimism, noting that Lake Erie was declared recovered from nutrient pollution decades ago but is now "worse than ever."

Missed targets

The 2017 targets were the latest to be missed since the state-federal Bay Program set its first nutrient reduction goal in 1987. The target set then, for a 40 percent reduction by 2000, was missed, as was a follow-up goal for 2010.

That year, the EPA imposed a new, more regulatory cleanup plan intended to end further delays. The Chesapeake Bay Total Maximum Daily Load, commonly called a pollution diet, set nutrient targets for each state and major river, with plans to achieve them required by 2025. As an interim goal, 60 percent of needed cleanup actions were to be taken by the end of last year. To keep efforts on track, the EPA required states to submit detailed "watershed implementation plans" showing how they would meet their goals, along with two-year "milestone" check-ins on progress. It also required a "midpoint assessment" at the halfway point to incorporate new science and make whatever course corrections might be needed to achieve the 2025 goal.

The EPA will issue its official review of progress in July. But Bay Program computer model estimates through the end of last year show only Virginia, West Virginia and the District of Columbia met their 60 percent goals for both nitrogen and phosphorus.

Overall, they show:

≈ Pennsylvania achieved 18 percent of its nitrogen goal and 58 percent of its phosphorus goal.

≈ Maryland achieved 53 percent of its nitrogen goal and 127 percent of its phosphorus goal.

≈ Virginia achieved 82 percent of its nitrogen goal and 101 percent of its phosphorus goal.

≈ West Virginia achieved 89 percent of its nitrogen goal and 94 percent of its phosphorus goal.

≈ Delaware achieved 33 percent of its nitrogen goal and 110 percent of its phosphorus goal.

≈ The District of Columbia achieved 258 percent of its nitrogen goal, and 100 percent of its phosphorus goal.

≈ New York nitrogen loads increased by 4 percent, while phosphorus decreased 69 percent.

Even where progress was on or ahead of schedule, the overall figures mask some problematic trends. Everyplace except New York, which has been plagued with problems at its largest wastewater treatment facility, far exceeded their wastewater goals. Although wastewater plants are not the largest cumulative source of nutrient pollution, they accounted for 70 percent of the watershed's nitrogen reductions from 2010 through 2017, and as a group have exceeded their 2025 goals.

But, because most wastewater plants are now upgraded, nutrient discharges from many of those facilities are likely to increase as population growth and development spurs an increase in the volume of water they treat between now and the cleanup deadline. That means more effort will be needed from areas where progress has been more difficult, such as stormwater and agriculture. All jurisdictions missed their nitrogen goals for stormwater, and all except West Virginia missed them for agriculture.

Nitrogen from stormwater runoff, as well as septic tanks, has ticked upward, while the rate of reductions from agriculture — the largest source of nutrients to the Bay — has been stagnant. Since 2010, computer model figures show that farms in the region have reduced nitrogen runoff in the watershed as a whole by about 1 million pounds a year, about the same rate as before the TMDL was established.

With less than eight years to reach the pollution diet's ultimate goal, and having to address tougher-to-control sources to get there, the region clearly faces a tall order.

Further, the job is expected to get slightly harder in July. The Bay Program, using numbers from a new, updated computer model that incorporates a vari-

ASSESS CONTINUES ON PAGE 29

Assess from page 28

ety of new information and reflects new science, is expected to adopt new state cleanup targets to guide efforts through 2025. Generally, those numbers show less progress than did the old model, which was used to evaluate the impact of actions through 2017.

In preliminary numbers, Maryland appears to be hardest hit by the changes. But in a statement, Maryland Environment Secretary Ben Grumbles said the state "is fully committed and will continue to press all of our Bay state partners to do what it takes to get the job done so we can stay on track for one of the biggest environmental success stories in a century."

He praised the EPA's work to bring "sound science" into the midpoint assessment process but also said the agency needed to help through "robust funding and strong enforcement."

Getting to the finish line

When those updated cleanup targets are set, it will kick off a yearlong effort for states to draft new watershed implementation plans outlining what they will do to reach their 2025 Bay restoration goals.

In a letter sent to the states in June, the EPA — which has the legal responsibility to oversee the Bay cleanup — said it expects those plans to provide evidence that states have adequate financial and technical assistance, cost-share and regulatory programs in place to oversee stormwater and agricultural runoff reduction efforts. It also said states need to have programs in place capable of tracking the installation of various pollution control practices and verifying that they continue to work over time. The EPA also said it wants states to involve local governments in their cleanup plan development and to set some sort of local pollution reduction goals to help achieve nutrient targets.

The EPA added that it will evaluate progress between now and 2025 "and may take appropriate federal actions for those jurisdictions that are not making adequate progress toward meeting their [pollution reduction] planning targets."

The agency singled out Pennsylvania for increased oversight. In the letter, the EPA restated concerns it has voiced in the past about the state's significant shortfalls — not just in actual progress, but in committing to the level of funding, staffing and regulations needed to make progress.

Federal regulators want the state to clearly identify the most effective pollution control practices and the areas where they can most effectively be employed to curb nutrient-laden runoff. And they want the state to ensure that funding is prioritized to deploy those practices within targeted areas. All federal Bay-related grants have to go into those priority areas, the agency said.

The Bay's underwater grasses, such as eelgrass, are harmed when too much nitrogen clouds the water, blocking the sunlight they need to grow. (Dave Harp)

In addition, the EPA letter directs the state to make other policy, legislative and regulatory changes needed to meet goals, including restrictions on such harmful actions as spreading manure during winter months. The agency recommends creating new programs to transport manure out of areas with an excess of animal wastes and establishing an agricultural cost-share program, as other states have done, which can be used to target farms in priority areas. The EPA also wants Pennsylvania to achieve greater nutrient reductions from wastewater treatment plants to make up for shortfalls in curbing stormwater and agricultural runoff.

Deborah Klenotic, a spokeswoman for the Pennsylvania Department of Environmental Protection, said the state is still reviewing the letter and that "Pennsylvania remains committed to its 2025 Bay TMDL goals and is bringing unprecedented levels of partnership, ideas, resources and commitment to the challenge."

The state, she noted, has already launched an expansive planning process to write new watershed implementation plans that involves local governments and other stakeholders, and will ultimately result in county-level cleanup targets.

Rich Batiuk, associate director for science with the EPA's Bay Program Office, said the letter makes it clear that Pennsylvania's new plans "must provide a higher level of specificity in order to provide the EPA, the other jurisdictional partners and the public with sufficient reasonable assurance that Pennsylvania can achieve their goals by 2025."

Indeed, in a recent letter to EPA Administrator Scott Pruitt, Maryland Gov. Larry Hogan lamented that cleanup efforts would be "much further along" if all other states had made as much progress as his state. "Fair and consistent accountability among the jurisdictions and strong oversight from our federal partners is absolutely critical," he wrote.

If the state keeps falling short, the EPA letter held out the possibility of taking "backstop" actions against it, which include increased environmental enforcement activity in Pennsylvania's portion of the Bay watershed; requiring new discharge permits for currently unregulated smaller-scale animal farming operations; mandating greater reductions from wastewater treatment plants; and directing grants to only be used for specific purposes if the agency believes the state is not adequately targeting projects.

The EPA has twice temporarily withheld grant funding from the state because of shortcomings and has been giving greater scrutiny to the state's programs and progress.

But finding ways to pressure Pennsylvania has proven elusive. In the past, the EPA has resisted the idea of regulating smaller animal operations because the state has so many of them. And with less than 10 percent of its nitrogen coming from wastewater treatment plants, a further crackdown there would produce only small improvements.

Even environmental groups are split over what to do about Pennsylvania.

Baker called for the EPA to exercise its backstop authority under the TMDL and impose new sanctions against Pennsylvania and any other state that falls behind. "If EPA remains unwilling to impose backstops," he said at the news conference, then the agency's words were "empty threats."

But Coleman said many of her coalition's members would oppose taking backstop actions against Pennsylvania, especially if they involve withholding funds.

"Pennsylvania is so far behind in the cleanup that taking away money at this point would be quite detrimental to the cleanup as a whole," she said.

Dam from page 27

Chesapeake Bay," said Betsy Nicholas, executive director of Waterkeepers Chesapeake. "We shouldn't be approving a 50-year license without a solid, accountable plan for removing sediment from behind the dam."

Exelon, in its filings, said that dredging was not a feasible option, citing the recent Corps/MDE study which estimated it would cost as much as $2.8 billion annually just to dredge enough to keep pace with what now flows into the reservoir.

Further, the utility said those costs would increase over time because the amount of material to be dredged each year — equivalent to 25 football fields covered with 67.5 feet of sediment — would quickly exhaust nearby disposal sites.

Maryland is planning to fund a pilot project, though, to determine whether lower cost options which reuse some of that material might be feasible.

Since its last operating license expired Sept. 14, 2014, Conowingo has operated on an annual license issued by FERC. The license renews automatically while the relicensing is pending.

Any delay in issuing a new license for Conowingo would also postpone millions of dollars' worth of fish passage improvements at the dam, which were negotiated between Exelon and the U.S. Fish and Wildlife Service. Those improvements were primarily aimed at getting American shad and river herring upstream, but most of those actions are contingent on the new license.

There is no prescribed time frame for the MDE to make a decision regarding either Exelon's or the waterkeeper's administrative appeals. The state must respond by July 9 to Exelon's state court challenge that was filed in the Baltimore City Circuit Court. The state's response to Exelon's federal lawsuit, filed in the U.S. District Court for the District of Columbia, is due by July 11.

Meanwhile, others will be watching to see whether the action sets a precedent.

"It's a bit of an odd situation, given that it's a 25,000- square-mile watershed, to hold the folks accountable who actually did a service to the Bay," said Andy Davis, a spokesman for Brookfield Renewable, which owns two upstream dams in Pennsylvania — Holtwood and Safe Harbor — whose reservoirs are also largely filled, according to the Corps study.

"But right now, we are just watching from the sidelines like everyone else. We will continue to do so and see where this thing shakes out."

Onancock paddle weaves nature, history with every stroke

Charlie Cox, a young paddler on a guided tour of Virginia's Onancock Creek, stops for a close-up inspection of periwinkle snails in the marsh grass.

By Jeremy Cox
Photos by Dave Harp

Four and a half miles from its mouth at the Chesapeake Bay, Onancock Creek diverges in three directions. In 1680, settlers transformed the banks of this branching stream into the town of Onancock.

The community on Virginia's Eastern Shore has borne witness to more than 300 years of U.S. history, a narrative recorded in its antebellum homes, sprawling cornfields and ever busy wharf.

Despite its deep harbor, Onancock was never destined for the types of development — seen in port cities like Baltimore and Norfolk — that have all but banished nature from the landscape.

As a result, Onancock serves up a living classroom in which the environment shapes history and vice versa all the way to the present. Its story is best told from the vantage point of the water, and one of the best people to tell it is Bill Burnham.

"The history and the present are very close," Burnham said, as he paddled his kayak upstream on a warm June morning toward the wharf where his outfitter business is headquartered. "The families you see from the Revolutionary War are the people you see in the restaurant."

Burnham maintains all of the mandatory trappings of an ecotour guide: sweat-wicking long-sleeve T-shirt, polarized sunglasses with a strap, wind-tossed blond hair and a ruff of gray hair on his chin. What distinguishes him becomes apparent within the first few minutes of a paddle: his seasoned storytelling ability, which can drill with equal depth into Onancock's ecological and historical highlights.

One moment, he is describing the daily habits of periwinkles, the marble-size sea snails that spend their lives on marsh grass near the shoreline; the next, he is recounting the tale of the ill-fated Commodore Zedekiah Whaley, a Revolutionary War figure buried off the creek's center branch — though no one knows exactly where.

Burnham's skill can be explained in part by his years as a history major, followed by time spent as a journalist. His wife, Mary, is a former journalist, too.

Together they operate Burnham Guides, a paddling tour company spawned by their passions for kayaking and writing. And that passion doesn't have time for a break. While based in Onancock during the summer, they give tours in the Florida Keys and Costa Rica during the winter.

They continue to write, having authored no fewer than six outdoor travel guides since 2007.

Onancock (pronounced with emphasis on the second syllable) lies at about the midway point of Virginia's portion of the Delmarva Peninsula — essentially a large, Ice Age era sandbar formed by melting glaciers. No interstates traverse its landscape, and its only connection with the state's mainland is a 23-mile network of bridges and tunnels.

Much of the region's urban scenery can be described most charitably as unspoiled by gentrification. A pair of geography scholars published a study a few years ago about the preponderance of abandoned gas stations found in the area.

Onanock is a diamond in the rough. Visitors to this town of 1,200 souls are greeted by a downtown of quaint antique shops, restaurants featuring cosmopolitan flavors and an old-fashioned movie theater. The town is one of the main drivers of the Shore's 31 percent increase in tourism-related tax receipts since 2010, said Kerry Allison, executive director of the Eastern Shore of Virginia Tourism Commission.

Its central location makes it a base camp for visitors looking to explore the entire shore, from Assateague Island's sandy beaches to Cape Charles' shopping district, Allison said. And Onancock offers plenty of experiences of its own, particularly for people interested in getting out on the water, she added.

"Seeing the Eastern Shore from the water is the only real way to understand it," she said. "People lived on the water. It was their only transportation artery at that time. And that has been erased from modern history."

The path of least resistance to that watery ideal is a

Paddlers on Onancock Creek stop to chat with watermen about the day's catch.

Bill Burnham leads kayakers through the family-friendly waters of Onancock Creek (left), which includes shoreline views of homes from the 1800s and 1930s (above).

two-hour excursion with Onancock Sailing Adventures. The company ferries up to five passengers per trip on a scenic journey starting and ending at the town wharf on a cat boat called Gratitude.

