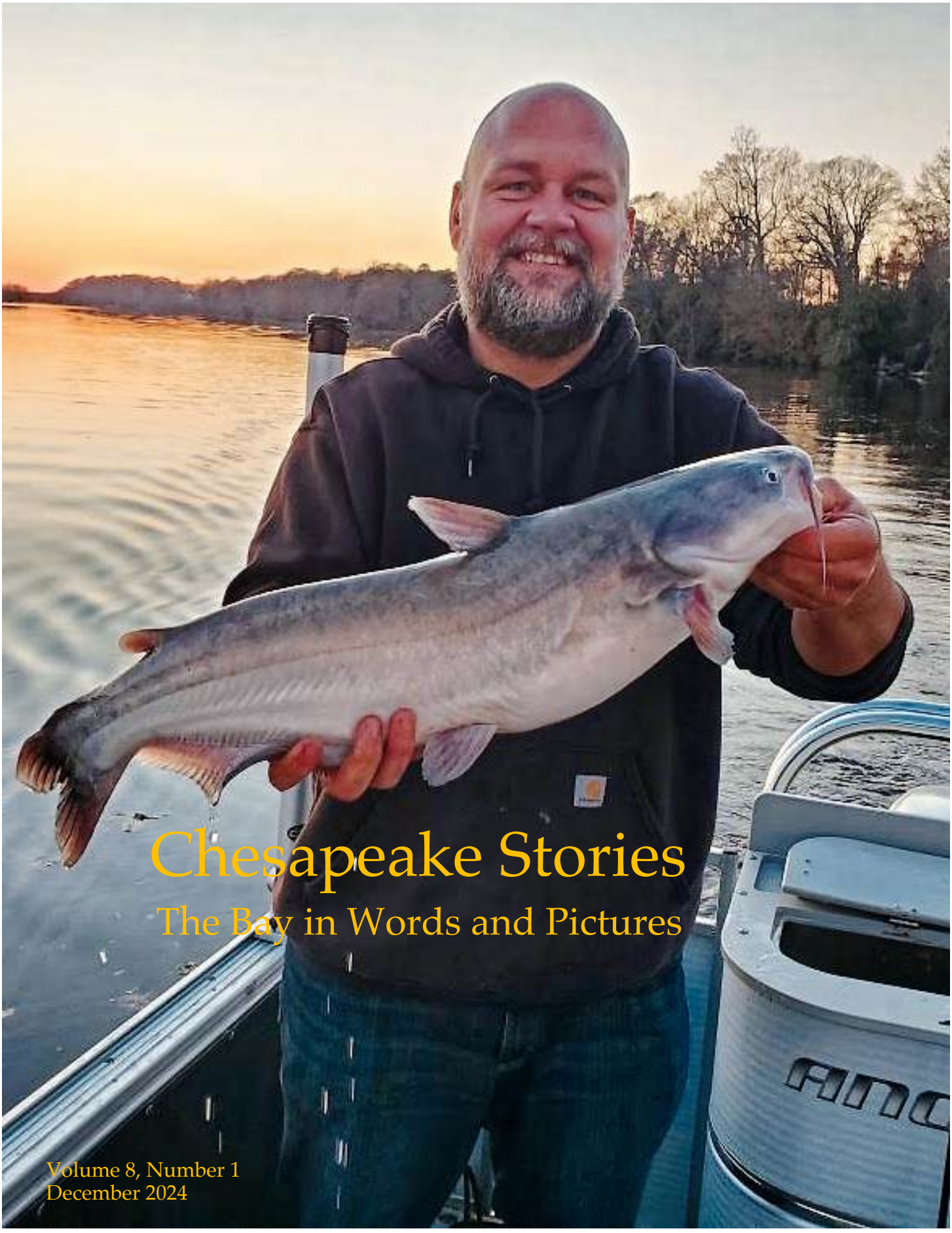


Chesapeake Stories

The Bay in Words and Pictures

Volume 8, Number 1
December 2024

Photo: Will Beaven
Cover photo: Sam Denherder

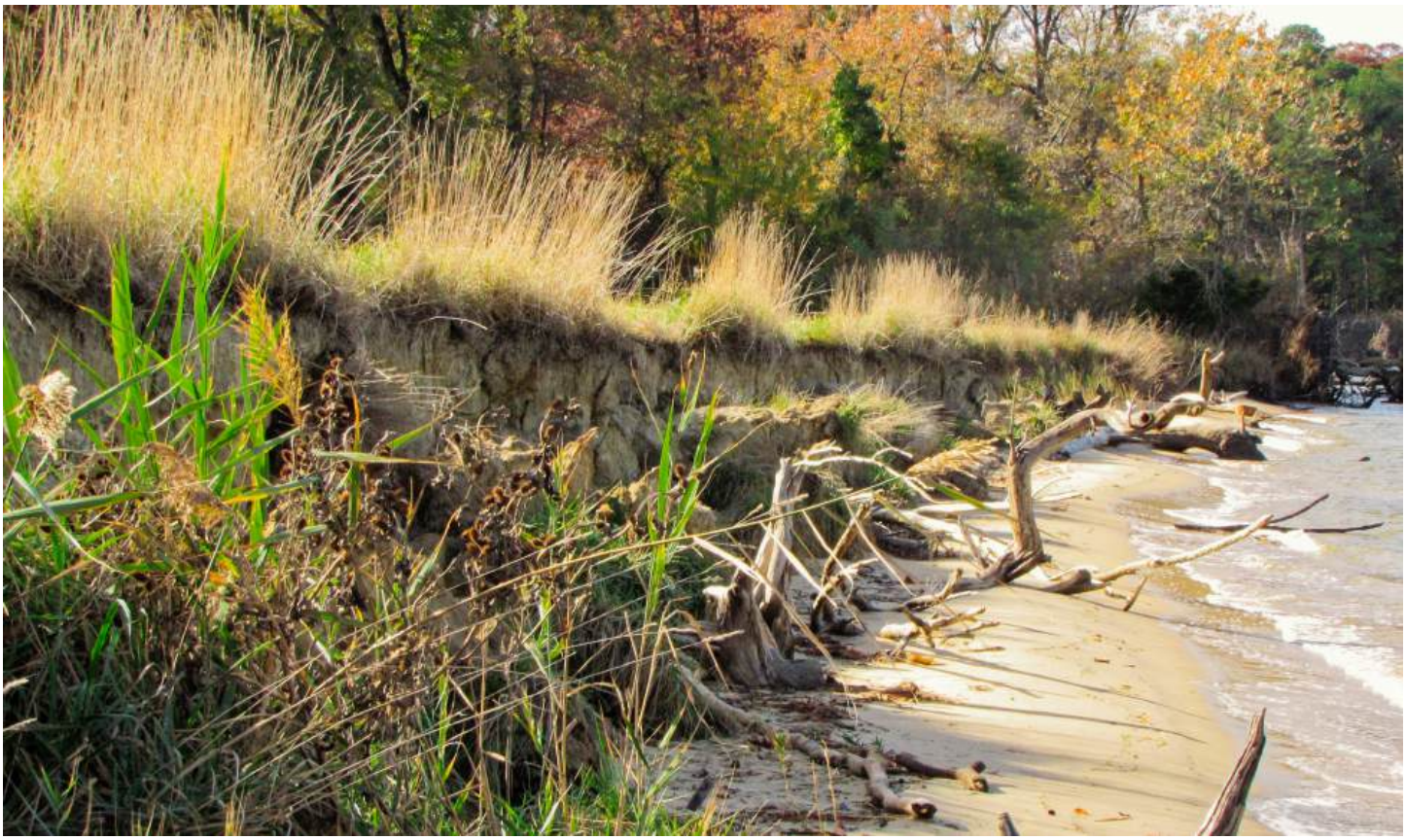
Contents

Chesapeake Stories: The Bay in Words and Pictures is a student publication of the Department of Environmental Studies, Salisbury University

