

# Chesapeake Stories

The Bay in Words and Pictures



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Photo: William Fehrenbacher  
Cover Photo: Travis Zimmerman

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# Time To Move Turtles?

Reptiles Challenged To Outrun Climate Change

Tanner Kille, Kimberly McGurk, Travis Zimmerman



Mud turtles do have legs and feet, but are they fast enough?

Photo: Travis Zimmerman

**To move or not to move?** That is the question many will be asking in the near future as sea levels rise, causing major issues for freshwater turtles

## Time to Move Turtles? (continued)

who live in the low lying coastlines of the Chesapeake Bay watershed. Areas once habitable for these reptiles will become unlivable, with salinity levels in the Bay and nearby bodies of water increasing.

Affected turtles will lose body mass and deteriorate over time if their ideal habitat conditions are not met. While some species have a higher tolerance than others, it is still a challenging topic to consider for researchers and scientists in the field. It is no secret that animals are able to evolve over time, but with sea levels rising at an accelerated rate, scientists say we must act now. So what should be done to aid these species and their habitats? Should turtles be moved to higher ground, or will moving them cause more harm than good?

Ashlee Reinke, the Park Ranger Lead at Tuckahoe State Park, has always had an affinity for turtles. "I am blessed to work in situations where I see them often as well as encourage others to appreciate them as much as I do," she said. Reinke has worked for the park for eleven years, and during this time has been an instructor for nine years in Scales and Tales, an environmental education program that uses non-releasable birds of prey and reptiles to educate and encourage people to become better environmental stewards.

"At Tuckahoe State Park we house and care for an array of different birds and reptiles," Reinke said. The park's birds of prey include a Barred Owl, a Great-Horned Owl, three Eastern Screech Owls, a Red-Shouldered Hawk, a Red-Tailed Hawk, a Bald Eagle, a Golden Eagle, and an American Kestrel. Legless reptiles cared for by the park are two Corn Snakes, a King Snake, and Black Rat-Snake. There are also three Eastern Box Turtles, two Eastern Mud Turtles, two Painted Turtles, a Spotted Turtle, and a Red-Eared Slider.

Once an injured animal is rehabilitated and deemed to be non-releasable, it can still be given a life through Scales and Tales.

Injured animals are not the only animals that come into the care of the park. People occasionally bring in pets that they can no longer care for, and the park will sometimes take them. The reason that pets cannot simply be released back into the wild is that even if they were native to the area, they most likely have been imprinted on. This means that they never learned or forgot how to survive in the wild on their own and are now dependent on humans to survive.



Spotted Turtle

Photo: Travis Zimmerman

The handling of animals is one thing that Reinke teaches in Scales and Tales. When it comes to moving turtles as an aid due to sea level rise, her training, while limited on the particular subject, has shown her that this is not the right decision. "One of the major points that are laid out is to 'Leave Wildlife Wild,' she said. "If someone comes across a turtle in the wild, Scales and Tales encourages them to only observe with their eyes, not to move them. If a turtle *must* be helped, [for example to

## Time to Move Turtles? (continued)

move it out of the road], you want to make sure you move them in the direction they are traveling.” Moving of any animal from one location to another that is outside of its home environment brings a risk of spreading disease into the new environment. While picking up animals like turtles is not recommended, if for some reason picking them up is necessary, they should be put back in the same area they were found so that they will not damage another ecosystem.

Reinke went on to say that “disease could wipe out other [animal] populations that would have otherwise not been affected.” And while the Scales and Tales training mainly focuses on the spread of disease as the reason to not move animals, this is not the only way this action could hurt the new ecosystem. Those other populations could also be affected by a competition for resources when turtles are moved into new environments.

Through the years working and conducting Scales and Tales training, Reinke has not seen much change in the program’s educational material, but the program tries to stay current on big issues such as climate change. In the past, Scales and Tales educators have put their heads together to better incorporate solutions into their programming, Reinke said, “So if moving turtles becomes the aid that is needed with this issue, I would assume the program would adapt.”

Amanda Rocker (cover) is a senior grad student at Salisbury University who is aiming to graduate this winter with a master’s degree in Applied Science. Early on in Amanda’s collegiate career she met the herpetology professor at Salisbury University, Dr. Eric Liebgold, and soon discovered that the two shared an interest in turtles.