For something a little more hands-on, see the Burnhams. Their operation is nestled in an old steamboat ticket office on the wharf, leased from the Historical Society of the Eastern Shore of Virginia. The organization also owns the larger building next door, the 1842-built Hopkins Brothers Store, which has been transformed into the renowned Mallards at the Wharf restaurant.

Our booking included a single kayak for myself and a tandem for my wife and our 8-year-old daughter. The two-hour guided tour of Onancock Creek costs $45 per person, but it's a good deal considering that on most days it's likely to be a small group.

Patrons can save a little money by simply paying the rental fee and venturing out on their own. The professional accompaniment isn't a matter of safety; the surrounding waters are smooth and easy to ply in most weather regardless of paddling experience, and getting lost is nearly impossible with the out-and-back route.

Splurging on a guide, though, will prove valuable to anyone unfamiliar with Onancock's history or its flora and fauna.

The wharf looks over the broad pool of water where the three channels coalesce into one, broad waterway. After easing us into our plastic watercraft, Burnham steered us upstream into the creek's center branch. We immediately encountered the first of many anachronisms: a wooden-plank bridge that still carries car traffic.

The slow-moving branch, he explains, bisects the town into two eras of growth. To the north, stately homes built as early as 1830 are tucked back behind the grassy banks. To the south, the landscape is locked in the 1920s and 1930s, dotted with homes picked out of Sears catalogs.

A few hundred yards beyond the mouth of the branch brought us to the former Onancock School, where generations of local students graduated, including Virginia's current governor, Ralph Northam. In accordance with Onancock's cultured present, it is now an arts and community center.

After another bend, the water petered out into a thatch of salt marsh filled with spartina grass and, farther landward, groundsel bushes.

Now, I've known my daughter to become enraptured with scoring a minor league baseball game by hand, so I know she is made of different stuff than most 8-year-olds. But it was still striking to witness her become engrossed in Burnham's commentary on the tiny snails that clung to the waving stalks of grass.

"I call them marsh farmers," he said, plucking one from its perch to give her a closer look.

As the tide rises, a periwinkle climbs its chosen stalk to stay above the water. Along the way, it gnashes its teeth into the grass, leaving a groove that will become covered with algae once it's submerged. When the water falls, the descending snail feeds on the freshly collected algae.

"For a lot of people who are new to a salt marsh environment," Burnham said, "they say it pretty much all looks the same. But these little critters are doing something amazing every day."

Tacking naturally from habitats to humans, Burnham nudged our floating party toward the backyard of one of the grandest structures on the tour. Scott Hall, built in 1769, is known as much for its graveyard as for being the oldest house in town.

There lies Whaley, the Revolutionary War commodore, somewhere.

In 1782, after the British surrendered at Yorktown but before the Treaty of Paris formally ended the Revolutionary War, Whaley set off on an expedition to halt British plundering of Eastern Shore farms. He gathered more than two dozen volunteers in Onancock into his boat and, along with three allied vessels, sailed into the Bay.

In Kedges Strait near Smith Island, just across the state line in Maryland, the Battle of the Barges ensued. It was a rout. Three of his barges fled the fight, leaving Whaley's flagship to suffer heavy losses. Whaley was killed, and he was brought back to Onancock for a lavish funeral. His body lies within the cemetery at Scott Hall, but the plot's exact location remains a mystery, Burnham said.

Back out in the main creek, the view suddenly morphs from urban to rural. Here and there stand sturdy-looking houses, backed by acre upon acre of farmland that has provided the region with its wealth for hundreds of years. Our caravan startled an osprey midmeal, and it erupted from its branch with a fish clenched firmly in its talons.

Burnham led us back toward town but not before circling into the creek's north branch. A giant, gray barge loomed into view, having just off-loaded a fresh bounty of crushed rock bound for road construction or making cinder blocks. A few more paddle strokes brought us alongside a crab boat and its crew, chatting about the day's haul.

Exploring Onancock by water

Legend has it that Onancock translates as "foggy place," so let's clear some things up on traveling there. Route 13 provides the best (and only) access, but don't miss the signs pointing the way (Business Route 13 from points north or Virginia Route 179 from points south).

Burnham Guides offers a variety of kayak trips, including an overnight sojourn to a 1920s fishing lodge on an island near the tip of the Delmarva Peninsula. The two-hour tour of Onancock Creek is $45 per person. Call 305-240-0650 or email mary@burnhamguides.com.

Cruises with Onancock Sailing Adventures are available May–October at 9:30 a.m., 12:30 p.m., 3:30 p.m. or 6:30 p.m. Rates are $45 per person. Call 757-710-3658 for information.

Thomas Point a beacon for mariners, historians alike

Participants on a tour of the Thomas Point Shoal Lighthouse approach the 1875 structure, which stands in its original location at the mouth of Maryland's South River.

Story & Photos
By Kimbra Cutlip

I once heard the Thomas Point Shoal Lighthouse described as a Victorian rendition of a lunar landing module.

It's an absurd image that stuck with me, not just for its succinct visual depiction of the structure — a white, six-sided, lapped-board cottage perched on spidery iron legs in the middle of the Chesapeake Bay — but also for the sense of vulnerability and isolation it evokes.

Indeed, there must be parallels between landing on the moon and spending weeks at a time encapsulated in a tiny shelter surrounded by a vast, inhospitable environment. That was the reality of life for a succession of lighthouse keepers who tended it for 111 years.

Today, the public can tour the lighthouse, in its original location just south of Maryland's Bay Bridge, for a glimpse of that life. The light is operated by the Coast Guard and still serves as an active aid to navigation, but the house and structure were transferred to the City of Annapolis in 2004. They are being restored and preserved by the U.S. Lighthouse Society and its Chesapeake Chapter.

Run by the Lighthouse Society, the tours begin with a 30-minute boat ride from the Annapolis Maritime Museum and can accommodate up to 18 participants. As we motored out of Annapolis, four yellow-shirted docents chatted up passengers, eager to share their knowledge of the harbor, the Chesapeake and Thomas Point, an elbow of land at the mouth of the South River where a shallow shoal extends a mile and a quarter into the Bay.

The last manned lighthouse on the Bay, it hosted keepers until 1986 when the mechanism was fully automated. It is the only intact lighthouse of the "screwpile" design still in its original location. This design involved manually screwing long iron rods or pilings deep into the Bay's bottom. Above the surface, the pilings at the lighthouse cant slightly inward and are braced with tie rods and steel I-beams. The resulting platform supports the 35-foot diameter hexagonal cottage and lends it the distinctly lunar-landing module appearance. It is arguably the most iconic light on the Chesapeake Bay.

"Thomas Point Shoal Light has six dormers," docent Tom Cagle said as we sped toward our destination. "It's the only one with six. Watch out for the model they sell in town. It only has two."

A broad-faced retired Maryland Natural Resources police officer with an infectious smile, Cagle told us he called the manufacturing company with the hope of persuading it to rectify the error. Now that the error has been brought to my attention, I've noticed a lot of misidentified Thomas Point Lighthouses, including a photo in the National Archives.

The tour began on the open deck beneath the house. Meg Govan, a retired fifth-grade teacher and a docent since 2006, told us that, on the shore side of the lighthouse, the water is a mere 6– to 8-feet deep and becomes shallower all the way to shore. On the Bay side, it drops quickly to 35 feet. British ships, she said, ran aground in these waters twice during the War of 1812.

In the late 1800s, when the shoal was fertile ground for commercial oystermen, lighthouse keepers often recorded names of vessels working in their vicinity and helped to keep a watch for poachers. The lighthouse is now a popular spot for anglers, but the days of oystering the shoal is over.

So, too, are the days of screwpile lighthouses. Their downfall was caused by a once-common occurrence that is hard to envision today: ice. In recent decades, the navigable waters of the Bay have frozen enough to require Coast Guard icebreakers only a handful of times, but historically ice was a very real hazard. In the late 1800s, screwpile lighthouses at Love Point and Wolf Trap were destroyed by ice and one at Sharps Island was shorn from its foundation. Even the sturdier caisson light that replaced it was tilted by ice in 1977.

Thomas Point has withstood damaging ice since it was built in 1875, in part because of a steel wedge set on its own screw piles about 90 feet upstream, where it would split ice flowing down the Bay during the spring thaw. Riprap was also added over time, and the lighthouse stood its ground. But not without incident. In 1877, the lens was knocked from its base and broken. Keepers told the *Baltimore Sun* "the running ice shakes the light-house so much that the stoves have to be lashed down. At night the ice breaking against the piers sounds like the cracking of fire."

In 1918 and 1940, heavy ice led to the evacuation of the cottage. In later years, the keepers endured hurricanes such as Agnes in 1972. Now, as the wakes of passing boaters slapped loudly but harmlessly against the iron rods and surrounding riprap, I reached up to touch the bottom of the lighthouse — the very floor that had shuddered and groaned violently beneath the keepers.

As Govan spoke, she was interrupted every seven minutes by the raspy, angry squawking of birds — or rather a recorded simulation of birds in distress. "It's to keep the birds away," she said. "If you see the picture of this lighthouse on the Weather Channel, the roof looks white because it's covered in guano. It's an old picture, from before the restoration."

Fastidiousness was required of early lighthouse keepers, who were expected to wear their full woolen uniform at all times. Clearing bird poop from the roof would have been part of the daily routine, I suppose. Govan mentioned wanting to ask the Weather Channel to replace the photo

A tour group gathers inside the Thomas Point lighthouse as docent Meg Govan tells tales of its history (above left). Docent Chris Mulry (above right) explains the solar-powered light that operates in the lantern room and still serves as a navigational aid to ships on the Chesapeake Bay.

with a new one now that the red metal roof is kept clean again.

After taking questions, she led us to the first floor of the house which we accessed by climbing a narrow ladder through a hatch in the wrap-around porch. White gingerbread balusters form the porch railing.

The exterior boards of the cottage gleam with heavy layers of white paint, interrupted here and there by small pocks of black — wounds of rotted wood. Closer inspection revealed that they were actually quite prevalent on one side, but unnoticeable under patches of white duct tape. Before the Lighthouse Society took over, the building had fallen into disrepair. Restoration is clearly ongoing, but it appeared the duct tape was doing its job for now.

Inside, the restoration looks nearly complete with beautifully finished original hardwood floors, white tongue-in-groove walls and ceilings, period furniture and two wood stoves. The first floor is divided into four rooms, a sitting room and kitchen that approximate 1905 appearances, a head keeper's bedroom that is still under renovation, and the "Coast Guard room" refurbished to its 1970s era radio room and office.

Throughout its life, the lighthouse was manned by three or four men working 12-hour shifts and rotating two or three weeks on duty with one week ashore. Rotating crewmen carried trash and mail, and a monthly tender delivered water, fuel and other provisions.

In the sitting room, Govan showed us the lighthouse version of a book mobile, a medicine cabinet-size bookshelf resting on the floor. Books were rotated between lighthouses up and down the Bay.

In the kitchen, or galley, a list of annual allowances included early lighthouse staples such as coffee, tea, flour, baking powder, vinegar, beef, codfish, mutton, apples and 104 pounds of something called pilot bread. This is where I began to feel the constraints of a timed tourist expedition. Interesting information hung on the walls everywhere, but there was not enough time to read it.

Moving on to the radio room — a glaring example of the ill-conceived aesthetic of the 1970s, with its "government green" paneled walls and wheat-brown carpet squares — Govan discussed how life had changed for the keepers and then proudly showed us the careful restorations, which included a vintage television that a volunteer had carefully glued back together after vandals smashed it on the rocks below.

A spiral staircase leads to the second story of the lighthouse, which once housed the 1,000-pound fog bell keepers had to wind like a clock. The bell struck three times every 30 seconds when visibility was low. The volume must have been torture. Today, the National Oceanographic and Atmospheric Administration weather instruments operate in this space. (Anyone in the world can see conditions on the lighthouse at ndbc.noaa.gov/station_page.php?station=tplm2.)

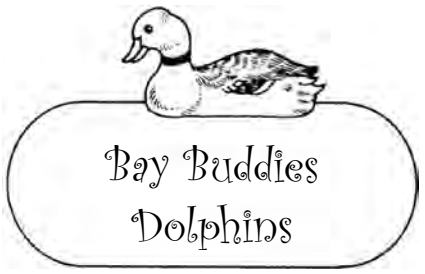
A hatch in the ceiling and a ship's ladder lead to the heart of the lighthouse, the lantern room. The low-wattage acrylic light is wired to a bank of four solar-charged marine batteries, but circular brass vents on each parapet remind me that it was once a living beacon with a flame that required tending. First oil, then gas vapor fueled the light, which was amplified by a 28-inch crystal Fresnel lens. It was electrified in 1933 and converted to solar in 1997.

Our hour on the lighthouse ended all too abruptly when the last of us had poked our head into the tower. I could have stayed all day trying to conjure up an obsolete way of life. I imagine time moved more slowly for the occupants of the lighthouse, but in the compression of its 150-year history, its keepers bore witness to significant changes in climate, technology and culture.

Today, their stories are being kept alive by a new breed of keeper — volunteers from the Lighthouse Society who lovingly scrape, paint, repair, and, yes, use duct tape, as well as docents like Govan and Cagle who lead tours and defend the image of the lighthouse against false replicas and outdated photos.

The wraparound porch of the Thomas Point lighthouse offers scenic views in all directions.

Tours of the Thomas Point lighthouse run on select Saturdays through early October. The cost is $80 per person and tickets can be purchased at uslhs.org/about/thomas-point-shoal-lighthouse/tours. Note that guests must be at least 12 years old or 4-feet tall to safely navigate the ladders. Videos on safety and the history of the lighthouse are also available on the website. For information, call 415-362-7255 or email info@uslhs.org.



It's summer, and humans aren't the only mammal tourists visiting the waters of the Chesapeake. Will you be lucky enough to see an Atlantic bottlenose dolphin? If not, you can learn more about these animals by taking this quiz. Answers are on page 39.