Going, Going, Gone

Worsening land loss in Bay region causes concern

----Will Beaven, Caroline Hilyard, Ian Mathieu



Shoreline erosion, Eastern Bay Photo: Will Beaven

Erosion has been a problem in the Chesapeake Bay Region for thousands of years. On average, 260 acres of shoreline in the region are lost each year. An additional 5.2 million tons of sediment,

primarily from farms, is lost each year. Erosion not only negatively impacts the people, but the ecosystems as well. This forces people in different occupations to work together to mitigate the damage.

So what exactly is erosion? It is a geological process that involves the removal of materials such as soil, rocks, and sediments. It can have many causes, including wind, deforestation, rain/flooding, snow, rising water levels, climate change, overgrazing and construction/urbanization.

In Maryland, the two main kinds of erosion that we see are shoreline and agricultural erosion.

Shoreline Erosion

Shoreline erosion is mainly caused by strong currents and waves, as well as flooding that will move or carry away rocks, soils, and sediment.

Water that is connected to the main stem of the Chesapeake Bay tends to have a greater wave height and strength in comparison to rivers and creeks. These waves create erosion of banks and beaches, which leads to undercutting and the removal, transportation, and deposition of the banks' sediments.

In Maryland, the amount of shoreline erosion will vary from less than two to greater than eight feet of erosion per year. The shoreline erosion is greatly affecting waterfront property owners, because they have to spend more time and money to protect their shorelines.

Elevation, weather patterns, land use and the amount of vegetation are all influencing factors on how much erosion may occur in a certain area. Molly Ginn, a lifetime local to the Chesapeake Bay region, recalls living in her waterfront home on the Wye River: "We would go down to the beach and would witness huge chunks fall off the bank. The bank was 20 feet high. We would lose so much land at each storm because we were facing west."

Another Talbot County resident mentions that, "We ... have probably lost hundreds of acres here over the years."

When dealing with erosion, people often resort to riprap, bulkheads, jetties or living shorelines as a solution.

Riprap is rock placed along the shoreline to absorb the force of waves.

Ocean City Photo: Caroline Hilya

Bulkheads provide the same protection as riprap but act as a solid wall that protects the shoreline. Bulkheads can

Going, Going, Gone (continued)

be found in concrete (seawalls) and wooden form. Bulkheads are commonly seen in waterfront communities and hotels.

Jetties are long lines of rock, typically extending perpendicular to shore, used to help regulate wave energy.

Jetty Photo: Caroline Hilyard

Living shorelines incorporate plants, rocks, and sand to a shoreline to help stabilize it. Over time, the hope is that these shoreline plants establish and multiply.

It is common to see both riprap and living shorelines together, since sometimes riprap will not be enough and erosion will occur through the rocks.

Plants like Chokeberry trees, Beachgrass, Switchgrass, and many grasses in the genus Spartina as well as deciduous trees are all well suited for a variety of conditions and can help control erosion.

But solutions must be carefully chosen to suit the site. Weems Brothers Marine Construction project manager Mark Beaven expressed his frustration with the state of Maryland: "The state wants everyone to do a living shoreline, even though it is not a good fit for all properties. It's a better fit for a property on a creek or small river. The state doesn't recognize that."

Beaven also explains that the difference [in practical knowledge] between the government officials and shoreline workers is significant, "since they are not actually out there doing the work."

He explains that what some people don't realize is that living shorelines don't always work well in high wave energy areas, including areas of high boat activity and places facing high winds. They are also much more expensive than the alternatives.

Mark Beaven Photo: Weems Brothers

The sad part, he says, is that there is not

much you can actually do to prevent erosion in these areas. Jetties, bulkheads, and riprap can be effective, but in some areas erosion occurs throught the riprap, and the land behind the rocks is carried through them and into waterways. You commonly see this kind of erosion on points sticking out into larger rivers and bays.

According to the Maryland DNR there is a Shoreline Protection Act that requires the use of natural solutions unless the property has been shown to be unfit to do so. While the Oxford Strand (on the Tred Avon River in Talbot County) could have fallen into this latter category, they chose to go the natural route.

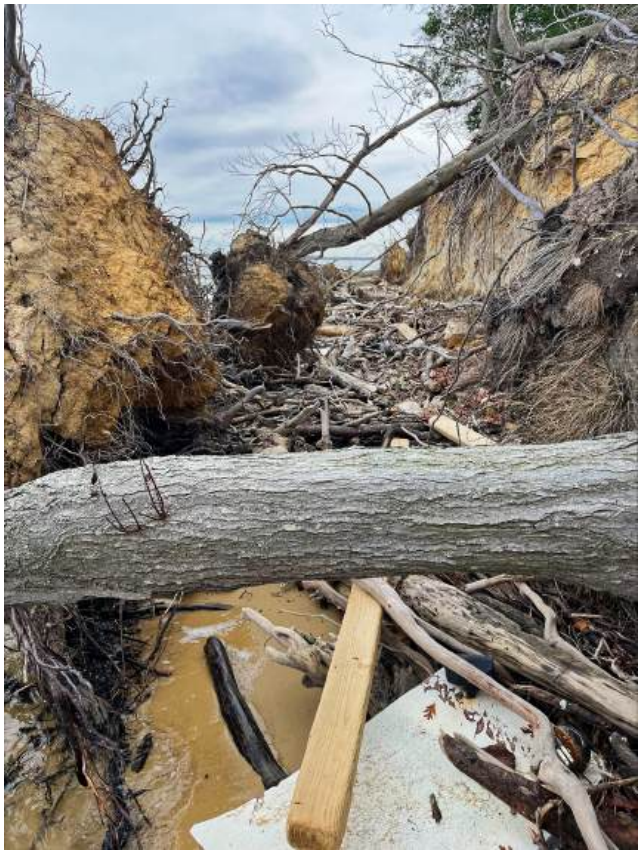
Oxford Strand Photo: Dave Harp, *Bay Journal*

The Strand is an example of constant high wave energy, with heavy boat traffic and high storm intensity. Its roadways are frequently flooded.

According to the National Wildlife Federation, The Oxford Strand has recently been augmented by a living shoreline that has three components:

First, three offshore breakwaters are planted with native vegetation that help slow the wave energy coming towards the shore. Second is a hooked headland on each side of the beach that catches sediment, creates a low sloped shoreline for wildlife, and reduces wave diffraction (when a wave bends after hitting an object/obstacle). Third is a sand dune that was added to protect Strand Road from flooding.

While this solution is promising, many areas are suffering from the same problems as the Oxford Strand, but residents simply cannot afford to undertake such a substantial project. Talbot County resident Kerri Ginn says it would take "millions" to preserve the shoreline where she lives.