Liebgold's work in the field includes studying the IUCN Red Listed endangered Spotted Turtle since 2016 and working with the federal government to provide information for their decision to add the species to the Endangered Species List in Delaware and Maryland.



Dr. Eric Liebgold

Photo Courtesy of Eric Liebgold

To Liebgold, the removal of turtles depends on other environmental factors. “The big missing piece of information is whether there is an appropriate and underutilized habitat that they could be moved into,” he said. However, “Turtles in general are resistant to salt water in the short term --it shouldn't kill them--so maybe they can find new habitat after the old habitat is under salt water. Maybe.” Liebgold believes the ultimate way to solve the problem is by tackling the issue at its roots. “Stop sea level rise [and] spend extra effort and money to preserve any habitats of endangered species that are not predicted to be encroached (or less encroached). This doesn't help all species in

## Time to Move Turtles? (continued)

danger, but [it] could help some.”

As Rocker completed her undergraduate degree and sought to complete her graduate degree, she realized that she needed to do a research project. Liebgold suggested the idea that she should look into the Eastern Spotted Turtle population along with other local species in and around Salisbury, MD, and see how they are affected by different environmental factors.

The complete description of Rocker’s work is as follows: “I looked at their current population status through size class distribution and predation pressures brought upon by environmental pressures.” What she discovered is that the majority of turtles within the Salisbury region are in fact adults, but some species have increased predation on them depending on the location in which they lived.

“Some species had increased predation, seen by marks on their shells,” she said. “These species are more susceptible to things such as rising sea levels and climate change as they cannot easily adapt to a new climate and are forced out of their homes.”

Climate change and rising sea levels could cause behavioral changes in turtle species as well, she added. “These are freshwater species, so sea level rise would result in

saltwater encroachment in ponds they reside in.”

If available homes for these freshwater turtles become limited it is possible that we could see increased aggression between species as they

fight for more suitable homes. “Turtles are sensitive to seasonal and temperature changes in the air and water that mark behaviors such as breeding and nesting, and a change in average temperatures and climate may alter these behaviors or their occurrence,” Rocker continued as she stressed the importance of the lurking demise of these freshwater turtles.

She explained, “Unfortunately not much is known about the different species, so attempting to find new homes for them or find a new suitable location would be difficult without more studies being done.”

However, Rocker does believe that there are ways that an everyday average Joe can help the local turtle populations: “We need to better educate ourselves on the local species and their importance, as this will help us preserve their overall biodiversity of the area.” As for what we can do if we come across a turtle, she stressed that we should not simply take the turtle in and keep it as our own; instead, echoing Ranger Reinke, she advised that we should carefully assist it if it appears to be stuck or is crossing the road, but otherwise leave it alone.