1. Dolphins have occasionally been sighted as far north as Baltimore Harbor, the Chester River and Washington, DC. Where are you most likely to see dolphins in the Chesapeake?
A. Cape Charles
B. Elizabeth River
C. James River
D. All of the above

2. Dolphins eat a variety of Chesapeake species. Which of these is not on their menu?
A. Crustaceans, including shrimp, crabs
B. Fish, including spot, croaker, menhaden, silver perch
C. Invertebrates, including squid, jellyfish
D. Aquatic vegetation, including eelgrass, redhead grass, widgeon grass

3. Dolphins cannot drink the water where they are normally found because it's too salty. Where do dolphins get the water they need to survive?
A. They surface when it rains and open their mouths skyward to catch the drops.
B. They travel up freshwater rivers to drink there.
C. They absorb water through their skin, which filters out the salt.
D. They get all the water they need from the fish they eat.

4. A male dolphin is called a bull, a female dolphin is called a cow and a young dolphin is called a calf. What is a group of dolphins called?
A. Herd
B. Pod
C. Platoon
D. Squad

5. Dolphins are at the top of their food chain. Still, that doesn't stop the occasional orca or a large shark – especially a bull shark – from making a meal out of a dolphin. Dolphins won't go down without a fight, though. What dolphin defense do predators try hard to avoid?
A. A hard wallop from its tail
B. A nasty bite from its long, sharp teeth
C. A poke from its strong, hard beaklike nose
D. A slicing cut from its fin

6. Dolphins are highly intelligent and playful. They have been observed chasing each other (like tag), tossing seaweed between them (like catch) and carrying objects, which they sometime use to try to persuade another dolphin to play. What ages are seen doing these activities?
A. Older dolphins
B. Younger dolphins
C. Both young & old dolphins

An Atlantic bottlenose dolphin leaps out of the water (National Aeronautics and Space Administration)

7. Dolphin eyesight is excellent both in and out of the water. At night, Dolphins are able to see in shades of gray and one other color spectrum. Which spectrum is it?
A. Blue-green
D. Blue-purple
B. Yellow-orange
C. Yellow-green

8. Dolphins can hear much better than humans. How much better?
A. 5 times
B. 10 times
C. 15 times
D. 20 times

9. How do dolphins communicate with other dolphins?
A. Clicking
B. Creaking & squeaking
C. Whistling
D. All of the above

10. Humans pose the greatest threat to dolphins. How?
A. Fishing equipment, such as gill nets
B. Hunting (FYI: Dolphin meat can contain chemical contaminants.)
C. Pollution
D. All of the above

11. Dolphins are in the family *Delphinidae*. Three of these whales are also in this family. Which one isn't?
A. Beluga whale
B. Killer whale (orca)
C. Melon-headed whale
D Pilot whale

— Kathleen A. Gaskell

You dolphinitely need to take this quiz!

Several Atlantic bottlenose dolphins showed up off Cove Point, near Solomons, MD, at the end of April. Since its launch last summer, ChesapeakeDolphinWatch.org – a website run by the University of Maryland Center for Environmental Science – has received reports of 1,000 sightings in the Bay and its rivers. Visit the site to learn more about these creatures and, in the meantime, you might discover a fact or two by taking this quiz. Answers are on page 39.

1. There has been at least one exceptional case of a 1,400-pound Atlantic bottlenose dolphin. How large is the average bottlenose dolphin that visits the Chesapeake?
A. 6 feet long, 100–200 pounds
B. 9 feet long, 200–300 pounds
C. 12 feet long, 300–400 pounds
D. 15 feet long, 400–500 pounds

2. Unlike humans, who breathe without thinking about it, dolphins must consciously make the decision to breathe. Dolphins can't take in air underwater and must constantly come up to the water's surface to breathe. Adults have been recorded staying under the water for as long as 15 minutes, but what is the average amount a dolphin stays underwater before it must come up to inhale?
A. 3 minutes
B. 7 minutes
C. 9 minutes
D. 11 minutes

3. The average lifespan of a bottlenose dolphin is 20–25 years, with a maximum age of 60–65 years. Which sex, on average, tends to live about 10 years longer? It's also the smaller of the two genders.
A. Female
B. Male

4. How are dolphins different from most land mammals?
A. They have no sweat glands.
B. They eat and breathe through separate holes in their mouth.
C. The normal birth position is tail (feet) first.
D. All of the above

5. A dolphin swims and steers using its flippers (forearms) and flukes (tail – each half is one fluke). Which is used to swim and which is used to steer?

6. Bottlenose dolphins usually swim 2–4 miles per hour. What is their top recorded speed?
A. Almost 11 mph
B. Almost 18 mph
C. Almost 26 mph
D. Almost 33 mph

7. Dolphins get only one set of teeth in their lifetime. They use their teeth to capture, not chew, their prey, which they swallow whole. How many teeth does a dolphin have?
A. 18–34 teeth
B. 38–64 teeth
C. 72-104 teeth
D. 110–140 teeth

8. Only newborn dolphins have hair, and it falls out within two weeks. Where is this hair found?
A. The top of its mouth
B. The top of its blowhole
C. Around its eyes
D. On the tips of its flippers

9. Dolphins share a behavior with bats. What behavior is this?
A. They locate their prey using echolocation.
B. They flap their flippers to swim using the same motion that bats use their wings to fly through the air.
C. They are nocturnal.
D. They hibernate in sea caves.

10. A bottlenose dolphin would regularly dive 200 feet to the Sea Lab II off La Jolla, CA. He not only brought tools and mail to the lab's personnel. Should a diver get lost, he was trained to lead the diver to safety. What was his name?
A. Blitz
B. Dash
C. Ricochet
D. Tuffy

11. Speaking about dolphin names, researcher Janet Mann, as part of her Potomac-Chesapeake Dolphin Project, has given names to a local population of the more than 500 individual dolphins spotted near the Potomac's mouth. After whom are many of the dolphins named?
A. Greek gods & goddesses
B. Flowers (females) & trees (male)
C. Literary characters
D. U.S. presidents & first ladies.

— Kathleen A. Gaskell

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"Fish are jumping and the river is high." Justin Aaron, right, and Arthur King fish a pound net on the upper Blackwater River. A regular on the river, Aaron catches all manner of fish. This day it was mostly mud shad and a few carp. (Dave Harp)

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A pair of bald eagles are perched on a duck blind in the Blackwater River one morning in June, most likely searching for breakfast. (Dave Harp)

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Juvenile brown pelicans take flight near their nesting grounds on a sandy spit between Smith and Tangier islands. (Dave Harp)

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Newport News, VA

Scott Sewell
Baltimore, MD

Tom Sherman
Blacksburg, VA

Marshall & Ginger Silverman
New Freedom, PA

Larry & Louise Smith
Williamsburg, VA

In Memory of Anna Mae Snyder
from Ted Snyder, Jr.
Oley, PA

In Memory of Ted Snyder, Sr.
from Ted Snyder, Jr.
Oley, PA

Theodore Stastny
Baldwin, MD

Lynette Stehr
Berwyn Heights, MD

Philip Sze
Gaithersburg, MD

In Honor of Kathleen Littleton
from Michael Nastasi & Terry Passano
Salisbury, MD

Patricia Vazquez
Brandywine, MD

Charles Wright
Virginia Beach, VA

Verne Keefer
Virginia Beach, VA

Donald Bennett
Hughesville, PA

In Memory of Whitey Schmidt
from Mr. & Mrs. David Brunk
Jamesville, VA

John Buchleitner
Severna Park, MD

Caeser Butkiewicz
Mount Carmel, PA

Susan Christopher
Wicomico Church, VA

In Memory of Terry A. Crauston
from Joshua Cranston
Silver Spring, MD

John Current
Apalachin, NY

Gerald Dietz
Loganville, PA

Greg Godon
Birdsboro, PA

Paul E. Grech, Jr.
West Grove, PA

Wally Horak
Riva, MD

Bill Mason
Glen Rock, PA

Denton Ortman
York, PA

Mary Perkins
Glen Burnie, MD

Barnett Rattner
Annapolis, MD

In Memory of Joan
from Gene Hicks
Bel Air, MD

Richard & Alta Richardson
North Chesterfield, VA

Dan Rosen
Springfield Center, NY

George Rutter
Front Royal, VA

Leslie Suhr
Harrisburg, PA

Leon Thompson
Wilmington, DE

Charles Stephen Ward
Annapolis, MD

C. B. Allwein
Mount Gretna, PA

In Memory of Scott Bowling
from Anna Angolia
Cottage City, MD

In Memory of James Mentzer
from Bonnie Mentzer
Lancaster, PA

John Seitz
Hyattsville, MD

In Honor of the U.S. Coast Guard
from Gary Riegel
Reading, PA

Bill Arnold
Lancaster, VA

Sandra Ashenfelter
Boiling Springs, PA

Archie Bachelor
North Prince George, VA

George & Dorothy Bloomer
Palmyra, PA

Paula Bounds
Henderson, MD

Steve Bowman
White Hall, MD

Sue Ann & Chuck Chlumsky
Shrewsbury, PA

Marty Clapper
Reading, PA

Lynda Clary
Tangier, VA

M. Hanford Day
Silver Spring, MD

Capt. Doug DuVall
Ellicott City, MD

James Florentine, Jr.
Westminster, MD

Ed Gabsewics
York, PA

Barry Hornberger
Wyomissing, PA

Mr. & Mrs. James Houstoun
Glen Rock, PA

Stephen Jackson
Red Lion, PA

David Kantner
Cornwall, PA

Ray Laracuente
Harrisburg, PA

Robert Liskey
Middle River, MD

Joseph Martin
York, PA

Susan Martineaw
Bridgeville, DE

Mr. & Mrs. John Murray, Sr.
McClure, PA

James Payne, Jr.
Manassas, VA

Terry Perkins
Wyoming, DE

Steven Pope
Mathews, VA

Henry Robbins
Bel Air, MD

Robert Rothenhoefer
Falls Church, VA

Paul Scheibe
Kennett Square, PA

Steve Schreiner
Columbia, MD

Paul Smith, Sr.
Havre De Grace, MD

Jan & Dale Snyder
Millersburg, PA

Peter Swinehart
Boyds, MD

Norma Swope
Williamsburg, VA

W. M. Tress
Hanover, PA

Joseph Turczyn
Coatesville, PA

In Honor of the U.S. Coast Guard
from Gary Riegel
Reading, PA

Jeff Trader
Pocomoke City, MD

John Engle
Seven Valleys, PA

Paul Farragut
Ellicott City, MD

Robert Gorey
Catonsville, MD

Mr. & Mrs. Herbert Lodder
Lutherville, MD

Robert Mosher
Charlton, NY

Ed Reisman, Jr.
Camp Springs, MD

Heather Schwartz
Clarksville, MD

Mary Shrift
West Chester, PA

Mr. & Mrs. Marshall Waring
Henrico, VA

Guy Wilkerson
Sterling, VA

Ed DiRaimo
Wheaton, MD

Cynthia Touchet
Camp Hill, PA

Randy & Anne Whitby
Smithsburg, MD

George Balas
Bastian, VA

Marvin & Grace Fienman
Philadelphia, PA

Annie Holley
Rocky Mount, VA

Jim Burch
Phoenix, MD

Tom & Vickie Carter
Newark, DE

Margo Bloxom
Chincoteague Island, VA

Mark M. Getz
Fleetwood, PA

FORUM

COMMENTARY • LETTERS • PERSPECTIVES

States must focus on how much is left to do, not how much has been done

BY ALISON PROST

This is a critical time for Bay restoration. At the halfway point between 2010 and 2025 the question is: Are we on track?

The Chesapeake Bay Foundation's midpoint assessment focused on the principal Bay states' progress in implementing the Chesapeake Clean Water Blueprint, also known the Chesapeake Bay Total Maximum Daily Load or "pollution diet." These three states are responsible for achieving roughly 95 percent of the remaining pollution reductions. Our evaluation has found success, but also troubling trends.

The blueprint, established in 2010, includes pollution limits, state-specific plans to achieve those limits, two-year milestones to evaluate progress, and consequences for failure. The states also committed to have practices in place to achieve 60 percent of the needed reductions by 2017, and to finish the job by 2025. The CBF's report used information from the Chesapeake Bay Program to assess whether the states achieved the 60 percent goal. We also evaluated the key policies and programs that states were relying on and made recommendations for future priorities.

On the positive side, watershedwide, the 2017 pollution reduction goals for phosphorus and sediment were achieved and pollution reductions from wastewater treatment plants far exceeded 2017 goals in all three states. On the downside, the nitrogen pollution reduction goal was missed, and Pennsylvania continues to be responsible for most of the shortfall. In addition, reducing polluted runoff from urban and suburban areas is also off track in all of the jurisdictions.

Pennsylvania

Pennsylvania's cleanup plan established a strategy to achieve agricultural compliance with state regulations on all farms in the Chesapeake watershed by 2017. Overall, progress was lagging until July 2016 when the Pennsylvania Department of Environmental Protection initiated a program to verify that farms at least have the required plans, as well as set a goal to inspect 10 percent of the farms annually.

Since 2016, the DEP and county conservation districts have inspected 15 percent of agricultural land in the state for required sediment and erosion control and manure management plans. About 65 percent of farms inspected had the required plans.

In Pennsylvania, the Keystone 10 Million Trees Partnership, coordinated by the CBF, is expected to have a positive impact on reducing agricultural, urban and suburban pollution by achieving as much as two-thirds of the Chesapeake Bay TMDL goal of 95,000 acres of forested riparian buffers. (Dave Harp)

Although the commonwealth is meeting the commitment to determine that farms have plans, moving forward, the inspection program should begin verifying the implementation of the practices in the plans. With 6,800 miles of streams impaired by agricultural activities, future compliance efforts must transition toward technical assistance and implementation.