Heavy erosion damage, Eastern Bay
Photo: Will Beaven

Agricultural Land Loss

Farms are the backbone of our health, environment, and economy. Therefore, it is crucial that good soil practices take place to ensure minimal soil loss and high yields.

According to farmer Katelin Frase, cover crops, buffers, no- till, and erosion control plans are all ways to combat erosion on a farm. “We planted a mixture of clover and barley this year for cover crop,” she said.

Cover crops are cold weather crops that are used to improve/maintain soil health rather for harvest in most cases. Examples include winter wheat, radish, rye, and vetch.

Cover crop, Talbot County
Photo: Will Beaven

Buffers are areas of vegetation in or around a field that can protect the surrounding environment from possible pollutants, runoff, and soil loss.

An erosion control plan can involve buffers, but it also involves the use of BMPs (best management practices)

“Most of our erosion management is in relation to ditches.” Says Caroline County farmer Matt Taylor. By concentrating on ditches for erosion control, he is able to minimize runoff by placing them effectively throughout the farm.

Erosion control plans are simply strategies to prevent erosion, which may employ the previously discussed methods and others such as *no-till farming* (leaving residue from previous crops in the field rather than plowing it under).

A good example of these practices in the region is in Talbot County, where Mark and Andy Beaven restored a wetland and installed grassed waterways which prevented massive amounts of soil from leaving the farm.

Ben, Mark, and Andy Beaven win Cooperator of the Year award.
Photo: Talbot County Soil Conservation District

Shorelines and farms need plans that take into account the different factors that might result in significant erosion, like being under high winds on a point or having a low point in a field.

Another common cause for land loss is "rill erosion," where water from rainfall flows

across the land, picking up topsoil. "The heavy soil particles pick up the smaller particles as the water is traveling," according to Salisbury University Professor Davis Scheid, leaving less soil and fewer nutrients on the field.

Professor David Scheid
Photo: SU Department of Environmental Studies

Scheid noted that wetlands along the shore play a major role in mitigating damage from runoff, filtering nutrients and toxins like kidneys, and absorbing and releasing water like a sponge.

Eroding marshland, Nanticoke River
Photo: Ian Mathieu

Beach stabilization is also important. To that end, Katelin Frase and her husband grow and harvest beachgrass at a site in Delaware and sell it to shoreland owners throughout the region. The process involves separating the harvested grasses into individual stems for transplanting. Co-author Will Beaven has been personally involved in this procedure.

Oyster reefs are another interesting option for erosion control. According to NOAA "Oyster reefs can protect underwater vegetation and waterfront communities from some effects of waves, floods, and tides."

But Frase added that, "with increased developments and urban sprawl, you will continue to see an increase in erosion. Stronger storm events are also increasing erosion rates."

Effects on Wildlife

As more and more sediment gets into the waterways and clouds the water, it can have major effects on plants and wildlife. Scheid noted, "Absolutely-- it can impact soil, and then it can impact the microfauna and microflora, and from that point it will affect food chains.

"Wetlands and salt marshes can be very affected, causing impacts in fish and crab habitats, also causing economic effects."

One species that is directly affected by erosion is the blue crab. An already declining blue crab population can be affected by erosion because the sediment entering the water can impede growth of vital grasses that they use for habitat.

Going, Going, Gone (continued)

Another example of wildlife being directly affected by erosion and nutrient loss is the Maryland Darter. A small, colorful freshwater fish, once a resident of the Susquehanna River drainage, the Darter died out due to a heavy influx of sediment, nutrients, and chemicals, according to the Maryland DNR.

Maryland Darter
Photo: Susquehannock Wildlife Society

Horseshoe crabs, in existence for around 445 million years, are also greatly affected by erosion, because like blue crabs they rely on healthy grasses for habitat, and excess sedimentation kills those grasses.

Adult horseshoe crabs prefer sandy beach areas within bays or coves that are protected from wave energy, along with areas of shallow waters like bays. The Chesapeake Bay is a critical nursery and spawning area, and extremely important for juvenile development.

Shoreline erosion along with shoreline development is resulting in loss of suitable spawning spots and causing disruption in juveniles' early life. Eroded shorelines with high concentrations of slit or peat are not satisfactory for spawning or reproduction and reduce egg survivability.

Erosion is also affecting spawning because it changes beach characteristics that are important in spawning site selection such as topography, sediment texture, and geochemistry.

Even measures taken to prevent erosion, such as riprap and bulkheads, can be detrimental because they affect the amount of shoreline available for horseshoe crab spawning.

Dead horseshoe crabs, Eastern Bay
Photo: Will Beaven

Hope for Improvement?
According to the Maryland Department of the Environment (MDE), erosion and sediment control plans are in place to protect the Chesapeake Bay from runoff and pollution originating from land developments/redevelopments.

These plans are required for any earth-

Going, Going, Gone (continued)

moving activity that will disturb 5,000 square feet or more of land area or 100 cubic yards or more of soil.

In order to try to minimize the amount of runoff and pollution, soil will be kept on site so the sediment and nutrients cannot end up polluting streams or other waters.

The State of Maryland has also started multiple shore erosion control projects, and the MDE has required a Critical Area Buffer Management Plan(BMP) and a Critical Area Buffer Notification Form (BNF) be submitted with those plans.

Other projects include creating revetments with either lawns or trees as a buffer to erosion, other vegetation as a buffer, replacing an existing bulkhead, offshore work such as creating a breakwater, marsh edging, or putting stone in front of an existing bulkhead.

Landowners can add improvements such as rain gardens, rain barrels, swales, green roofs, native ground cover, pavement removal, and permeable pavers to their properties in order to slow down water's movement, allowing it to filter through the soil instead of washing it away.