Mud Turtles

Photo: Travis Zimmerman

# Saving SAV

Submerged Aquatic Vegetation Vital to Bay's Health

---Cassandra Duncan, William Fehrenbacher



Submerged Aquatic Vegetation: Widgeongrass

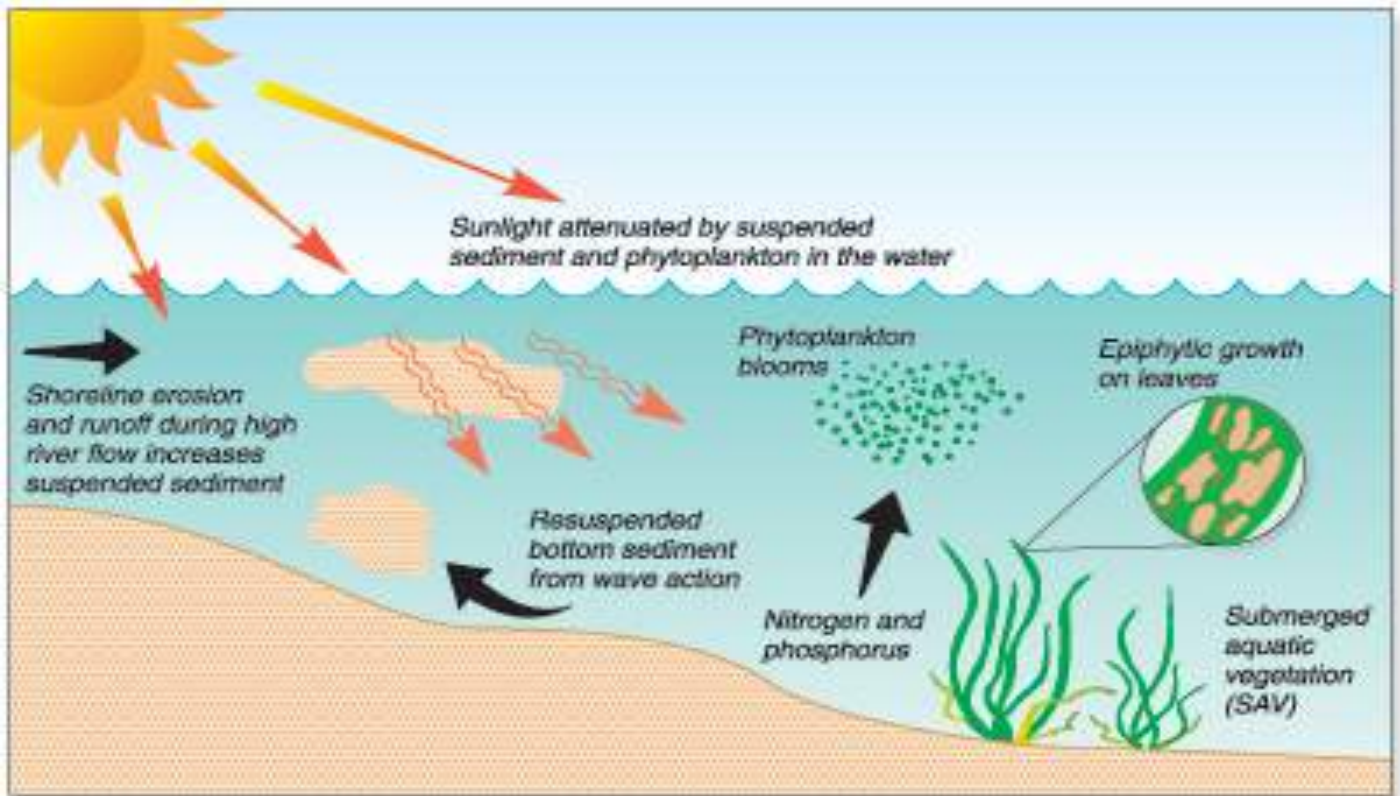
Photo: William Fehrenbacher

Looking toward the horizon, viewers see the tall grasses on the shore blow in the breeze as the sun sets. In the water, beds of deep green grasses wave in the current, dancing in their own underwater breeze. These grasses are known as submerged

## Saving SAV (continued)

aquatic vegetation, or SAV, plants that grow in shallow waters such as edges of bays, rivers, and streams, providing habitat for many different species of fauna that reside in the Bay.

The increased dissolved oxygen levels that SAV provides allow Bay inhabitants to properly breathe. Small creatures also rely on SAV for sustenance. Trapping excess sediments in the terrain instead of allowing them to flow downstream is another huge function of SAV.



Functions of SAV

Infographic: <https://pubs.usgs.gov>

Eelgrass and widgeon grass are two of the most abundant species in the Chesapeake Bay and play an important role in the Bay's health.

Throughout the Bay's history, the landscape and populations surrounding it have changed. An increase in the number of people in the roughly 64,000 square miles of the Chesapeake Watershed has caused a large decline in SAV populations, as more impervious surfaces and development continue to pump unfiltered water—known as runoff—into the Chesapeake and with it, more harmful substances.

Runoff is the excess water from any form of precipitation, like rain, snow, hail, or sleet, that does not absorb into the ground. Instead, this water streams downhill, collecting excess nutrients and sediments on its way to the watershed. Nitrogen, phosphorus, and sediment contribute heavily to the issues around SAV's.

An extreme example of this damage came in 1972, when, according to the Maryland Department of the Environment, Hurricane Agnes "produced devastating rains and sediment runoff that decimated soft-shell clam, oyster, and submerged aquatic vegetation populations."