In addition, the statewide Keystone 10 Million Trees Partnership, coordinated by the CBF, is expected to have a positive impact on reducing agricultural, urban and suburban pollution by achieving as much as two-thirds of the blueprint goal of 95,000 acres of forested riparian buffers. But Pennsylvania continues to be challenged by inadequate federal and state investments to clean and protect its rivers and streams.

The effectiveness of these efforts should benefit from the DEP's proposed approach of targeting time and resources in counties and watersheds that are delivering the most pollution to local waters and the Chesapeake Bay.

Maryland

Like other states, Maryland has made progress reducing pollution from wastewater treatment plants and at this time, this is covering gaps from other sources. Maryland will not be able to rely on wastewater plant upgrades to cover shortfalls at the 2025 deadline.

Maryland is also significantly behind in reducing polluted runoff from urban and suburban areas. None of the state's most populated counties nor Baltimore City have met goals for reducing this pollution, which is established in regulatory permits. To get back on track, Maryland must strengthen the next round of permits, adhere to deadlines and requirements in approving jurisdictions' Financial Assurance Plans and reduce forest loss from development.

To improve progress in agriculture, Maryland should focus its cost-share investment dollars in targeted areas and on sustainable practices — and restrict the use of funds for new or expanding poultry operations. Maryland also needs to better account and plan for pollution increases from sprawl growth in rural areas as well as an expanding poultry industry.

Virginia

Virginia has made progress in wastewater and agriculture, but needs to improve stormwater cost-share programs, account for growth in poultry farming and strengthen urban stormwater permit requirements.

The budget passed last month by the General Assembly is an important step. It provides funding for agricultural conservation practices and new funding for matching grants to help local jurisdictions, as well as reduce urban and suburban polluted runoff. These funds should be spent cost-effectively to maximize pollution reduction benefits.

In addition, as in Pennsylvania, the implementation of forest riparian buffers has been sluggish and needs to be accelerated. Furthermore, the state needs to re-evaluate its post-construction stormwater criteria for new development and develop an accounting-for-growth framework that considers the expansion of poultry production.

Moving forward

The Bay jurisdictions are starting to work on the third iteration of their cleanup plans that will describe actions between now and 2025. These plans must be detailed and comprehensive — and address existing shortfalls.

Developing local pollution-reduction goals and ensuring robust outreach efforts is critical, as are efforts to prioritize and target resources to maximize cost-efficiency.

In addition, the Bay jurisdictions should start planning now for the impacts of climate change — both in terms of the potential for additional pollution reductions and the prioritization of practices that will yield multiple benefits, including greenhouse gas reduction and climate resiliency.

The Chesapeake Clean Water Blueprint is working. The dead zone is getting smaller, Bay grasses set a new record last year, and the Bay's oyster population is recovering. It is time to develop and implement plans that will finish the job.

Alison Prost is acting vice president for environmental protection and restoration at the Chesapeake Bay Foundation.

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 Chesapeake Media Service.

Forum

Commentary • Letters • Perspectives

Oligotrophication! A big word for even bigger news, a Bay comeback

By Tom Horton

It was a year ago, a sunny summer morning overlooking the Choptank River… We were discussing what it has all meant, studying the Chesapeake Bay for about 40 years with just retired University of Maryland scientists Walter Boynton and Michael Kemp.

Except they're not sounding as retired as they should. Both have completed enviable careers; Walt's dealing with leukemia and post-polio stuff, Mike with Parkinson's disease. But like two old hounds, legs feeble but noses still keen, they've picked up the hot scent of a scientific mystery.

"Oligotrophication." Mike almost doesn't know how to pronounce it. It's rarely uttered — the opposite of "eutrophication," the term for the overfertilization and resulting de-oxygenation of waters through he addition of human wastes and fertilizers, which has become the sorry norm for the Bay and coastal waters around the planet for many decades.

Some oligotrophication would be a good thing for our Chesapeake, promising cleaner, clearer waters, lusher with all of the life that abounded when Walt first saw the Bay in 1969.

Could it be happening, even a smidgen, after 30-plus years of federal-state Bay restoration efforts?

Collegially, the two scientists go back and forth about the prospect, prodding, second guessing, arguing as they've done since they started working together in the 1970s — as scientists have done with one another since there was science.

With their younger colleague Jeremy Testa, they've recently uncovered tantalizing hints that the Chesapeake, decades after tipping over the edge toward a more degraded state, could be on the threshold of a comeback. "My gut says so, but [it's] still just bits and pieces of proof…not conclusive," Mike said.

Both men acknowledge that environmental science knows more about how ecosystems go to hell than about how they come back. There's too little experience with the latter.

Walt's more convinced at this point than Kemp. He recalled earlier work in the Potomac River where the water had gotten so cloudy that only a single species of nonnative grass inhabited the bottom. Visibility, measured by a black-and-white Secchi disc lowered into the river was 0.6 of a meter.

Visibility improved very marginally

Retired University of Maryland scientists Michael Kemp, left, and Walter Boynton published around 50, peer-reviewed papers and in 2009 won the prestigious Odum Award for Lifetime Achievement, the only joint winners of the prize. (Dave Harp)

Chesapeake Born

to where you could see another 0.05 of a meter into the water. But that was enough to explode the river bottom with many species of native grasses. Both scientists find it "thrilling," this notion that there are "thresholds" or "tipping points" where a slight change can create a cascade of other changes.

They're excited by what's emerging from decades of old water quality data they've been reworking, reanalyzing "a thousand different ways" for the last few years, Mike said.

Something unanticipated seems to be happening, a trend involving forms of nitrogen — technically NH_4, N_2, N_3 and NO_2 — that might make you want to stop reading right here. But to a Bay scientist…well, let Mike tell you:

"When I first saw that relationship (in the data) I felt like the Conquistadors traveling across the American Southwest and coming upon the Grand Canyon — Wow! How'd this get here?"

In essence, it makes them suspect our modest gains in reducing nitrogen entering the Bay so far might have still been enough to reach a tipping point, creating a positive feedback loop, boosting the estuary's ability to rid itself of pollution faster than expected.

Our traditional measurements of progress, like reductions in volumes and duration of oxygen-poor waters or total pollution entering the estuary, might not be the whole story, might not be accounting for the Bay, in effect, also beginning to help itself.

Walt and Mike were born to do just this stuff, to tease out scientific truths from big, complicated, ever-shifting ecosystems like the 187-mile-long Chesapeake, embedded at the base of 64,000 square miles of lands that drain into it through 40-odd significant rivers.

Both came here as Ph.D. students of the legendary H. T. Odum at the University of Florida, a genius who brought systems analysis to ecology, pioneered tracing the flows of energy through nature that allowed a fuller understanding of how all of the parts, including humans, fit together. Other scientists might publish on wetlands and fisheries; Odum delved into economics, physics, even religion and wrote books like *Environment, Power and Society*, which has influenced my own writing about the Chesapeake.

The pair's Odumesque training would prove a good fit for the efforts begun in the 1970s to understand the estuary's unprecedented, systemwide decline. Just as important from Odum, who worked his whole career with his even more famous brother, ecologist Eugene, Mike and Walt also learned collaboration, which was not encouraged in their field when they started.

Together, they've published around 50 peer-reviewed papers and in 2009 won the prestigious Odum Award for Lifetime Achievement, the only joint winners of the prize.

"We live in the age of estuaries," the late oceanographer Donald Pritchard (an Odum winner) used to say, meaning the geologically brief times between Ice Ages when seas rise and Chesapeake Bays form.

More recently, in the last half century, we entered the age of eutrophic or polluted estuaries — more recently still the era of trying to reverse such trends.

Is it possible we may now be trending, slightly but surely, toward oligotrophic, or recovering estuaries?

It would be a fitting capstone to the careers of those two old dogs, Walter Boynton and Michael Kemp; both of whom would say more research needs to be done to confirm that.

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.

Chesapeake Challenge

Answers to
You dolphinitely need to take this quiz!
on page 34.

1. B, 2. B, 3. Female 4. D,
5. flukes swim, flippers steer
6. B, 7. C, 8. A, 9. A, 10. D
11. D

Bay Buddies

Answers to Dolphins! on page 34.

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

Forum

Commentary • Letters • Perspectives

As the tide rises against them, Deal Islanders hold their ground

By Caitlyn Johnstone

A small country road, ambitiously designated a state highway, branches off U.S. Route 13 in the town of Princess Anne, MD, and meanders out into the marsh of the Eastern Shore. For 19 miles, the road travels through forests of loblolly pines before giving way to miles of marsh grass and patched water. Continue out into the marshes, past where you would expect to see humans and you end up in Deal Island, one of the last classic Chesapeake Bay watermen communities.

The size of the island is dependent on your level of optimism: the county website describes Deal as being 3 miles wide and 1 mile long. The resident-maintained island website describes Deal as 6 miles wide and 3 miles long. It depends on how you determine what is "land" and what is "water," a line that becomes ever more difficult to draw as the years pass. Deal Island is, like most of the islands in the Tangier Sound, slowly being lost to the sea.

Before the sun is fully up on the last day in March, Butch Walters is at the local marina preparing to search for the last of the winter oysters. His morning greeting is immediately followed with suspicious questions about how we know the same people that he does, and how he came to have passengers. Working on the water is not a tourist opportunity, and Deal Island is so far out of the way that strangers rarely venture out. When we explain our contacts, Walters' weathered face laughs. "I wondered how you were able to get down here and do that!"

Full disclosure, I grew up on Deal Island visiting my family. It is the kind of island where childhood memories are a Norman Rockwell painting, if he had experienced a bit more salt and some blue crabs. Summer evenings frequently included trips for ice cream in the open bed of a pickup truck, if you could find a place on the edge amongst the crab pots. A man with kind eyes that disappeared beneath deep black wrinkles would serve up bonbons – frozen custard layered with chocolate syrup-soaked ice in paper cups – in a tiny car-drawn trailer sitting among the weeds. Headed back with our treats in the bed of the pickup, our bare feet would dangle above the dirt road as we rattled off at speeds fast enough to easily dislodge a child or two.

The island and a closeup view of the working day of a waterman is not generally open to new people. On Deal Island, residents differentiate neighbors by being "born heres" and "come heres."

Butch Walters of Deal Island, MD, culls oysters harvested using a power dredge in the waters north of Deal Island, MD, in 2017. (Will Parson / Chesapeake Bay Program)

There is a sense of place to the island so deeply ingrained that very few would think of leaving, even if it became necessary. Butch Walters is a "born here," and one of the last in generations of watermen in his family.

A changing island

Under the Chesapeake Bay lay more than oyster beds. Straight out from Deal Island is a patch of marsh called Holland Island, home to birds and not visible at all during high tide, when it fully disappears beneath the waves. Under the surface are the remains of an entire community—homes, schools, churches, shops and a post office. In 1910, Holland Island was the most populated island in the Chesapeake. Ninety working vessels made port on the island, returning each night to beautiful Victorian homes. Just like Deal does today, Holland Island had a traveling baseball team. Such a lively community created the illusion of permanence.

By 1922, Holland Island was abandoned. With no bedrock to hold it in place, erosion quickly returned the island to the Bay. Some of the homes were dismantled and taken to Crisfield, MD, to be rebuilt. Others tried to remain behind on their island, only to have devastating storms pull the land out from under their feet.

On a visit to the island many years later, former waterman Stephen White came across the headstone of a little girl in one of the abandoned graveyards. Because of the inscription on this headstone, he poured blood, sweat and tears into trying to save what remained. One single house persisted above the waves in the decades to follow, beautiful and desolate. White and his wife placed sandbags, stones and wood and even sunk a barge as breakwaters. The sea proved a larger opponent, and White gave up the fight for Holland Island in 2010. The headstone of the small girl that had driven his 15-year crusade read, "Forget me not, is all I ask."

The last house on Holland Island would be photographed many times in the years since its abandonment. A venture capitalist group bought the island in the fall of 2010, commissioning a surveyor to take aerial photos of the disappearing sand with its solitary home. The last house collapsed into the waves in October of 2010. Today, the remains of structures below the waves and the welcome respite of shallow sand out in the Bay make an excellent refuge for wildlife and a great place for watermen to go crabbing.

The islands of the Chesapeake Bay are curious in their virtually rockless composition, making land highly susceptible to erosion from storms and everyday wear. The Chesapeake basin has long-term geology working against human habitation as well: Thanks to the compression by a heavy sheet of ice during the last ice age, the Chesapeake basin fluctuates from its release similar to the way Jell-O would wobble in and out after a pressing finger was lifted. Currently, the Chesapeake basin is sinking, bringing the land closer to the water at the same time that the water is rising up to meet it.

In this area, it is not a matter of what is causing the changes—whether you want to believe it is human-caused climate change, changes that are part of the natural cycle of the Earth, sea level rise, a sinking Chesapeake or a combination of factors—the reason is not important. Everyone on the island can see the changes. Current residents will likely live out their days on Deal Island, but the island and the way of life will not last forever. There is still a ways to go until then. The watermen of Deal Island are working to save their heritage, in pictures and memoirs if not in passing on the traditions.

This is all happening on a slow geologic scale, but the combination of factors facing Deal Island is accelerating the timeline for its human residents. Holland Island still exists for the birds and crabs, but it has been many decades since its human community was lost to the dissipation of the land, and present-day watermen were shocked to dig into its

Island continues on page 41

Forum

Commentary • Letters • Perspectives

Island from page 40

past and find their ancestors lived there. By the time Walters' great-grandchildren reach his age, they may be learning the same history about Walters and the other watermen of Deal.

The life of a waterman

"I've been oystering since I was 15 years old," Walters said. "It gets in your blood, and you just don't lose it. I mean you're just stuck. You don't want to do nothing else." He speaks with a Deal Island accent, a warmly rolling mumbling of words with a simultaneous staccato cadence, unique to these small Chesapeake lands. "I could be doing something else and I hear somebody say 'oysters' or 'catching some crabs' and I'm ready to go."