Drainage pond and stone spillway, Kingston Landing Photo: Will Beaven

Photo Essay: Erosion

Wounded shoreland around the Bay

----Photos by Will Beaven

Boneyard

Photo Essay: Erosion

Boneyard 2

Photo Essay: Erosion

Behind the riprap

Eastern Bay

Photo Essay: Erosion

Uprooted

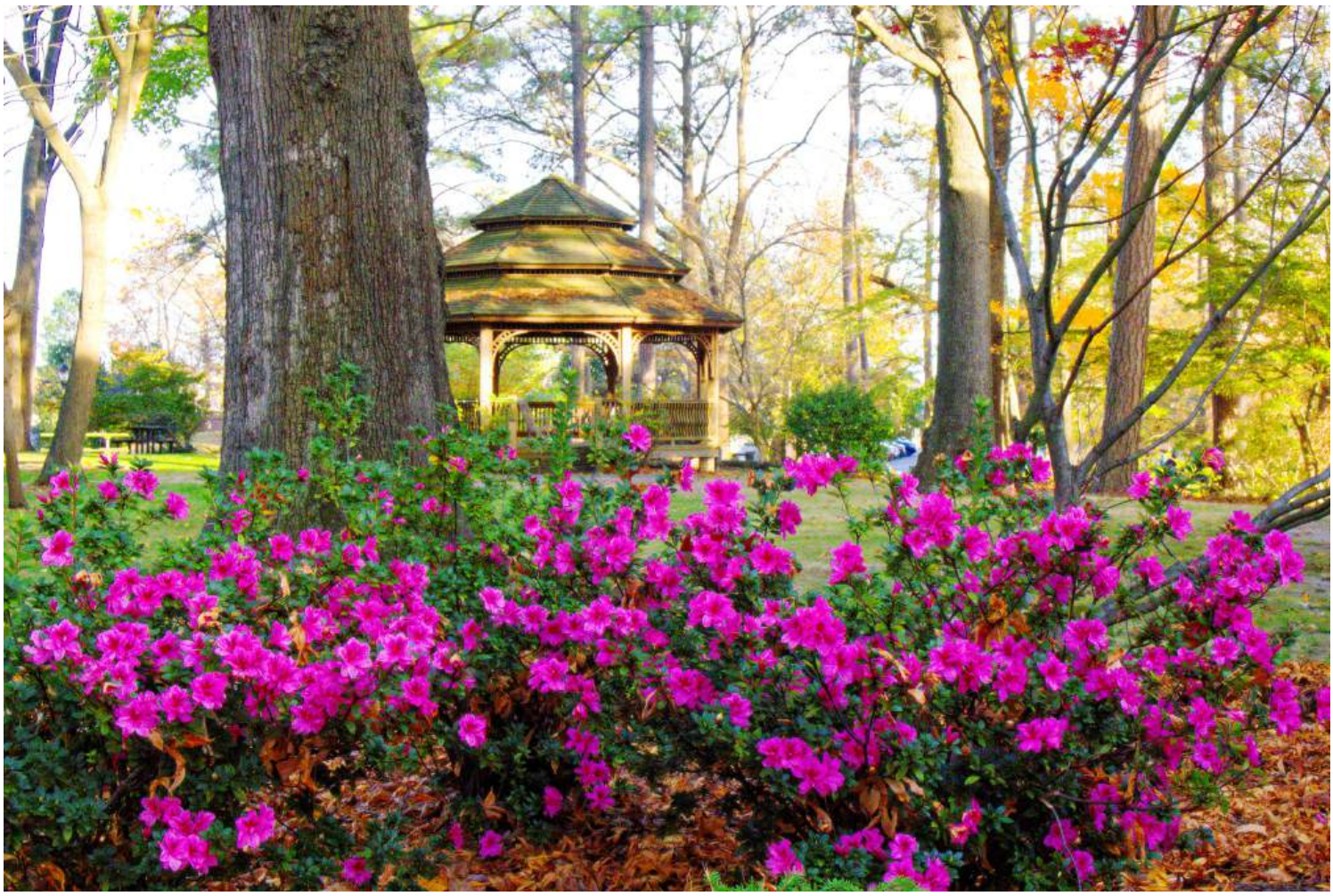
Photo Essay: Erosion

Eastern Bay 2

Campus Carbon

Salisbury University addresses climate change and promotes sustainability

----Jay Goodman, Kylie Mitchell, Will Tinkler



Native species garden, Salisbury University Photo: Jay Goodman

Salisbury University was recently ranked 29th nationwide in Princeton Review's Green Schools list, based on the sustainability practices that are

Campus Carbon (continued)

taking place on campus and the university's progress in tracking its carbon footprint and moving toward net-zero carbon emissions.

SU was a signer of the American College and University Presidents' Climate Commitment in 2007. As a result of that pledge, the school established a Climate Action Plan (CAP) in 2010, which was updated in 2014 and again in 2021.

According to the university's Sustainability webpage, The CAP has four objectives:

1. Serve as a leader in our region in providing educational opportunities that enhance social, environmental and economic sustainability.

2. Aspire to lead local environmental sustainability initiatives and communicate those efforts to internal and external constituents.

3. Emphasize social sustainability at SU by promoting a resilient community.

4. Promote economic sustainability by expanding effectiveness and efficiency practices and promoting a transparent process for strategic planning and budgeting.

Multiple individual strategies accompany these objectives. Salisbury set greenhouse gas emissions reduction goals, hoping to reduce those emissions 15% by 2012, 25% by 2015, 30% by 2020, 50% by 2025, and 100% by 2050.

In 2020, the university announced it had hit a 61% reduction in 2020, putting it ahead of the climate plan schedule.

Chris Homeister, SU's Director of Sustainability, is the person charged with keeping track of all of this data. Homeister coordinates with every department on campus to help the school reach its collective sustainability goals.

Chris Homeister Photo: Salisbury University

He explained the path forward for Salisbury's Climate goals: "We've already met the [carbon reduction] goal for the year 2030. We're already ahead of the game on that. [But] a lot of things we've done to reduce our carbon emissions were the low-hanging fruit, a lot of the easiest things to be done. So the next step is to reduce emissions even more; it's gonna cost more money and more energy to do it."

Blackwell Hall is an older structure being rebuilt on campus with the goal to achieve an LEED (Leadership in Energy and Environmental Design) Platinum rating. It is a large part of Salisbury University's sustainability goals.

"It was one of our least efficient buildings,"

Campus Carbon (continued)

said Homeister, "and we are currently renovating it to make it the first net-zero building on campus, so it's gonna [tramsform] one of our least efficient into one of our most efficient, which is pretty cool."

Blackwell Hall renovation Photo: Jay Goodman

There is also a plan to install solar panels on the building as part of the renovation. After Blackwell Hall, SU already has plans to renovate other buildings on campus.

And renovations are just one way the university is trying to meet its goals. Multiple programs have been implemented to increase recycling and reduce waste.

To encourage people to recycle more, they installed mini trashcans at every office desk in academic buildings. They have also made the recycling bins easier to identify on campus so that less "cross-contamination" occurs between waste and recyclable material. Students in dorms are also provided with recycling-specific trash bags to help encourage them to join the effort.

Salisbury University Students pay $12 each semester towards the "Green Fund." This is a fund that is used exclusively for sustainability projects on campus. Students and faculty are encouraged to submit projects they want to see implemented, and the Green Fund is what pays for these projects.

Nine projects were submitted in the Fall 2024 term. Six were approved, two needed additional info before a ruling, and one was denied.

The total cost for the projects this term will be $38,000 to $50,000. Last year, there were $155,000 worth of approved projects, including recycling improvements and better recycling bins at Seagull Stadium.

Some of the additional projects from the Green Fund include zero-waste starter kits for incoming freshmen, a reusable cup campaign,

Bring your own cup Photo: Jay Goodman

Campus Carbon (continued)

bird strike prevention film installations, solar powered charging stations, and native species gardens.

Bird strike prevention film applied, Henson Hall
Photo: Jay Goodman

Native species garden. Photo: Jay Goodman

AASHE RATING: EXTRA MOTIVATION

AASHE (Association for the Advancement of Sustainability in Higher Education) provides sustainability resources to students and faculty in order to empower higher education facilities to make changes towards sustainability.

They grade schools on a multilevel scale called STARS (The Sustainability Tracking, Assessment & Rating System) starting at the bottom as follows, reporter, bronze, silver, gold, and platinum.

As of October 30th of 2023, Salisbury University has a bronze AASHE STARS rating and an overall score of 43.58. The areas Salisbury University is currently excelling in are air & climate with 8.18/11, energy with 7.96/10, water with 5.90/6, coordinating & planning with 7.12/9, diversity & affordability with 5.23/10, and well-being & work with 3.84/7.

AASHE aims to bring sustainable practices to higher education and figure out what drives universities to improve. They also hope to push the younger generation to be more active in sustainability and equip them with the skills to solve environmental problems. To do this they also offer tools in professional development.