## Saving SAV (continued)

The fertilizer runoff and sediment particulates are both major disruptive processes that directly impact the decline of SAV's in the Bay. Excess nutrients lead to algae blooms, which cloud the water and prevent the sun from reaching SAV. And, as explained by the Chesapeake Bay Program, "Stormwater runoff can also push excess sediment into rivers and streams. Sediment can block sunlight from reaching underwater grasses and suffocate shellfish."



Shoreline with Grasses

Photo: Cassandra Duncan

This degradation of water quality makes the environment for the SAV unstable. Chris Patrick, an expert on SAV at the Virginia Institute of Marine Science (VIMS) explains, "Locally the biggest issue that people have talked about for the Chesapeake Bay is eutrophication, which is a fancy term for lots of nutrients coming off the watershed into the bay and enriching that system." In order to have strong native SAV populations, the temperature, salinity, chemical compositions, and overall water quality must all be balanced.

Fishermen in the Bay area interact with SAV's, whether they are aware or not. Dr. Shane Hall, a professor of Environmental Studies at Salisbury University and avid recreational fisherman, offers a different perspective on SAV in the Bay. Dr. Hall remembers, "When I was in college, I was a part of a student club that was funded through a grant called the St. Mary's River Project (SMRP), and we went around to elementary school classes each week to teach basic Chesapeake ecology and conservation. We had this whole day on SAV and a "rap" that somebody wrote about SAV that we sang with the second graders. It was really lame, but the kids liked that."

Hall later learned more about SAV through first-hand experience, as they can cause major issues for boaters. "Historically," he said, "there is so much grass in the Chesapeake Bay that no matter what kind of motor you have on a boat, it cannot overpower running into the grass for a sustained amount of time. [The grass] will wrap around the blade of your motor and it will mess you up... and [become] a potential danger, if you actually damage your motor and then you're out there in the water without a means of getting home."

This issue led the Department of Natural Resources and other governmental organizations to target SAV, using a variety of herbicides to kill the plants in order to improve the quality of recreational activities like boating and swimming. Brooke Landry, biologist for MDNR and chair of the Chesapeake Bay Program's SAV Workgroup, said, "It was mostly back in the '70s where people were generally encouraged to get rid of the SAV around their dock; mainly it was providing an impedance to

## Saving SAV (continued)

recreation and boating, but that was before people realized how bad herbicides are [for their] long term effects and how long they can stay in the sediments and destroy the environment. There were multiple state and federal agencies that pushed that mindset. Fortunately now, we know the importance of our grasses.”



Booke Landry and Her Colleague, Becky

Photo Courtesy of Brooke Landry

The aquatic grasses still face threats from waterfront residents, but eradication is no longer encouraged by governments. In a recent survey sent out to waterfront property owners about their opinion on SAV along their shoreline, the DNR received conflicting feedback. “There were some people that were not aware of its benefits, but then there were others that knew there were benefits and that the restoration of SAV was a goal and priority, but their personal use in their waterfront was more important to them than the environmental benefits,” Landry said, and added that there is a law allowing for limited removal of submerged grasses for waterfront landowners: “COMAR 4-213 is the one that states that waterfront property owners are allowed to remove SAVS for navigational purposes. If you have a boat, you can remove a swath of SAV up to 60 feet wide and up to the

## Saving SAV (continued)

navigational channel. What happens is that people extend that privilege to removing it all along their shoreline for recreational purposes." Violation of this law is often hard to prove and is punishable by citation depending on its severity.

Keeping track of SAV bed acreage and protection is a difficult process. Thanks to the Riverkeeper programs across all bodies of water surrounding the bay, aquatic vegetation has become easier to monitor. "Being involved with the riverkeepers has really helped us expand our oversight in looking for infractions. We get them involved and they help us monitor SAV," said Landry.

VIMS has also had great success at monitoring and restoring sections of the Bay. According to Chris Patrick, "At this point, we've put out about 500 acres of seeds, and we are at about 9600 acres of grass mix, so that makes it the single [largest] restoration intervention on the planet." The areas targeted by this project, though, faced fewer overall water quality issues than other areas. Patrick said, "It's been a really successful story, but it was only possible because that environment could support it."