Though the pull on the heart that calls one to the water seems to be both environmental and genetic, Walters may be one of the last able to answer it. "Our generation, my generation, is the last big generation that's still working the water… Kids are not wanting to work or they're not used to this kind of work. Cause it is more work. Ain't nothing easy about it."

Walters' grandfather and great grandfathers before him were all watermen. His father worked the water until he went into the service, then worked on boats and went into painting after his return. Walters' son seems to have inherited a part of the waterman heart, but it isn't enough. "He reminds me a lot of my father cause he has the light for [being a waterman]," said Walters, speaking of the extra quality he feels one needs to be a waterman, "but he don't have the light to do it for a living." He looks out over the waters as he talks, steering with a practiced hand and keeping one eye on his screen readouts. Technology has revolutionized some aspects of working the water, like the introduction of the power dredge, but Walters still uses a few of the old watermen tricks. Flocks of ducks tend to swoop down and feed on oyster beds, leading the watermen to a likely spot. If you know what you're looking for, the wildlife and the water can be just as effective as a depth finder.

But it takes more than having "the light" and the knowledge to be a waterman. Mary Frances Whitelock, a former math teacher and former shedder (someone working in the crab sheds preparing the soft shells), spoke about the economic strains on the watermen industry. "I know a lot of parents don't want their people to go out on the water because they don't think there's a future in it anymore. Used to be, everybody down here worked for the water. They made their living on the water. They grew up that way. But a lot of young people are leaving the island because there aren't many jobs. If you don't have your license already, it's a five–, six–, seven-year waiting list unless you got somebody in the family that's leaving their license to you."

Feral cats inhabit a marina on Deal Island in Somerset County, MD. Cats often eat scraps that watermen bring in with their catch. (Caitlyn Johnstone / Chesapeake Bay Program)

The boat, rigging equipment, licensing fees and strain of diminished catch all make working the water a less profitable business these days. "I don't know what's gonna happen to the water businesses. Looks to me likes it's gonna be starvation time…there's not going to be any watermen. There's nobody young who can afford to go into the water business." That's former waterman and boat builder Jack Willing, the man who presides over Scott's Cove Marina and holds court for watermen on the faded couch next to the chip rack in the marina shop.

To Willing, much of the problem with oyster recovery is a lack of communication between the state and the watermen. "[The watermen] have been doing it since they were 5 or 6 years old," he said. "The watermen could tell you what's going on."

Willing sees many problems with the current state of hatcheries, though he's highly in favor of growing oysters. During high school in the late '50s, Willing was head of an aquaculture club that had great success in cultivating oyster patches and making a profit. "But the state!" he exclaims, "they can't grow one, save their heart overboard, unless they plant shells for them to catch on." "Saving a heart overboard" is a mixture of affection and disparagement akin to the Southern "bless your heart," and not a phrase you're likely to hear outside a waterman town.

He said that those with an interest in oyster survival need to be more connected with a broader view of the ecosystem involved in oyster survival. For one thing, keeping it local. "[Hatchery oysters] won't grow like the natural oyster will. They grow real long and narrow and they're not fit to eat. They're getting shells from down in Florida; ancient shells is what they're called. They won't catch on them, either. That's what they're planting overboard on rocks — that are productive rocks! — and they ruined 'em."

Rather than merely brushing shoulders when they come into contact in a day's work, Willing would like to see true collaboration between officials and watermen on the science of growing oysters and the direction of the seafood industries. "If you can't catch no oysters, you lose all your market. If you don't keep them cultivated, they die. It's pretty simple. They can't get up and move around like a crab can."

Living on Deal Island

Like the crabs, the people of Deal Island have the option to move away, but most would rather stay through the changing conditions. Scenery is breathtaking, but it's the neighbors that are the strongest factor.

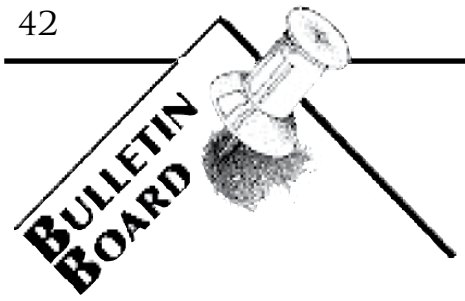
There are four communities that make up the area: Dames Quarter, Chance, Deal Island and Wenona. "I like a community life," Whitelock tells us from her sunny deck. Her home looks out over a large piece of property edged with marsh grasses, a shimmering strip of the open Bay and view of the work boats on the horizon. "It's quiet, but yet everybody's here. If you need somebody, you call. Country life."

The typical age in the area has started to creep up. When someone passes away, extra food, flowers and people are coordinated through the churches, fire companies, legions and other civic-minded organizations strongly established on the island. "It's a community thing, the whole thing, from Dames Quarter right on down," Whitelock states with pride. "They're different communities but we're all the same. [We] look after each other."

Working the water holds the same level of dedication for the remaining watermen. "It's a way of life," Walters suddenly stated from the helm of his work boat. Silence has stretched for some time when this statement is offered, and he spoke directly to the water as he said it. "It gets in your blood and lays claim; I don't know what it is. It got in mine. I been here ever since."

Caitlyn Johnstone is an outreach specialist at the Chesapeake Bay Program and Alliance for the Chesapeake Bay.

A tombstone dating to the early 1800s lies broken on Deal Island, MD. (Will Parson / Chesapeake Bay Program)



VOLUNTEER OPPORTUNITIES

CBL Visitor Center

Volunteer docents, 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 during the spring, summer and fall seasons. Training sessions are required. Contact: brzezins@umces.edu.

Paradise Creek Nature Park

Paradise Creek Nature Park in Portsmouth, VA, is looking for participants of all ages (12 & younger w/adult) to take part in its *Volunteer Service Days* 9–11 am. July 28 and Aug. 11 and 25. Help to pull invasive plants and install native species as well as maintain trails and recreation amenities. Wear closed-toe shoes and long-pants. Bring sunscreen, insect repellent, water bottle. Preregistration is required. Contact: Kat Fish at 757-392 7132, kfish@elizabethriver.org.

Adopt-a-Stream program

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. Participating groups receive an Adopt-A-Stream sign from the PWC Public Works Department in recognition of their stewardship. To learn more, adopt a stream or get a proposed site, contact waterquality@pwswcd.org.

York County (PA) Parks

Upcoming volunteer opportunities at York County, PA, parks include:

- *Kain Park,* York: 6:30–8:30 p.m. July 10. Trail maintenance.
- *Kain Park,* York: 9–11 a.m. & 1–3 p.m. Aug. 11. Clean up the lake by canoe.
- *Raab Park,* Seven Valleys: 9 a.m.–12 p.m. Sept. 22. Trail work.
- *Nixon Park,* York: 9–11:30 a.m. & 2:30–4 p.m. Oct. 6. Habitat tree plantings.

Preregistration is required. Contact: parks@yorkcountypa.gov, 717-840-7440.

Cromwell Valley Park

Cromwell Valley Park near Towson, MD, needs volunteers for its *Habitat Restoration Team / Weed Warrior Days* 10 a.m. to 12 p.m. July 7, 11, 21 & 25 and Aug. 18, 22, 25 & 29. All ages are welcome (12 & younger w/adult) to help remove invasive species, plant natives and maintain restored habitat. Service hours are available. Meet at Sherwood House parking lot. Preregistration is required. Contact: Laurie Taylor-Mitchell at ltmitchell4@comcast.net.

Patapsco Valley State Park

Maryland's Patapsco Valley State Park needs volunteers to help remove wavyleaf basketgrass throughout the park. Workdays are scheduled 9 a.m. to noon July 21, Aug. 25 and Sept. 8. Wear long pants, long sleeves and sturdy boots. Bring water and gloves. Rain cancels a workday. The park also needs volunteers to help with weekly maintenance. Registration is required. Contact: volunteerpatapsco.dnr@maryland.gov.

Lancaster, PA, stream surveys

The Lancaster (PA) County Conservancy needs volunteers of all ages to help out at its Susquehanna Riverlands Research and Education Center at Climbers Run Nature Preserve in Pequea, 9–11 a.m. July 14 as part of the Water Quality Volunteer Coalition, a partnership with the Lancaster Conservation District and Donegal Trout Unlimited. Preregistration is required. Contact Linda Ferich at lferich@lancasterconservancy.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 July, August and September at Little Paint Branch Park in Beltsville. Learn about natural features and native plants. Sign in for a safety orientation. Gloves and tools are provided. Contact: Marc Imlay at 301-442-5657, Marc.Imlay@pgparks.com.

Magruder Woods

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

American Chestnut Land Trust

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

Prince William Ploggers

Join the Prince William (VA) *Ploggers*, a volunteer corps of joggers who pick up litter. Contact: Lynda Kummelt at 571-285-3772; lkummelt@kpwb.org.

Snap a stream selfie

Water quality in 80 percent of U.S. streams is unknown. Volunteers can help bridge the information gap by taking a selfie from their backyard or nearby stream. Contact: iwla.org/streamselfie.

Anita Leight Estuary Center

Volunteer opportunities at Anita C. Leight Estuary Center in Abingdon, MD, include:

- *Invasinators:* 9–11 a.m. July 15. Work at Leight Park & Bosely Conservancy. Ages 14+ Remove invasive species, plant natives.
- *Plankton Monitoring Studies:* July 11, 18 & 25. Adults. Help to collect, identify, analyze plankton samples. Call the center for introductory training.

Preregistration is required for both programs; contact: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

Ruth Swann Park

Help the Maryland Native Plant Society, Sierra Club and Chapman Forest Foundation 10 a.m. to 4 p.m. the second Saturday in July, August and September remove invasive plants at Ruth Swann Park in Bryans Road. Meet at Ruth Swann Park-Potomac Branch Library parking lot. Bring lunch. Contact Marc Imlay at 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., return at 5 p.m. Carpool contact: Laurel Imlay at 301-277-7111.

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.

RESOURCES

Emerald ash borer program

The Virginia Department of Forestry's *Emerald Ash Borer Cost-Share Program* will help landowners nonprofits, schools, homeowner associations and municipalities treat ash trees to prevent death by the emerald ash borer. Contact Meredith Bean at meredith.bean@dof.virginia.gov, 434-220-9034. To learn about the borer, visit emeraldashborer.info. To participate in free webinars, visit emeraldashborer.info/eabu.php.

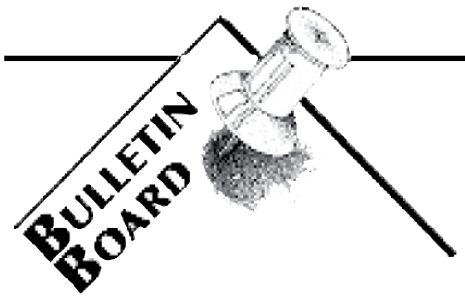
MD weekly fishing report

Learn what fish are biting where in Maryland through summaries written by experts at news.maryland.gov/dnr/tag/weekly-fishing-report.

Learn if your yard is Bay-Wise

Master Gardeners in Prince George's County (MD) takes part in *Bay-Wise*, a program that offers free consultations on sound environmental practices for county residents' yards to help them to have their landscapes certified as Bay-Wise. The Master Gardeners look for healthy lawn maintenance, efficient watering and pest control, and native trees and plants that provide shelter and habitat for wildlife. They also suggest approaches to reduce pollution. Free Bay-Wise signs are given to homeowners who demonstrate sound Bay-Wise practices. 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 as Bay-Wise, though, homeowners need to have the Master Gardeners visit and evaluate their landscape. Contact: Esther Mitchell: estherm@umd.edu

BULLETIN CONTINUES ON PAGE 43



Bulletin from page 42

or visit extension.umd.edu/baywise/program-certification. Click on "download the yardstick" to evaluate a landscape and/or vegetable garden.

Runoff on private property

Private property owners in Virginia who need help with erosion and runoff control can contact the Prince William Soil and Conservation for VCAP Assistance at 571-379-7514 or visit: http:/vaswcd/vcap.

Floatable monitoring program

The Prince William Soil & Water Conservation District in Manassas, VA, needs volunteers to help assess and trace trash in streams as part of 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. Contact: waterquality@pwswcd.org.

Turf / lawn programs

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

Stormwater management help

Businesses and nonprofits interested in landscaping and turf management, stormwater pond management, wildlife concerns, recommendations for maintaining landscapes, protecting water quality and pollution prevention can call 703-792-6285 to schedule a free site visit.

Bilingual educator resources

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

Forums / Workshops

Class for forest owners

The University of Maryland Extension is offering a *General Forestry Course* for landowners. Both paper and online versions of the course are offered Sept. 1 through Dec. 15. This non-credit course with no formal classes covers how to protect trees from insects, diseases and fire; step-by-step procedures on making a forest inventory and stand analysis; details of the forestry business; tax nuances; and the sale and harvest of forest products. The course is designed to provide a framework for a forest stewardship plan. The $150 fee includes supplemental readings. The paper version text and appendices for the course are in binder form. Online users receive a flash drive of the paper version of the text and appendices. A certificate of completion is awarded when all assignments are completed. Contact: extension.umd.edu/forestry-course. or Nancy Stewart at 410-827-8056 x107, nstewar1@umd.edu.

Grants to fight MD wildfires

The Maryland Department of Natural Resources is offering critical grant funding through its *Volunteer Fire Assistance Program* to help strengthen wildland firefighting capabilities statewide. The grants, which help first responders to acquire and maintain the skills and specialized tools they need to battle wildfires, are funded by the U.S. Department of Agriculture Forest Service. They require local matching funds of 50 percent, with a maximum award of $3,000. Volunteer fire departments can submit one grant application per year. Applications will be accepted until July 16. Contact: Monte Mitchell at 410-260-8503.