This gives Salisbury University even more insight on how they are moving with their climate action plan and other aspects of the university itself.

Seeing how the university does in each area not only shows them where they are excelling but also identifies places that need more attention.

Seeing how well our university is doing also motivates everyone working towards our goals to continue working, because it is paying off.

Sustaining Vital Marshland

Working to save the marshes of Blackwater National Wildlife Refuge

----Nathan Cross, Connor Kinch, Gwyneth Rhudy

Great Blue Heron at Blackwater Refuge Photo: Nathan Cross

Humans have been trying to control nature throughout history. We shape ecosystems for our own benefit--for agriculture, living space, commerce, and other uses. Often this involves

the clearing out of the natural environment.

The opposite is true too, however; some organizations are attempting to control nature to *preserve* a natural environment, and not only for our own benefit, but for the benefit of the animal communities that live there.

Blackwater National Wildlife Refuge is one of these places. The refuge, which is located just south of Cambridge, Maryland, was established nearly a century ago; it consists of over 28,000 acres of forest, marshland, and shallow water.

Its primary purpose is to be a rest stop for ducks and birds on the highway of the Atlantic Flyway, a massive migration pattern along North America's eastern coast, but it serves other purposes as well.

Bald Eagle nesting exhibit with real-time video coverage of actual nests in the Refuge
Photo: Friends of Blackwater NWR

According to U.S. Fish and Wildlife Service, "the refuge contains one-third of Maryland's tidal wetlands... [It is] an important resting and feeding area for migrating and wintering waterfowl, and is one of the chief wintering areas for Canada geese using the Atlantic Flyway… it is also home to the largest natural population of formerly endangered Delmarva peninsula fox squirrels [and] the largest breeding population of American bald eagles on the East Coast, north of Florida."

While the area is perfectly suited for the animals that stay there either permanently or on their way to someplace else, it is also quite vulnerable. Sea level rise is a constant threat, along with saltwater intrusion and invasive species.

A lot of management is needed to conserve the refuge's condition and keep it habitable; this work is done by rangers at the refuge, through volunteer work, and through managed hunting.

Thomas "Tom" Miller is a park ranger and visitor services specialist at Blackwater Refuge, working under the U.S. Fish and Wildlife services for the Department of Interior. He has been at Blackwater Refuge since 2001 and was able to explain the history of the refuge, its makeup and purposes, the permits and programs available at the refuge, and the problems he and other staff members face with ecosystem management, along with the solutions they have implemented.

History

Blackwater Refuge was established on January 23, 1933, around the same time that the construction of artificial wetlands and freshwater impoundments began. It was built from the natural wetlands that already existed in the area, but to make it suitable for the refuge's purposes, saltwater flooding from the Bay had to be controlled, and the soil had to be

made fertile.

Ranger Thomas MIller Photo: Nathan Cross

Blackwater Refuge was able to gain additional lands under the authority of the Endangered Species Act, the North American Wetlands Conservation Act, and other pieces of legislation. Due to this land gain, their purpose expanded to protecting and managing the area's habitats for migratory birds as well as for endangered species and native animals.

They are still acquiring land today; in 2015, the Migratory Bird Conservation Commission approved more than $2.2 million in funding for Blackwater Refuge to acquire 758 acres.

According to the Chesapeake Conservancy, this funding was only a portion of the $27 million approved by the Commission on Sept. 9 that went towards conserving a total of 200,000 acres of wetland and associated upland habitats across the United States.

In 1962, Blackwater Refuge received funding for recreational activities and began transitioning to more of "a place for people." Today, the refuge is home to a number of walking trails, picnic tables and pavilions, a large visitor center with interactive and informational exhibits, and a drivable trail through the forest and marshes known as Wildlife Drive. The first non-profit citizens group was later established in 1987, known as the Friends of Blackwater National Wildlife Refuge.

View down Wildlife Drive Photo: Gwyneth Rhudy

Blackwater Ecosystems

Blackwater's primary purpose is to act as a "rest stop" for migratory birds, Ranger Miller says, providing a safe habitat for birds to rest and fuel for the rest of their trip south.

Most of the wetlands within the refuge contain low-level freshwater impoundments made to suit the refuge's most frequent visitors, dabbling ducks. Surrounding the impoundments are grasses native to the marsh, which includes salt meadow cordgrass and saltmarsh cordgrass, and in wetter parts of the marsh, Olney three-square.

A large part of the refuge is also taken up by forest and "ghost forest." According to the

Friends of Blackwater website, these forests are mainly made up of tall loblolly pine trees, common trees for bald eagles to nest in, but also including patches of other evergreens and deciduous forest.

Loblolliy pines, living and ghost Photo: Gwyneth Rhudy

While the area isn't suited for deepwater ducks, Miller says that most deep-diving ducks reside in the Chesapeake Bay and that they don't come to the refuge often.

As for dabbling ducks, a group that includes mallards, gadwall and species of teal, the shallow water allows them to feed naturally by diving to the floor of impoundments to feed on aquatic plants and invertebrates. According to Miller, the grass also helps attract waterfowl to the refuge; ducks like to hide in the thick vegetation, which conceals them and makes them feel safe.

The refuge includes several hundred acres of farmland too, which are used to plant crops for the waterfowl to graze from. The most common crops planted there are high-energy foods, says Tom, crops that will "help [the waterfowl] to rebuild their fat reserves... while they're here in the winter." These plants include clover and corn – clover to provide protein, and corn for carbohydrates. The crops within Blackwater are generally planted during the summer. When the freshwater impoundments are drained during a project, the refuge will sometimes plant food in the shallow water, such as Japanese millet, another high-energy food.

Permits and Programs

The Refuge permits a wide variety of human activities. They have a trapping program for muskrats, by which they control the amount of trapping that happens within the refuge. "There's plenty of them out there," Miller says. "You can remove and you can harvest them without affecting the population."

He says that the muskrat trapping that is done at Blackwater Refuge has been done historically: "It is more of a tradition for these folks who come out and do it. The Refuge is divided into different management units, and it is usually the same folks that come along, and they must lease pieces of our property to go out onto to trap. They usually just walk out into the marsh areas, set their traps, and then come back and harvest them. This usually happens between January and mid-March.

"To take some muskrats off the land is perfectly manageable. If you have too many muskrats in one area, it can damage the marsh. They also have hunting here by permit, deer hunting, waterfowl hunting, and turkey hunting in the spring season."

There are also volunteer programs. They have volunteers working in the visitor center, and some volunteers do maintenance and building projects, but biological volunteer work is rare. According to Miller, it "depends on the project that the biologist is working on and if they need help or something like that, but we haven't had one in a long time."

Threats

With the changing climate and human construction, as well as other factors in the

area, Blackwater Refuge has been facing more serious and frequent environmental threats in the past several decades. Included among these problems are intrusion and flooding of saltwater into the artificial habitats, erosion, shrinking of coastlines and loss of sediments, sea level rise, damage by invasive species, and the need to protect threatened and endangered species. The refuge has been able to offset, if not entirely solve, multiple problems over the years and tries to look into the future to decide the most important projects for conservation.

Since the 1930s, Blackwater has lost over 5,000 acres of marsh habitat to sea level rise, subsidence, erosion, and vegetation destruction from nutria, an invasive rodent (see sidebar), according to a study done on marsh migration in joint with the U.S. Fish & Wildlife Services.