Aside from the monitoring and restoration efforts, there are policies and regulations (currently 15 different regulations) in place to attempt to protect SAV populations in the Bay. Regulations define what an SAV is, what can be done with them, and what can be done *to* them, for example when harvesting oysters, and these laws are enforced with fines and revocation of licenses.



Watermilfoil

Photo: William Fehrenbacher

Many of the issues with creating effective mitigation to protect SAV's center around its complex nature. Water is always flowing, and water quality, good or bad, flows great distances, making it difficult to pinpoint sources of pollution.

With increasing levels of pollution and changes in average Bay temperatures, there are many cases in which new species of SAV begin to take over areas that were unproductive before. Hydrilla and watermilfoil are two non-native species of aquatic vegetation that have a very high tolerance to fluctuating water quality. These plants are able to step in and provide very similar ecosystem services to those provided by native and more fragile plant species. In addition, these non-native species trap sediment and seeds of plants upriver and can eventually enable native species to grow back if conditions are favorable.

The future for our submerged grasses in The Chesapeake Bay is encouraging. The goal set for strong SAV recovery in the bay is 185,000 acres of grass beds. Brooke Landry said, "When we started in 1984 there were only 38,000 acres, and recently we maxed out in 2018 at 108,000 acres.

## Saving SAV (continued)

Unfortunately in 2019 and 2020, we did decline a lot by going back down to 62,000 acres. But all in all, we are taking the appropriate steps to reduce our nitrogen, phosphorus, and sediments to facilitate our water quality.”

The “total maximum daily load” is a tool used to measure the amount of pollution being put into the Chesapeake both by individual counties and states as a whole. When implemented in 2010, the data reflected a strong correlation between regulatory practices and improving ecological productivity. Landry said the future of SAV is promising as long as “we as a people and communities push our regulatory agencies to adopt policies that ... increase water quality through improving wastewater treatment plants, stormwater runoff, riparian buffers, rain guards, anything to decrease the amount of water that transfers from the watershed into the Bay.”