The Bay Backpack

Provided by the Chesapeake Bay Program's Education Workgroup, the *Bay Backpack* is an online resource for educators with information about funding opportunities, field studies, curriculum guides and lesson plans related to the Chesapeake. Contact: baybackpack.com.

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 more 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. Contacts: sanctuaries.noaa.gov/news/aug17/toolkit-helps-students-and-teachers-fight-against-marine-debris.html; marinedebris.noaa.gov/curricula/marine-debris-monitoring-toolkit educators; marinedebris.noaa.gov/sites/default/files/publications-files/MarineDebris-MonitoringToolkitForEducators.pdf.

Urban farming workshop

Future Harvest Chesapeake Alliance for Sustainable Agriculture, the University of Maryland Extension and the Farm Alliance of Baltimore invite urban farmers to *Cultivate Baltimore: Community-Engaged Farming*, 6–8 p.m. July 12 at Whitelock Community Farm in Baltimore. Eric Jackson of Black Yield Institute will explain why it's critical to gather input from, show respect to and support a farm community's members. Whitelock Community Farm's Isabel Antreasian will discuss the ways Whitelock engages and serves their Reservoir Hill community. The workshop fee is $10. To request a scholarship, email futureharvestcasa@gmail.com with the subject line "Cultivate Baltimore scholarship request."

CBMM educator workshops

Free educator workshops offered by the Chesapeake Bay Maritime Museum in St. Michaels, MD, include:

- *Exploring the Chesapeake: Mapping the Bay:* 10 a.m.–2 p.m. July 30 for K–12 school-based and homeschool educators. Learn strategies for teaching with maps using the CBMM's *Exploring the Chesapeake: Mapping the Bay* exhibition. The Maryland Geographic Alliance is co-host of this workshop.
- *STEM & Ocean Literacy:* 9 a.m.–5 p.m. Aug. 6. Open to middle school educators (Other teachers may attend if space allows.) Participants leave with the *Reach Educator Guide for Middle School, Modules 1-10* and earn U.S. Sailing STEM Educator certification. The Reach modules are correlated to national education standards in science and math, as well as US Sailing's Learn Sailing Right! Baltimore's Downtown Sailing Center is a co-host of this workshop. Contact: cbmm.org.

Events / Programs

MD Conservation Corps

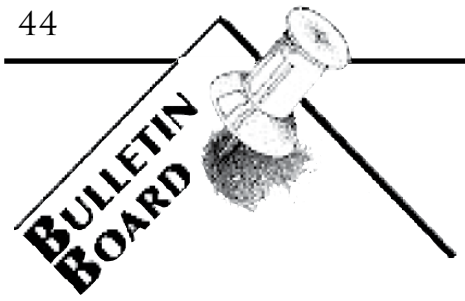
The Maryland Department of Natural Resources is recruiting young adults, ages 17–25, for the *Maryland Conservation Corps*, an AmeriCorps program that staffs extensive conservation, environmental and natural resources management projects across the state. Participants work on five to seven teams for an 11-month period beginning in September. Their work might include: conducting interpretive state park programs; helping to preserve historical heritage sites; improving park nature centers; maintaining trails; planting trees; providing environmental education programs for students; restoring wildlife habitat; and working with schools to plant Bay grasses. Interested individuals must submit an online application at dnr.maryland.gov/publiclands/Pages/mcc_application.aspx. Placement is on a first-come, first-served basis.

Bulletin continues on page 44

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.
- **September issue: August 11**
- **October issue: September 11**



BULLETIN FROM PAGE 43

Farm-to-table fund-raiser

The Prince William Environmental Excellence Foundation's third annual *Farm to Table Fund-raiser Dinner* takes place 3–8 p.m. (first seating 3:30–5:30; second seating 5:30–7:30) Aug. 25 at Windy Knoll Farm in Nokesville, VA. The meal is an open seating, buffet-style dinner with lemonade, tea and water; local beer and wine will be available for sale. All meal ingredients will be provided and produced by farms in Prince William County. The event also includes local artisans, farm sponsors, vendor displays, antique equipment, silent auction, raffle and a hayride tour of the farm. Tickets are: $40/adults, $20/ages 13–18; free/ages 12 & younger. All proceeds support the foundation's environmental, agricultural and natural resource conservation education programs.

Destination Dinosaur at VLM

The Virginia Living Museum invites the public to its latest exhibit, *Destination: Dinosaur,* a dinosaur-themed experience. Guests travel back to the Jurassic and Cretaceous periods as they view 11 animatronic dinosaurs in the indoor gallery; a life-size T. rex and Pachyrhinosaurus photo-op in the garden; water-spitting Dilophosaurus & baby on the back deck; original Virginia dinosaur tracks; and outdoor dinosaur discovery trail. Three dinosaur-related shows are also being offered:

Did An Asteroid Really Kill the Dinosaurs? 1:30 p.m. daily May 5–Sept. 3 in the Abbitt Planetarium. Fee: $4 plus museum admission.

The Rex is Right! 12:30 p.m. & 1:30 p.m. daily June 16–Sept. 3. Live theater program in the outdoor amphitheater.

Daring Dinosaurs! 11 a.m., 12 p.m. & 1 p.m. June 16–Sept. 3. Live animal encounter on the museum's main level.

Destination: Dinosaur is included with museum admission: adults/$20, ages 3–12/$15. Contact: thevlm.org, 757-595-1900.

Kent Island youth fishing derby

Kent Island Fishermen, Inc. and the Kent Island Estates Community Association's *13th Annual Youth Fishing Derby* takes place 8 a.m. to 1 p.m. Aug. 11 at Romance Pier and the Kent Island American Legion #278. Register for required wristbands at 8 a.m., fish 9–11 a.m. and get prizes and refreshments 11:30 a.m. to 1 p.m. Participants, who must be accompanied by an adult, are asked to bring their own rods as there are only a few loaners available. Bait is provided. Prizes are awarded for the largest fish, smallest fish, most unique fish and most fish caught in each age group: 3–5, 6–10 & 11–16. Winners must be present to claim their prize. There will be no more than one trophy per winning child. Contact: wotwater@atlanticbb.net

Cromwell Valley Park

Upcoming programs at Cromwell Valley Park's Willow Grove Nature Center [N] or Primitive Technology Laboratory [T] near Towson, MD, include:

Ochre: Humanity's Paint: 1–3 p.m. July 14 [T] Ages 8+ Learn the history of red ochre pigments, then hike in the Minebank Run to collect, process the rock into paint. Bring a bandana or white shirt to paint. Shoes will get wet. Fee: $4.

Wild Edibles: 1–3 p.m. July 15 [N] Ages 18+ Join a naturalist to collect, cook what is found. Fee: $5.

Mud & Fire / Part I: 1–2:30 p.m. July 21 [T] Ages 18+ Use clay from White Marsh Run to discover how native people made pottery. Fee: $4.

Mud & Fire / Part II: 1–3 p.m. Aug. 11 [T] Ages 18+ Bring the pot from Part I to learn how to fire pottery on a campfire. Fee: $5.

Poisonous Plants & Animals: 1–2:30 p.m. July 22 [N] Ages 5+ Learn to how to identify, avoid: poison ivy, cherry leaves, nightshade, copperhead snakes. Fee: $4.

Moths in the Moonlight: 8–9:30 p.m. July 27 [N] All ages. Attend an indoor presentation about saturniid moths, then head outside to attract insects with bait, lights. Fee: $4.

Just for Kids / Little Free Library Launch & Story Time: 1–2:30 p.m. July 28 [N] Ages 3–10. Help unveil the Little Free Library with a story, hike to stream to search for creatures that live there. Shoes will get wet. Fee: $4.

Butterflies Like It HOT! 1–2:30 p.m. July 29 [N] Ages 8+ Learn to observe, identify butterflies, plus why they prefer hot weather. Bring binoculars. Free.

Discovering Dragonflies: 1–2:30 p.m. Aug. 4 [N] Ages 5+ The creature in *Alien* was partly based on insect life cycles. Help to catch these pond creatures. Shoes will get wet. Fee: $4.

Late Summer Wildflowers Field Hike: 1–2:30 p.m. Aug. 5 [N] Adults. Learn the stories behind wildflower names. Free.

Go Wild for a Native! 1–2:30 p.m. Aug. 12 [N] Ages 8+ Learn how to turn even a small corner of a yard into a wildlife oasis. Fee: $4.

Just for Kids / Animal Story Time: 1–2 p.m. Aug. 18 [N] Ages 3–10. Listen to an animal story, make a bookmark. Fee: $4.

Owl Prowl: 8–9:30 p.m. Aug. 24 [N] Ages 5+ Join a naturalist, who will call in a great horned owl. Wear dark clothing, sturdy shoes. Fee: $4.

Migrating Monarchs: 1–3 p.m. Aug. 25 [N] Ages 6+ Learn about, help to capture & tag these butterflies as they head south to Mexico. Fee: $4.

Stream Search: 1–2:30 p.m. Aug. 26 [N] Ages 8+ Search stream creatures. Nets provided. Shoes will get wet. Free.

Ages 12 & younger must be accompanied by an adult. Except where noted, preregistration is required for all programs. Contact: info@cromwellvalleypark.org, 410-887-2503. For disability-related accommodations, call 410-887-5370 or 410-887-5319 (TTY), giving as much notice as possible.

Chesapeake Bay Maritime Museum

Upcoming events and programs at the Chesapeake Bay Maritime Museum in St. Michaels, MD, include:

Winnie Estelle Ecology Cruises: 10–11:30 a.m. Aug. 8 and 1–2:30 p.m. July 12. All ages. Explore the Miles River's habitat and ecology; learn how to monitor, test its water quality; look for an oyster reef's animals. The route passes near Long Point Island, known for its eagle and osprey populations and heron rookery. Fee: $20. Preregistration required. Contact: cbmm.org/onthewater.

Winnie Estelle Cruises / Log Canoe Races: Two-hour cruises depart 9:30 a.m. July 29, & Sept. 16; and 9:30 a.m. & 1:30 p.m. July 28, Sept. 8 & 15. View Chesapeake Bay sailing log canoe races along the Miles River while aboard the 1920 buyboat. Cruises include commentary from CBMM's docents, crew. Fee: $35. Registration required. Contact: cbmm.org/onthewater.

Free Admission / Military Families: CBMM participates in the Blue Star Museums program, which offers free general admission to active-duty military personnel and up to five immediate family members through Sept. 3, 2018. It includes those currently serving in the U.S. military: Army, Navy, Air Force, Marines, Coast Guard as well as Reservists, National Guardsman, Public Health Commissioned Corps, NOAA Commissioned Corps. Participants must show a Geneva Convention common access card, DD Form 1173 ID card (dependent ID) or a DD Form 1173-1 ID card. Free, on-site parking available. Contact: cbmm.org, 410-745-2916. The program excludes festival admission. A list of 2018 participating Blue Star museums is at arts.gov/bluestarmuseums.

Family Boatshop Program: 10 a.m.–4 p.m. Aug. 4. Ages 10+ w/ adult. Help to build steam-bent bird feeders. The cost for one youth/adult pair is $55; each additional child is $20. Preregistration required; visit cbmm.org/shipyardprograms.

Summer Adventure Poker Run

Take part in the Anita C. Leight Estuary Center's *Summer Adventure Poker Run!* Abingdon 9 a.m.–12:30 p.m. July 14. Register in before 10 a.m. and get a list of locations (Anita C. Leight Estuary Center, Bosely Conservancy, Mariner Point Park & Copenhaver Park) to visit. Participants take selfies while collecting a playing card at each site before returning to the center. Those who complete the poker run earn a T-shirt. Prizes are announced at 12:45 p.m. Snacks will be provided. Free. No registration required. Contact: Laura Coste' at 410-638-3217 x2448, lmcoste@harfordcountymd.gov.

MD youth fishing rodeos

The MD DNR Fishing & Boating Services and partners in local communities are running free *Youth Fishing Rodeos* for ages 3–15. Participants learn basic angling skills; develop an understanding of the environment and natural resources; and have an experience that fosters interest in conservation and fishing. Because of space limitations, would-be attendees should call the contact at each venue to register. Upcoming rodeos include:

Bay 7 Street Ponds, Talbot County. 8 a.m.–12 p.m. July 14. Contact: Calvin Yowell, Easton Elks Lodge #1622, 410-820-8935.

Patterson Park, Baltimore. 10 a.m.–1 p.m. Oct. 27. Contact: Bob Wall, Baltimore City Recreation and Parks, 410-245-0854.

Eden Mill Nature Center

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

Child & Adult Paint: 6–8 p.m. July 13 (*Sea Turtle*) or 3–5 p.m. July 27 (*Fish*). Ages: 5–10 w/adult. Learn how to use tools, acrylic paints, canvas, brushes, as well as techniques. Child & adult each complete a 14"x 18" acrylic

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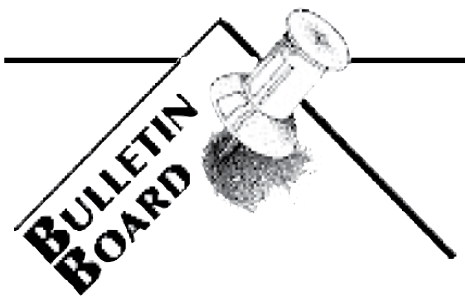


Bulletin from page 44

painting. Fee: $50.

≋ *Nature Storybook Art:* 10 a.m.–12 p.m. July 16–20. Ages 5–10 (no parents) Learn about books, illustrators, art techniques such as drawing, painting, collage, crafting/constructing. Fee: $71.

≋ *Still Life Drawing:* 5:30–7:30 p.m. July 19 (*Birds)* & Aug. 28 (*Textured surfaces*). Teens, adults. All skill levels welcome. Fee: $9. Courses teach tips, tricks for capturing subjects with an artistic naturalist's eye. Watch a brief presentation, spend the rest of the time drawing from your choice of a variety of displays.