Miller says that these threats can completely drown out the marshland if continued for long enough. "You have an animal that's eating away the marsh [and] the roots of your plants. You combine that with sea level rise, [and] the land here sinking slowly because of tectonic glacial retreat... you also have roads that have been built across the marsh [that] changes the hydraulics in the area... you combine all these things, the marsh starts drowning and eventually goes away."

The loss of marsh is more of an issue than just habitat loss, as it threatens a number of species that use the area, both migrating and native. The black rail, a hard-to-find bird that is rarely seen in flight and is often hidden in marsh grasses, was recently listed as endangered in the state of Maryland due to a survey in 2006 finding that its numbers had declined more than 85% since the early 1990s. In addition, the

Nutria & Nutria Eradication in Maryland

Nutria are a type of rodent, semiaquatic and herbivorous, originally from South America and invasive in areas of North America. According to the National Invasive Species Information Center, they are currently distributed along the Atlantic and Gulf of Mexico Coast in America, and in the Pacific Northwest.

Nutria Photo: US Geological Survey

The Chesapeake Bay Nutria Eradication Project was formed in 2002 in response to the invasive threat posed by nutria since their introduction in 1940. Nutria eradication was possible through the coordination of federal and state agencies working closely with public and private landowners. According to the U.S. Fish & Wildlife Services (USFWS), one-half of the 14,000-nutria removed during the project were from private lands with over 700 participating landowners participating in the project and protecting over a quarter of a million acres of marshes on the Delmarva Peninsula. Dogs trained to detect scat were also employed to better track down nutria, since it was easier to track than the nutria itself. They were used in verifying that a trapped area was clear of nutria.

After years of intense survey, the last known Maryland nutria was captured in May 2015. The USFWS attests that marsh restoration techniques such as native plantings or thin-layer placement or protecting marsh migration corridors would not be possible if nutria remained on the Delmarva Peninsula.

saltmarsh sparrow's population of 53,000 has been declining at a significant 9% per year according to the Chesapeake Conservancy; this sparrow lives only in tidal salt marshes in the eastern United States.

Ghost forest Photo: Gwyneth Rhudy

In reaction to this growing problem, Miller said that many experiments have been performed at the refuge with the purpose of preserving or recovering its marshland. These projects included opening water flow through a road that was built through a water impoundment and dredging sediments from below the water to rebuild land and shoreline or bringing in sediment from outside the marsh for new land.

One project brought in a group of volunteers to plant grass, and another one experiment mixed seeds into the sediments used for rebuilding. All of these experiments were successful, said Ranger Miller, and they could be continued as long as logistics allowed them. "It's the question of once you do it and spend all the money, how long is it going to last before the sea level catches up?" he said.

For example, the rangers could dredge up sediments in the refuge to build up its marshland and solidify its shorelines, but this was unfeasible since there was not enough sediment available within the marsh. "Too much of it has left the system [and] been transported out to the Bay over a long, long period of time," Miller said in explanation. "If the sediment never left the system, it would be easy to take it off the bottom of the river and rebuild everything."

Due to this, any projects that involve building up the impoundment beds or the shorelines require the sediments to be imported from outside the refuge by the dump truck, adding another layer of expenses and planning.

Co-author Rhudy photographs marshland
Photo: Nathan Cross

Soil loss within the refuge is leading to problems such as saltwater intrusion. A lot of the land is extremely low. Depending on the micro-topography of the area, as sea levels rise, marshland in some areas is lost and flooded with saltwater, which opens up direct contact to more land that may contain forest.

Miller says that the intrusion of salty water is what causes ghost forests to form. "We have had more high-water events, stronger weather

events that pushed water up here. So, you can have times when the saltwater gets pushed up in here and it is fast to come in and really slow to go out. During that time, it can get into areas, inundate areas that are forest, and it kills trees because the water just sits there, and it can make the soil saltier."

There is already a lot of ghost forest at Blackwater Refuge, and as the marshland absorbs more saltwater it will continue to form. This happened long before people had learned about climate change, according to Miller, and it just happens at a faster rate today.

A long-term strategy by Blackwater to manage the area is to purchase more refuge land that is upslope. The marsh can move up slope, and into places where the forests were turned into ghost forests. Those trees eventually fall, and those areas can become marsh land.

Blackwater still has areas that are marsh, and they look at areas that they think will become marsh in the future because of factors such as rising sea levels. They try to target these upslope areas for purchase by the Refuge in the future, knowing that at some point they may become marshland. By doing this, they can turn the land into something useful and manage it as marshland.

SET device exhibit Photo: Gwyneth Rhudy

One way that biologists at Blackwater Refuge figure out the changing elevation of the marsh over time is by using a tool called a Surface Elevation Table (SET). To collect data, they insert a pipe into the marsh. Then the biologists will attach the SET to the stationary pipe.

The SET device has 9 pins that slide into the arm before resting on top of the surface of the marsh. The length of each pin is measured and recorded, this process is repeated over time to figure out how the measurements and marsh's surface has changed over time.

Scene along Wildlife Drive Photo: Gwyneth Rhudy

Blackwater Wildlife Refuge has been around for a long time as it was established in 1933. Management plans have been made and are continuing to form in order to try and keep the land as healthy as possible, through the efforts of the rangers and many other people. In the future, Blackwater Wildlife Refuge hopes to continue using, maintaining, and gaining land to use as a habitat for many species, a rest stop for waterfowl, and an area for public recreation.

References

Buxton, L. (2024, September). *Marsh Migration and*. Retrieved from lccnetwork: https://lccnetwork.org/sites/default/files/Resources/Marsh%20Migration%20and%20Thin-Layer%20Placement%20on%20Blackwater%20National%20Wildlife%20Refuge.pdf

Chesapeake Conservancy. (2024, November 20). *Blackwater National Wildlife Refuge Expansion*. Retrieved from Chesapeake Conservancy: https://www.chesapeakeconservancy.org/what-we-do/conserve/advancing-goals/protected-network-of-lands/blackwater-national-wildlife-refuge-expansion/

Meyers, E. (2024, November 24). *Sea Level Rise at Blackwater National Wildlife Refuge.* Retrieved from The Conservation Fund: https://www.conservationfund.org/our-impact/projects/adapting-to-climate-change-at-blackwater-national-wildlife-refuge/

NOAA. (2024). *Blackwater Wildife Refuge Wetlands Restoration Project.* Retrieved from Tides and Currents: https://tidesandcurrents.noaa.gov/blackwater.html

U.S. Fish & Wildlife Service. (2022, September 16). *Decades-long Partnership Eradicates Destructive Nutria Rodents from Maryland*. Retrieved from U.S. Fish & Wildlife Service: https://www.fws.gov/press-release/2022-09/decades-long-partnership-eradicates-destructive-nutria-rodents-maryland

U.S. Fish & Wildlife Service. (2024, November 21). *Blackwater National Wildlife Refuge*. Retrieved from U.S. Fish & Wildlife Service: https://www.fws.gov/refuge/blackwater/species

Catch 'Em and Eat 'Em

One effective way to deal with Bay invasives

----Sam Denherder, Jordan Nichols

Blue Catfish Photo: Sam Denherder

Imagine a fish growing as large as 143 pounds, with a mouth abnormally large for its size. How about one that has a snake-like body and dagger-sharp teeth, and can also walk on land? Both of these creatures, the Blue Catfish and the Northern Snakehead, have become very widespread invasives in the Chesapeake Bay and its tributaries over the past decade.