≋ *Wee Wonders:* 9:30–11:30 July 23–27. Ages 2-5 with adult. Nature games & activities, story, craft, hike each day. Fee: $75.

≋ *Owl Prowl:* 8–9 p.m. July 28. Ages 6+ (minors w/ participating adult). After an indoor lesson on owls, hit the trails to perhaps hear their calls. Fee: $3.

≋ *Critter Dinner Time:* 11 a.m. Saturdays through August. All ages (minors must be w/adult). Learn about, help feed some of the center's animals. Free. Preregister by 4 p.m. the Friday before.

≋ *Sunrise/Sunset Canoe Trips:* 9–11:30 a.m. Saturdays or 5:45–8:15 p.m. Thursdays through mid-October. Ages 6+ (all minors w/adult) Explore Deer Creek. The emphasis is on environmental education, interpretation provided by naturalist guide. Fee: $8.

Preregistration is required for all programs. Contact: 410-836-3050, edenmillnaturecenter@gmail.com. Registration ends 24 hours in advance of programs. Weekend programs' registration closes at noon the prior Friday.

Youth lighthouse adventures

Youth groups are invited to reserve dates for the *Chesapeake Bay Maritime Museum's Lighthouse Overnight Adventures* on select Fridays and Saturdays, Aug. 31 through Oct. 27. A museum educator helps participants, ages 8–12 (and chaperones), travel back in time to explore the life of a late 19th-century lighthouse keeper as they spend the night in the 1879 Hooper Strait Lighthouse in St. Michaels, MD. From lighthouse engineering to the daily task of maintaining the great lamp, the overnight uses games, costumes and objects to explore the Bay's lighthouses. Brownie, Junior and Cadette Girl Scouts can earn badges. The fee of $40 per person includes an overnight stay with a dedicated museum facilitator, activities, patch and two-day admission to the museum's exhibitions and campus. Groups (12-person minimum, 18-person maximum) may add a drop-in river cruise aboard the 1920 buyboat Winnie Estelle, subject to seasonal availability. Overnights are reserved on a first-come, first-served basis, with a $100 deposit. Contact: cbmm.org/lighthouseovernights.

Mount Harmon Plantation

Upcoming events at the Mount Harmon Historic Plantation and Nature Preserve in Earleville, MD, include:

≋ *Sultana Guided Lotus Blossom Paddle:* 9–11:30 a.m. July 13. Ages 12+ Launch from Mount Harmon's waterfront for a paddle along an abundance of lotus blossom, led by a guide from the Sultana Education Foundation. Later, take a guided tour of the manor house. Kayaks provided. Bring water, snack, binoculars. Fee: $30. Preregistration required; visit sultanaeducation.org, click on public paddles under the public education menu.

≋ *Lotus Blossom Art & Nature Festival:* 10 a.m.–4 p.m. Aug. 4. Event includes nature-inspired fine arts, crafts, exhibitors, wagon rides, children's activities, live bluegrass music, local food vendors. Fee: $5; ages 12 & younger are free. Contact: www.mountharmon.org, 410-275-8819, info@mountharmon.org.

York County (PA) Parks

Upcoming events at York County, PA, parks include:

≋ *Creature Features:* 9:30–10 a.m. or 11–11:30 a.m. July 12, 19 & 26 and Aug. 7. Nixon Park, York. Ages 5+ Learn about an animal's natural history, behavior using photos, props, artifacts. Different animal each session.

≋ *Fridays in a Stream:* 9:30-11 a.m. July 13 (Rocky Ridge Park, York), July 20 (Nixon Park, York), July 27 (Wallace-Cross Mill, Hopewell Township). Explore a hillside starter stream, then a valley floor stream, then a rich, protected, coldwater stream. Hands-on, wet feet activity. *No* open-toe shoes or sneakers; rain boots recommended.

≋ *Bats Demystified:* 2:30–4 p.m. July 15. Nixon Park, York. Learn why bats are beneficial as myths are dispelled.

≋ *Woods Wander:* 10–11:30 a.m. July 17. Rocky Ridge Park, York. Meet at Hidden Laurel Parking Area. All ages. Explore one of several trails with a naturalist to investigate whatever is there. Preregister at 717-428-1961.

≋ *Wading Birds Drop-In:* 1–3 p.m. July 22. Kain Park's Iron Stone Hill Parking Lot, York. Ages 8+ Look for what lives around Lake Redman Look through binoculars and spotting scopes for water birds, learn why they hang out in the shallow waters. Drop in & leave at any time.

≋ *Moonlight Bike Rides on Heritage Rail Trail County Park:* Meet at 8:30–10 p.m. July 28 at Hanover Junction for 9-mile trip; 8:30–10 p.m. Aug. 25 at Seven Valleys for 10-mile trip; 7:30–9 p.m. Sept. 8 at Stump Park Meadow (*Astronomy Night*) for 8-mile trip. Bring bicycle, light, water, helmet. Contact: 717-840-7440, yorkcountyparks.org, parks@yorkcountypa.gov.

≋ *Insects:* 2:30–4 p.m. July 29. Nixon Park, York. Take an indoor, in-depth look of both local and exotic specimens.

≋ *Boats & Birds:* 9–11 a.m. Aug. 5 & 26. Kain Park, Lake Redman Activity Area, York. Take a slow paddle in a canoe or kayak on Lake Redman to look for birds living along the shoreline. No birding experience necessary. Bring a snack, drink, field guide, binoculars (there are a limited number of loaner binoculars). Fee: $20 w/park boat; $10/participants w/their own boat. Preregistration required; call 717-428-1961.

≋ *Butterflies of Pennsylvania:* 1–2 p.m. Aug. 12. Nixon Park, York. PowerPoint presentation of common butterflies and their host plants.

≋ *Caterpillars Drop-In:* 2–4 p.m. Aug. 12. Nixon Park, York. Meet live caterpillars, learn about their habits, habitats. Bring butterfly photos for identification. Drop-in & leave any time.

≋ *Hunter Safety Course:* 6–9:30 p.m. Aug. 16 & Saturday 8 a.m.–12 p.m. Aug. 18. Nixon Park, York. PA Game Commission instructors teach this course. Preregistration required; visit pgc.state.pa.us.

≋ *Flintknapping:* 2:30–4 p.m. Aug. 19. Nixon Park, York. Hands-on demonstration of the ancient art of making tools from rock. Participants can practice with stone axes, throwing sticks, bow and arrows, atlatl.

Except where noted, events are free and do not require preregistration. Contact: 717-840-7440, yorkcountyparks.org.

MD resources photo contest

The Maryland Department of Natural Resources is accepting entries for its *2018 Maryland Natural Resource Photo Contest.* First, second and third place winners will be selected for each of the four seasons featuring any of the following subjects: flora, landscapes, recreation, weather and wildlife. Selected photos will be featured in the DNR's 2019 wall calendar. The grand prize winner gets $500, a 2019 park passport, a five-year magazine subscription and five calendars with winning image on the cover. First place receives a 2019 park passport, two-year magazine subscription and five calendars; second place a one-year magazine subscription and five calendars; and third place one calendar. A Fan Favorite will also be selected by DNR Facebook followers after the contest closes. Entries can be submitted online or through the mail; the deadline is Aug. 31. Details are available at dnr.maryland.gov/Pages/photocontest.aspx. Contact: Lauren Mitchell at photocontest.dnr@maryland.gov.

VA conservation photo contest

The Virginia Soil & Water Conservation District's 2018 Photo Contest's theme is *Conservation Through The Seasons.* Each person can submit up to 10 photos. The contest runs through Aug. 15. Contact: vaswcd.org/photocontest.

Benjamin Banneker Historical Park

Upcoming programs at the Benjamin Banneker Historical Park and Museum, Catonsville, MD, include:

≋ *Liberty Tea Party:* 2–3:30 p.m. July 15. Adults. After the Boston Tea Party, colonial household's tea consisted of herbs, mints from their gardens. Learn about different teas, and customs at this casual afternoon tea party. Fee: $20.

≋ *What's Cookin', Mr. Banneker?* 12–3 p.m. July 21. All ages. Historical interpreters demonstrate Federal Period techniques of cooking at a hearth. Free.

≋ *Moths & Mars:* 8–9:30 p.m. July 27. Ages 5+ Celebrate National Moth Week and a close encounter with Mars! Learn how to attract nocturnal moths, view Mars through a telescope. Fee: $3/person; $10/family.

≋ *Trace Your Roots:* 10 a.m.–2 p.m. July 28. Learn the basic steps: exploring family artifacts & documents; standard records such as census, vital records, military records & other public records. Fee: $18.

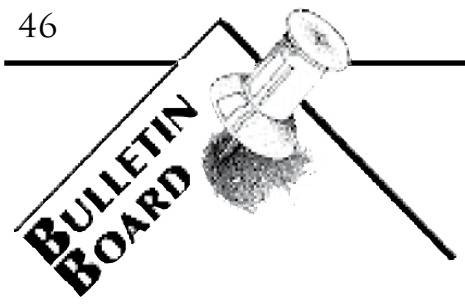
≋ *Todd Marcus Jazz Concert:* 6–8 p.m. July 28. Benefit concert on the lawn of the Banneker Museum supports programs. Tickets: $20.

Advance registration is required for all programs. Contact: 410-887-1081, BannekerMuseum@BaltimoreCountyMD.gov, .

Farm Sprouts

The Maryland Agricultural Resource Council invites children,

Bulletin continues on page 46



Bulletin from page 45

up to age 5, to *Farm Sprouts* at the Baltimore County Ag-Center in Cockeysville. The program uses themes from children's books to explore a farm or nature topic through movement, stories and arts & crafts. Sessions are scheduled 9:45–10:45 a.m. or 11:30 a.m.–12:30 p.m. July 27 (*Bees & Butterflies / Thumbelina*); Aug. 10 (*Pretty Ponies/ The Magicians Horse & The Horse and the Stag*); Aug. 24 (*Sunflowers & Birds / Two Little Dicky Birds*); Sept. 7 (*Cows / Ferdinand the Bull & Little Boy Blue*). The fee, for ages 9 months and older is $8. Bring a lunch to stay longer and explore the park. Registration required; visit marylandagriculture.org/farm-sprouts-preschool. Contact: info@marylandagriculture.org. Anyone who wants to attend the program but is unable to because of financial constraints is asked to contact MARC to see if arrangements can be made: 410-887-8973, info@marylandagriculture.org.

Calvert Marine Museum

Upcoming events at the Calvert Marine Museum in Solomons, MD, include:

Fossil Field Experience: 9 a.m. July 21, Aug. 18, Sept. 15, Oct. 20. Ages 8+ (Children must be w/adult.) Meet at Cove Point Lighthouse. Learn how to find, identify fossils, then search for them on beach until 11:30 a.m. Bring a bag lunch or eat at a local restaurant. Program resumes at 1 p.m. at the museum where participants discuss finds, explore the Paleontology Hall. Fee of $20 includes museum admission. Preregistration required. Contact: bit.ly//FossilFieldExperience or Melissa McCormick at 410-326-2042 x41.

Dee of St. Mary's Public Sails: 2:30–4:30 p.m. July 8 & 28; Aug. 12 & 25; Sept. 16 & 29; Oct. 14. Tickets: $25/ages 13+ and $15/ages 5–12. Ages 5 & younger not permitted. Advance reservations taken till noon the Friday prior to each sail. Remaining tickets are at admissions desk the day of the sail. Contact: 410-326-2042 x41.

Sharkfest: 10 a.m.–5 p.m. July 14. Live sharks. Learn 'sharktoids,' examine evidence of prehistoric sharks, make a shark-themed craft, take a picture in the life-size jaws of a Megalodon shark, get your face painted ($5 fee), slide down the jaws of a giant inflated shark, build a shark out of Legos and tag #cmmlegoshark and #calvertmarinemuseum. No complimentary passes or strollers inside the museum for this event.

Historic Sunset Supper Cruises on the Wm. B. Tennison: 5–7:30 p.m. Aug. 4 & Sept. 1. Learn about the WWII Amphibious Training Base, Solomons' boat-building heritage, battles, submarines, lighthouses, the Ghost Fleet, historic homes, landmarks while noshing on appetizers. Return to the museum for a presentation, light supper. Tickets: $50. Preregistration required; contact 410-326-2042 x41, Melissa.McCormick@calvertcountymd.gov.

CBEC kayak class

The Chesapeake Bay Environmental Center in Grasonville, MD, is offering *American Canoe Association Instruction Programs for Kayak Paddling Skills*. Both courses include two hours of dry-land instruction and three hours of on-water instruction on calm, flat water. The schedule is:

Level 1 Intro To Kayaking Instruction Course: 10 a.m.–5 p.m. July 29. Course for beginner/intermediate kayakers covers pre-paddling preparation, equipment, stroke development, maneuvers, self-rescue and rules of the water on traditional decked kayaks, inflatables and sit-on-tops (spray skirts are not included). For an extra fee, participants can sign up for an optional assessment that would provide documentation of having achieved a certain level of paddling ability. The cost is $70 (plus $20 for kayak/equipment rental). The assessment fee is $20. Register: bayrestoration.org/kayaking.

Level 2 Flatwater Safety & Rescue Course: 10 a.m.–5 p.m. Aug. 10 or Sept. 9. This workshop covers flatwater safety practices, rescue techniques that can be performed with a minimum of equipment in the first few minutes of an emergency. The cost is $70 (plus $20 for kayak/equipment rental). Register: bayrestoration.org/kayaking.

Contact Courtney Leigh, at 410-827-6694, cleigh@bayrestoration.org.

Patuxent Research Center

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

Scouts BSA Merit Badge Classes: 8 a.m.–12 p.m. July 14 (*Nature*); July 21 (*Plant Science*); July 28 (*Forestry*). [T] Parent participation required. All participants must have a blue card signed by their Scout Master that corresponds to the merit badge class. Bring reusable water bottle and wear the activity uniform, comfortable hiking shoes, hat, sunscreen, insect repellent. Camera, binoculars are recommended.

Screech & Kestrel: 12:15–12:45 p.m. July 14 & 21. [C] All ages. Meet an American kestrel & Eastern screech owl. No registration. Drop-in & leave any time.

Nature Tots / Leapin' Lilypads! 10:30–11:30 a.m. July 17. [C] Ages 3–4. Frog songs, stories.

Learn to Fish: 2–3:30 p.m. July 19 [C] Ages 3–12. Learn about proper fishing techniques, species found at the refuge. Equipment provided. Bring sunscreen, hat, water bottle.

Beginner Wildlife Photography Part II: 7–9 p.m. July 19. [C] Ages 14+ Class covers auto tracking settings, two-eye focusing, camera program settings, creating a backyard bird studio. Learn how animals see, so they don't see you!

Family Fun / Hot Diggity Dirt! 10 a.m.–1 p.m. July 20 & 21. [C] All ages. We take dirt for granted, but without it there would be no food, no animals, no people. Learn where it comes from, what it's for, who lives in it through hands-on activities, crafts, games for all ages. No registration. Drop-in & leave any time.

Bird Walk: 8–10:30 a.m. July 21 [C] All ages. Early migrants possible. Binoculars recommended.

Night Hike: 8–9:30 p.m. July 21 [T] All ages, registration required. Explore North Tract's nocturnal world.

Photo-Adventure Scavenger Hunts: 9 a.m.–1 p.m. July 21 & 28. [T] All ages. Using clues, individuals and/or groups can hunt on trails for sculptured stones, mystery objects, plants, animals while learning about the refuge's history, features. A camera or cell phone needed. *Beginner's Hunt* (0.75 mile) is on Little Patuxent River Trail. *Advanced Hunt* (1.2 miles) is on Merganser Pond Trail & Wildlife Viewing Area. *Amazing Race Scavenger Hunt* involves driving around the "Wildlife Loop" to find mystery objects, solve a biology puzzle. No registration. Drop-in & leave any time.

Learn to Fish: 9–10 a.m. July 25 [C] Ages 5–13. Learn proper fishing techniques, the types of species found at the refuge. Equipment provided. Bring sunscreen, hat, water bottle.

Special Weekday Opening of Lake Allen: 8 a.m.–4 p.m. July 27 [T] All ages. The lake will be open for fishing, hiking, nature observation. Normal state, refuge regulations apply. No registration.

Tree ID Hike: July 28 [C] 9:30–11 a.m. All ages. Learn about local conifers, deciduous trees.

Raptors Reign: 1–3 p.m. July 28 [C] All ages. Licensed falconer Rodney Stotts discusses, shares up-close encounters with birds of prey. No registration.

North Tract Bicycle Ride: 1–3:30 p.m. July 29. Ages 10+ Learn importance of reducing one's footprint & leaving no trace on 12-mile guided ride. Discover local wildlife, plants, historical sites. Bring bike, energy bar/snack, water bottle, helmet. Ride is weather dependent.

All programs are free; donations are appreciated. Except where noted, programs are designed for individuals/families and require preregistration. Contact: 301-497-5887. For disability-related accommodations, notify the refuge, giving as much notice as possible. Contact: fws.gov/refuge/Patuxent.

Paradise Creek Nature Park

Upcoming events at Paradise Creek Nature Park in Portsmouth, VA, include:

Clear-Bottom Kayak Paddles on Paradise Creek: 10 a.m.–12 p.m. July 14; 4:30–6:30 p.m. July 21 & Aug. 5; 4–6 p.m. Aug. 18; 9–11 a.m. Sept. 22. No experience necessary. Paddle includes kayaks, paddles, life jackets, guide. Learn about park's history, ecology. Fee: $40. Registration required at least two business days prior to paddle.

Ranger Station: 12-2 p.m. July 28 and Aug. 11 & 25. All ages. Meet education rangers, observe live wetlands animals, learn about the park's wildlife, ecology. Impromptu nature walks, ranger talks. No registration.

Contact 757–392-7132, kfish@elizabethriver.org.

Anita Leight Estuary Center

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

Kids-n-Canoes: 2:30–4:30 p.m. July 22. Ages 5+ Learn paddling basics, explore Otter Point Creek. Fee: $12.

Synchronicity Kayak: 7:30–10 p.m. July 27. Ages 8+ (17 & younger w/ adult) View sunset, full moonrise before Otter Point Creek paddle. Fee: $12.

Summertime Science: 10:30 a.m.–12 p.m. July 28. Ages 4+ Build, test rockets, make giant bubbles. Get messy. Fee: $5.

Fishy Fun: 1:30–3 p.m. July 28. Ages 5+ Learn which fish are common in the area, get to fish through hands-on activities. Fee: $3/person; $12/family.

Trail Running Series: 10–11 a.m. July 29. Ages 16+ All paces welcome. 2-mile course is out and back, single track. Free.

Ages 12 & younger must be accompanied by an adult. Events meet at the center and require preregistration. Payment is due at time of registration. Contact: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

Hear, here! Brown thrasher's songs alert you to its presence

By Mike Burke

An adult brown thrasher, left, stands by a juvenile in Virginia. The younger bird's eye will turn the characteristic yellow as it gets older. (cbgrfx123 / Creative Commons Attribution-Share Alike 2.0 Generic license)

A light rain was falling as dawn struggled to life. The sun didn't so much rise as reluctantly brighten the landscape.

I was tired and a little cranky that this endless rain might confine us indoors for yet another day. I put the kettle on to boil and found myself staring vacantly out the kitchen window at the farmhouse's backyard.

Ignoring the rain, a bird was busy hopping about, flipping through leaf litter in search of breakfast. The gray morning made it difficult to distinguish the rufous color on the bird's back and wings, but its behavior made the identification easy: This was a brown thrasher.

Brown thrashers (*Toxostoma rufum*) are one of those rare birds whose name is accurately descriptive of both its color and its behavior. Standing on longish legs, thrashers are a handsome reddish brown up top, from their caps to their long tails. Thin black-and-white wingbars are visible. Underneath, the birds are white, with black streaks across their chests giving way to all-white bellies.

The face is a mottled buffy brown with intense yellow eyes. The formidable bill is perfectly designed to thrash through detritus on the ground as the bird hunts for larvae, beetles, grubs, worms and the like.

Boldly and brightly colored, thrashers can be surprisingly hard to see because their favorite habitat is dense undergrowth. Here in the Eastern United States, that means the understory of forests. In the Midwest, you'll find brown thrashers in thickets, hedgerows and scrubby fields.

The kettle started whistling, but I was engrossed in watching this thrasher hop about. It was more effective at waking me up than the mug of tea would be.

Brown thrashers are short-distance migrants. Their permanent range centers on most of the U.S. Southeast. Come early spring, a number of these thrashers will head north as far as New York and west as far as Montana. They spread unevenly across the entire Mississippi watershed.

We start seeing brown thrashers in Maryland in early April. By mid-May, the entire Chesapeake Watershed is covered.

In the fall, migratory thrashers rejoin their resident brethren back in the Southeastern states.

Like many avian species, brown thrashers are nocturnal migrants. That makes them susceptible to crashes into buildings, broadcasting towers and other artificially lighted structures. The night lights disorient the migrants with all-too-frequent fatal results.

Brown thrashers are in the same avian family (*Mimidae*) as mockingbirds and gray catbirds. Like their cousins, they are excellent songsters and readily imitate other birds' songs.

Ornithologists tell us that a single brown thrasher may sing more than 1,000 different songs. That's one of the largest vocal repertoires of any North American bird.

Although they spend most of their time on or near the ground, thrashers look for high perches when they feel the urge to sing. It's often the easiest time to see them.

As many people recognize, mockingbirds tend to sing brief song segments four times in a row: e.g., *tseet-tseet-tseet-tseet; toodalee-toodalee-toodalee-toodalee*, etc. Brown thrashers can be recognized by their habit of repeating each segment twice: *cheep-cheep; seeme-seeme*, and so on. Catbirds usually do single segments, often ending with their namesake meow.

Brown thrashers build their nests low in trees or shrubs, sometimes even on the ground. Both parents incubate the young and care for the nestlings. They are especially vigilant around the nest and will attack any intruder — they have even been known to draw blood from people who get too close to their young.

Typically, thrashers have clutches ranging from two to six eggs. They incubate the eggs for two weeks and the fledglings are ready to leave the nest just 10–12 days after hatching. In the southern portion of their range, brown thrashers may have two broods annually. Farther north and west, they usually have just one.

Our changing landscape has been hard on thrashers. Although the population is still large, it has declined by an estimated 41 percent since 1966. The problem has been the loss of appropriate habitat.

Forest edges allow ample light in to foster the growth of thick understories of scrub. Today, those edges are being lost. Forest tracts are being clear-cut for expanding development.

In the second half of the last century, many family farms painstakingly carved out of forest lands were abandoned. These farms in the most rural parts of the watershed weren't developed. The forests gradually filled back in, taking those edges with them.

For more than a decade, several friends have joined us in renting the farmhouse where I was standing. The owner recently put the entire farm up for sale. We renters may lose a cherished rural retreat, but the impact on those two birds in the backyard may be more profound.

Complex legal, cultural and economic factors will ultimately decide the fate of the farm. It is a process that is repeated countless times annually across the watershed.

The fate of the farm — and the birds — was out of my hands. For now, all I could do was watch and pray for sunshine, both literally and figuratively.

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

JULY-AUGUST/2018 VOLUME 28 NUMBER 5

CHESAPEAKE BAY JOURNAL

The BAY JOURNAL is printed on 100% recyclable/recycled paper using vegetable-based inks.

www.bayjournal.com

THE BAY JOURNAL
P.O. Box 222
Jacobus, PA 17407-0222

NONPROFIT ORG.
U.S. POSTAGE
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PERMIT # 510

Spying a flying squirrel can brighten one's spirits on the darkest night

BY KATHY RESHETILOFF

Summer nights in my backyard include the usual wildlife visitors: crickets, toads, bats and the occasional deer. But one particularly steamy August night I was rewarded with a glimpse of a new nocturnal guest. While letting out my dog, I was startled by a small animal hanging on my bird feeder. Its large eyes reflected the glare of the porch light as the small mammal stood motionless. Then, in an instant, it leaped, gliding silently off my deck to the woods below.

This nighttime raider was a southern flying squirrel (*Glaucomys volans*). Although found in forests from southern Ontario to the Gulf Coast, southern flying squirrels are not often seen due to their stealthy nighttime habits. Only 8–10 inches long (including the tail), southern flying squirrels are grayish to brown above and creamy white below with a flattened tail, large ears and big black eyes.

Their most notable feature is a thin furry membrane of skin, known as a patagium, which runs along the sides of the body from the wrist of the front leg to the ankle of the hind leg. This membrane is what gives the squirrel its flying or, more accurately, gliding ability.

When the front and back legs are extended, the membrane forms a winglike gliding surface, acting like a parachute while the flat tail serves as a rudder. This allows the squirrel to silently glide from tree to tree. Before landing, the squirrel drops its tail and lifts its front legs. This slackens the membrane and acts as a brake. Flying squirrels land as lightly and quietly as they glide and will immediately scurry to the other side of a tree trunk to avoid detection by predators.

There are two breeding periods for the southern flying squirrel. The first is February through March and the second, May through July. Litters average between three and four young, which are born hairless with eyes and ears closed, and weigh less than 0.25 of an ounce. Development is slow. Ears open at 3 weeks; eyes open a week later. The young are weaned by the time they are 6– to 8 weeks old and are

Although found in forests from southern Ontario to the Gulf Coast, southern flying squirrels are not often seen due to their stealthy nighttime habits. (Phil Myers / University of Michigan Museum of Zoology)

then capable of gliding. Devoted mothers, the females seldom leave their newborns, defending them and even moving them if the nest is disturbed.

Southern flying squirrels favor beech-maple, oak-hickory and live oak forests. Tree cavities serve as nest sites. Often, a squirrel will use one cavity as its nesting site and others as feeding or refuge areas. Not surprisingly, their primary foods include nuts such as acorns and hickory nuts, but they will also eat berries, seeds, fruits, buds, flowers, mushrooms and bark.

As the days shorten, flying squirrels begin hoarding food. Nuts are gathered and stored, either buried individually or stashed in nest cavities or the cracks and crevices of trees. They do not hibernate but may remain in nests for several days during severe weather. Groups of flying squirrels may gather in one cavity to conserve warmth.

Predators include cats, owls, hawks, raccoons, weasels and foxes. But the amount and quality of habitat is probably the biggest threat these squirrels face. Southern flying squirrels require forests with mast (nut)-producing trees as well as snags (dead trees) or large trees with cavities for nesting.

The Chesapeake Bay watershed was covered by forests when colonists first arrived. By the late 1800s, 40–50 percent of the watershed's forests had been cleared of trees. Throughout the 20th century, new forests grew up on abandoned farmland. But these forests are now more homogenous in age, size and species composition.

Between 1982 and 1997, the Bay watershed lost more than 750,000 acres of forestland to development — a rate of about 100 acres per day. While this rate fell in 2006 to an estimated 70 acres per day, it remains unsustainable and forests have been divided into disconnected fragments, which offer less high-quality habitat for forest wildlife.

Southern flying squirrels require forests with nut-producing trees as well as dead or large trees with cavities for nesting.

I have yet to see another flying squirrel in the forest near my home. But efforts to conserve remaining forests and reconnect patches of forests are in full force throughout the watershed. I'll continue to keep my eyes peeled for this night glider and hope to see one again soon.

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