Catch 'Em and Eat 'Em (continued)

According to the National Oceanic and Atmospheric Administration (NOAA), Blue Catfish were released into Virginia freshwater waterways as a way to boost the local fishery. The species was intended to bring a good fight to sport anglers and more dinner options for hungry fishermen throughout the James River and Rappahannock River.

Wildlife managers thought that the Blue Catfish would stick only to the purely freshwater parts of the rivers and creeks but later found out that these fish are tolerant of higher salinity than they anticipated.

The Blue Catfish started spreading further down these rivers towards more open water and the mouths of the rivers. This unexpected movement, plus an abnormally rainy season (resulting in lower salinity) allowed these catfish to keep heading straight out into the abnormally fresh waters of Chesapeake Bay.

From there, the Catfish were able to spread out and move up into every tributary, river, and creek attached to the Chesapeake Bay

According to a local recreational and avid Blue Cat fisherman Aaron Denherder (cover photo), "They were originally stocked by the government in the James River and possibly the Potomac as well, I know Virginia did first in the 70's. When we had that large rainfall like 6 or 7 years ago, it dropped the salinity in the Chesapeake Bay, and then they spread into every river on the Bay."

Now, due to their higher tolerance for poor water quality, Blue Catfish dominate the water in urban areas such as Washington, DC and Richmond, Virginia. In places like this, the water is usually not even clean enough for the fish that live there to be considered fit for human consumption, according to the DC Department of Energy and Environment.

But according to the owner of a local seafood market in Salisbury, MD, that problem has not been an obstacle for those getting their catfish from the cleaner waters of the open Bay.

1 Fish 2 Fish seafood market Photo: Sam Denherder

John Connell of 1 Fish 2 Fish Crabs and Seafood in Salisbury, Maryland, has embraced these invasive species as a sustainable business opportunity. Connel says, "In this area, local people love catfish, so we sell about 10 pounds a day," highlighting the strong demand for blue catfish.

John Connell behind the counter Photo: Sam Denherder

Catch 'Em and Eat 'Em (continued)

He adds, "It's always been pretty popular, which is good considering it helps control the invasive species in the Bay."

According to Connell, he is directly affected by the damage the Blue Catfish cause in the bay. "For me, our number one thing is crabs, and I like selling [Blue Cats] because they're eating all the crabs… It really sucks, too, because you have the catfish, you have the Snakehead fish, you have all these different things that are in play now that make it tough for crabs and other things that the environment needs to thrive."

The Blue Catfish has proven to be quite an obstacle for the Blue Crabs in Chesapeake Bay. Having no natural predators, and eating almost anything that they come across, crabs are no match for these fish, it seems.

It might be expected that because of the increased population of Blue Catfish and the declining population of Blue Crabs, the prices of the crabs would skyrocket, but it may be more of a gradual process instead. Connell said, "It pretty much already is at that point. I mean, crab prices have already jumped up in the past three years, but I don't foresee the crab prices going higher."

Blue Catfish filets on display at 1 Fish 2 Fish
Photo: Sam Denherder

Until recently, most restaurants and fish markets have been selling primarily farm-raised catfish. But Connel prefers to sell local-caught fish rather than farm-raised. "Wild caught is usually actually about the same price, if not cheaper than farm [raised catfish]," he said, and added, "It's easy for them to catch Blue Catfish right now," and "Wild caught has always been pretty popular."

With Blue Catfish being so readily available in the Chesapeake Bay and possibly even cheaper than importing catfish from elsewhere, it makes for a pretty sustainable source of income and encourages the management of that species.

Sticker promoting in-house fish frying
Photo: Sam Denherder

As for the taste of the Blue Catfish, Connell said, "It has a very unique taste to it... I personally like striper more than catfish... it's ok, but I'm not a big fan on catfish." But even though Connell is not the biggest fan of the taste, clearly many people do like it, considering the large demand.

Connell said,"We do catfish bites--the main way with catfish is bread it and fry it. It's like a comfort food...around here it's just like fried chicken – fried catfish!"

Catfish nuggets Phoito: Sam Denherder

Blue Catfish are known for growing big at an astonishing speed, and they are apex predators that eat nearly everything they come across. Crab populations are suffering due to the ravenous qualities of this invasive species, and selling the catfish in markets and restaurants will encourage the decrease in their populations.

The marketing of the Blue Catfish is a critical part of getting it from the bay to the dinner table. Catfish are commonly known to be generally unattractive fish, and they are often considered to be what some people call "trash fish." Some may attribute their reasoning for abstaining from this species to religious beliefs, while most other people that do not prefer catfish are simply turned off by the fact that these fish are bottom feeders. But there are still many people who would consider Bue Catfish to be good eating.

The fact that the fish is local makes it way more marketable. People get way more interested when they find out that the food in shops and restaurants comes straight from their back yard.

The Northern Snakehead had a different introduction into Chesapeake Bay than the Blue Catfish. There are multiple different theories on how they were introduced, and the most likely option is a combination of causes. According to Maryland Department of Natural Resources, the Northern Snakehead was introduced from exotic aquariums as well as by local fishermen.

The aggressive feeding behaviors make the species a top pick for aquariums, especially in predatory tanks. These behaviors allowed Snakehead to gain popularity and become more popular in the pet trade. What not all people realize is the size these fish get to--

Northern Snakehead measuring 27 inches long
Photo: Sam Denherder

Catch 'Em and Eat 'Em (continued)

Northern Snakehead can get to over 33 inches long.

Since the Snakeheads get so big, they need a very large tank or even pond to keep them to their adult size. A minimum tank size of 500 gallons is required to properly keep them through adulthood.

A tank this size isn't common or cheap for someone to own, so when Snakeheads end up outgrowing almost all tanks, there isn't a place for them to go, the owners can't take care of the fish anymore, and they are forced to get rid them.

The easiest and seemingly most "humane" way of getting rid of fish like this is to release them into the wild. This is what lots of Snakehead owners ended up doing and is what lots of pet owners do globally.

Most tropical aquarium fish species would not survive a vast majority of the climates around the world, but in tropical areas and when dealing with especially hardy species, releasing them into the wild is a big problem. Northern Snakeheads are one of these hardy species, with tolerances allowing them to survive in almost every climate in the United States.

As more and more people started releasing them into the wild, there was a stable enough population of Northern Snakehead to reproduce and spread throughout the Bay.

Another way Northern Snakeheads found their way into the Bay is from local fishermen. The bites, attacks, blow ups, and follows that Snakehead give have been some of the best in the world. This makes them a top pick as a sport fish--everyone wants to see a Snakehead blow up out of the water after a frog. According to the DNR, some local fishermen may have purposely introduced some Snakeheads as a new, exciting gamefish.

Snakehead jaw Photo: Sam Denherder

John Connell is very aware of the opportunities that the Northern Snakehead brings to the area in terms of commercialization, and he discussed the challenges associated with the marketing of snakehead among other obstacles when asked about the rebranding of the species as the "Chesapeake Channa."

"Yeah, they are [getting rebranded]," he said. "I've had people say that it's really good, but I've never had the chance to try it… We've actually tried selling it here, but it didn't go over very well."

Although the fish has a controversial story, quite a few people insist that the fish is worth a taste. So what is the issue when it comes to getting people to buy Snakehead in markets?

"The Snakehead fish has actually gone up in price [since the rebranding," Connell explained. "It was ... a little higher than I thought it'd be pricing-wise… We actually kept our margins pretty small [because]we were just trying to build interest. Maybe if we branded it differently..."

Prices from suppliers have gone up further, "now that some fancy restaurants have started

putting it on their menu," leading to increased interest among the general public.

Between the Blue Catfish and the Northern Snakehead, the Chesapeake Bay needs our help. Invasive species like these are causing major damage to the ecology of the Bay, and they are devouring the most iconic food source that we have native in Maryland: Blue Crabs.

Both of these fish are voracious predators that need to be dealt with, and what better way to do that than by putting them on the menu, too?

By increasing the marketability of the Blue Catfish and Northern Snakehead and putting them on more dinner tables, we can better manage their populations and help sustain Blue Crab populations.

Marketing these fish also creates an opportunity to bring more income to local fishermen and seafood processors, boosting our local economy. Blue Catfish and Snakehead/Chesapeake Channa are apparently here to stay, so we may as well learn to enjoy them.

COMMON FISHING RIGS FOR CATCHING BLUE CATFISH AND NORTHERN SNAKEHEAD

Blue Catfish

Top and Bottom Rig--for smaller Blue Cats and other bottom feeders. The rig consists of two size 6 to 10 hooks with a lead weight attached to the bottom snap swivel. Connects straight to the mainline with a rotating swivel on top.

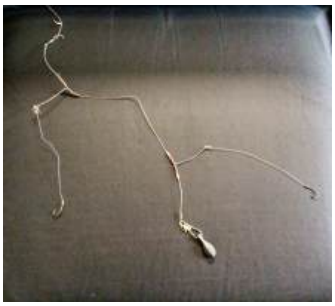


Photo: Sam Denherder

Fish Finder Rig--Very common for targeting Chesapeake Bay Blue Catfish. The lead weight on a slider allows the fish to take the hook without feeling any weight. The big circle hook prevents gut hooking and lets the fish hook itself. Bait can be cut bluegill, shad or herring, or live shiners.

Photo: Cats and Carp

COMMON FISHING RIGS FOR CATCHING BLUE CATFISH AND NORTHERN SNAKEHEAD (continued)

Snakehead

Slip Bobber Rig--Used with live minnows. The bobber allows the minnow to be suspended off the bottom in the chosen spot. The bigger the minnow, the better.

Photo: BassFishingandCatching.com

Frog-- Weedless frogs allow you to get into very tight, shallow, and crowded areas without the worry of getting snagged. Plus, the topwater blowups on a frog are some of the most fun bites to experience.

Photo: Sam Denherder

Soft Plastics--Using either a very lightweight jig head or no jig head at all allows the bait to float down slowly through the water column and stay suspended longer in shallow water. Commonly rigged to be weedless to decrease snags.

Photos: Sam Denherder

COMMON FISHING RIGS FOR CATCHING BLUE CATFISH AND NORTHERN SNAKEHEAD (continued)

Whopper Plopper--Like the frog, this is a topwater lure, popular for targeting Sakehead in shallower waters. The loud noise and commotion created by the spinning tail attracts a lot of attention from fish.

Photo: Sam Denherder

Spinnerbaits and Inline Spinners--These lures are great if you're fishing in an area with fewer weeds or in deeper water. The flashing from the blades provides lots of action and light to grab the attention of fish.

Photos: Sam Denherder

References next page.

Catch 'Em and Eat 'Em (continued)

References

"Fishing in the District | Doee." *Doee.dc.gov*, https://doee.dc.gov/service/fishdc

Blankenship, Karl. "Task Force Looking for Ways to Control Invasive Blue Catfish." *Bay Journal*, 4 Sept. 2014, www.bayjournal.com/news/fisheries/task-force-looking-for-ways-to-control-invasive-blue-catfish/article_9f100b1a-7316-5537-b861-cb7b988285a5.html.

Maryland Department of Natural Resources. (n.d.). https://dnr.maryland.gov/fisheries/Pages/fish-facts.aspx?fishname=Blue%2BCatfish#:~:text=Blue%20catfish%20are%20members%20of,look%20like%20long%20black%20whiskers.

Lockwood, Ryan. "Blue Catfish in the Chesapeake Are Gobbling up Everything in It." *Theodore Roosevelt Conservation Partnership*, 22 Apr. 2024, www.trcp.org/2024/04/22/blue-catfish-in- the-chesapeake-are-gobbling-up-everything-in-it/.

US Department of Commerce, N. O. and A. A. (2019, April 2). *What is an invasive species?*. NOAA's National Ocean Service. https://oceanservice.noaa.gov/facts/invasive.html

Knight, C. (2024, April 15). *Ohio catfish record? new richmond 15-year-old catches monster while Jug Fishing*. The Enquirer. https://www.cincinnati.com/story/news/2024/04/12/ohio-catfish-record-15-year-old-catches-monster-while-jug-fishing/73299961007/#

Fisheries, N. (n.d.). *Blue catfish: Invasive and delicious*. https://www.fisheries.noaa.gov/feature-story/blue-catfish-invasive-and-delicious#:~:text=They%20were%20introduced%20to%20several,and%20back%20into%20other%20rivers.

Northern snakehead. Northern Snakehead (Channa argus) Species Profile :: AquariumDomain.com. (n.d.-b). https://www.aquariumdomain.com/SpeciesProfiles/NewWorldCichlids/NorthernSnakehead.shtml#

Northern snakehead (channa argus) - species profile. USGS Nonindigenous Aquatic Species Database. (n.d.). https://nas.er.usgs.gov/queries/factsheet.aspx?speciesid=2265

How did snakehead fish get into the United States?. How did snakehead fish get into the United States? | U.S. Geological Survey. (n.d.). https://www.usgs.gov/faqs/how-did-snakehead- fish-get-united-states

(PDF) Martínez-Castillo, V.; Rodríguez-Troncoso, A.P.; Mayfield, A.B.; Rodríguez-Zaragoza, F.A.; cupul-Magaña, A.L. coral recovery in the Central Mexican Pacific 20 years after the 1997–1998 El Niño event. oceans 2022, 3, 48–59. https://doi.org/10.3390/oceans3010005. (n.d.-a). https://www.researchgate.net/publication/358807339_Martinez-Castillo_V_Rodriguez-Troncoso_AP_Mayfield_AB_Rodriguez-Zaragoza_FA_Cupul-Magana_AL_Coral_Recovery_in_the_Central_Mexican_Pacific_20_Years_after_the_1997-1998_El_Nino_Event_Oceans_2022_3_48-59

Midway, P. by S. (2017, September 5). *The fate of released Aquarium Fish*. The Fisheries Blog. https://thefisheriesblog.com/2013/08/26/the-fate-of-released-aquarium-fish/

Staff

Writers / Photographers

Will Beaven, Nate Cross, Sam Denherder, Jay Goodman, Caroline Hilyard, Connor Kinch, Ian Mathieu, Kylie Mitchell, Jordan Nichols, Gwyneth Rhudy, Will Tinkler

Faculty Advisor

Dr. Charlie Ewers

Photo: Nathan Cross