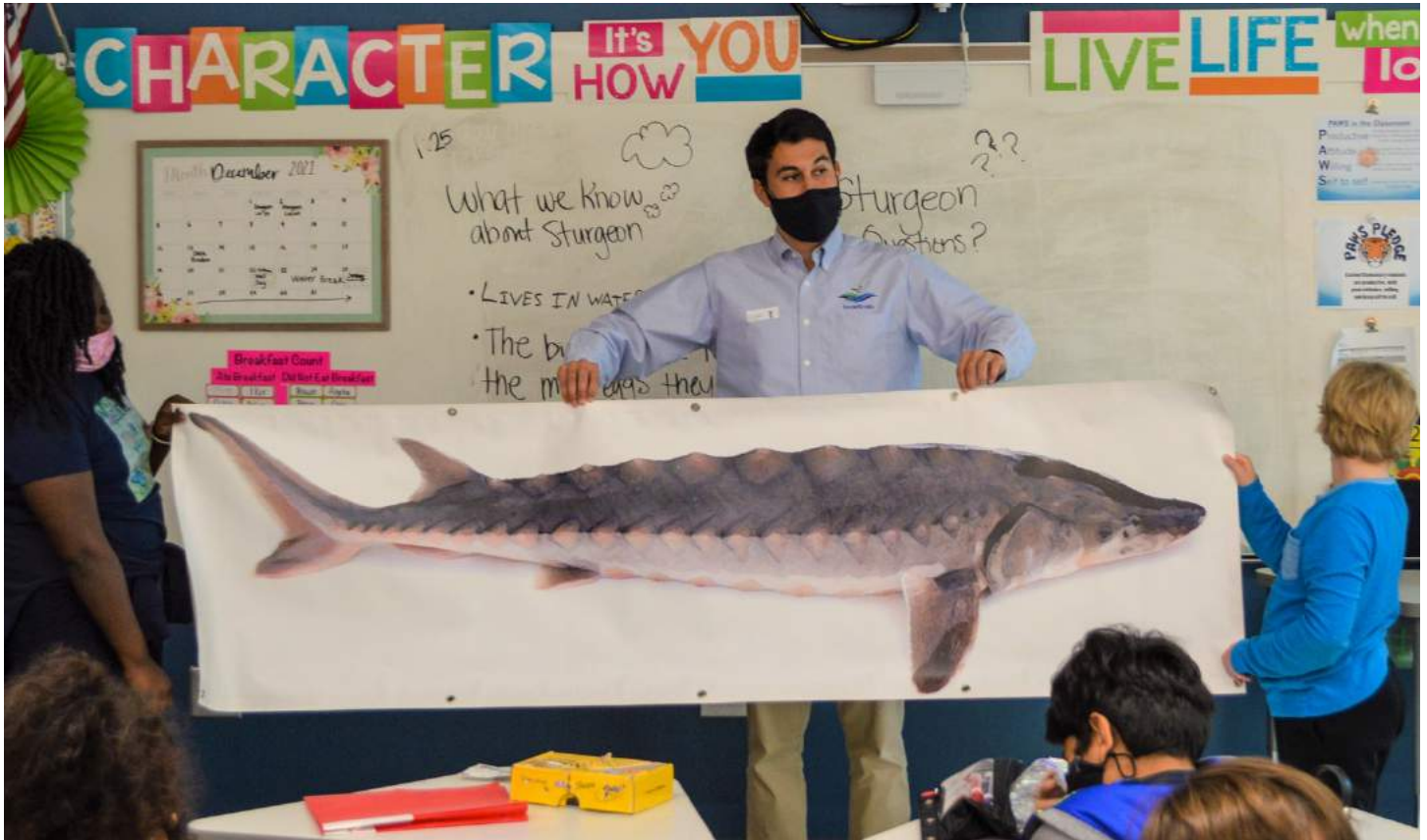


Agricultural Shoreline

Photo: William Fehrenbacher

# Advocacy through Education

Organization Instructs Eastern Shore Youth  
---Annika Geitner



Demetrio Gutierrez Finley Teaches about Sturgeon at Easton Elementary School

Photo: Annika Geitner

Choptank, Chester, Sassafras, Miles, and Wye Rivers. Eastern Bay and the Bayside Creeks. ShoreRivers, a non-profit organization in Easton, uses science-based advocacy, restoration, and most importantly education, to heal and preserve these Eastern Shore waterways, all of them

## Advocacy through Education (continued)

important tributaries to Chesapeake Bay.

ShoreRivers has developed multiple environmental education programs including lessons in local classrooms, professional development for teachers, field lessons and community focused action projects.

Suzanne Sullivan, Director of Education, has been with ShoreRivers since its creation. In 2017, she was working at MidShore Riverkeeper Conservancy (MRC) when it merged with Chester River Association and Sassafras River Association to create ShoreRivers. She is behind the engineering of the educational programs ShoreRivers provides to third and ninth graders in Talbot, Queen Anne's and Dorchester Counties.



Suzanne Sullivan

Photo: ShoreRivers

"It started year one with simply a field trip, one field trip, one class," Sullivan said. "I think it was St. Michaels we initially partnered with. And slowly we have been building relationships with teachers [and] building relationships with science county coordinators in the public schools. It just kept growing."

One of the educational programs ShoreRivers

provides to local students is an Atlantic Sturgeon Discovery Program. This program is taught to all third graders in Talbot and Dorchester Counties.



Mairin Corasaniti

Photo: ShoreRivers

Mairin Corasaniti, Education and Outreach Coordinator at ShoreRivers, is one of the environmental educators who teach this three-lesson program in local elementary schools. "It started as a pilot in Talbot County with a Chesapeake Bay Trust grant," she said, "and then when we got the NOAA [National Oceanic and Atmospheric Administration] Bay Watershed Education and Training grant, we expanded it to Dorchester County. Our goal is to have these in every elementary school in Talbot and Dorchester Counties."

"It's a [program with] three classroom visits, one action project, and one field trip program. So, we would come in three times to do this program and take the kids on a field trip to Horn Point and support them in an action project."

Students first get a 'Sturgeon 101' lesson to introduce them to the species. This lesson is

## Advocacy through Education (continued)

often done by their regular classroom teachers. Then students participate in a habitat investigation where they discover what sort of water quality and river bottom the Sturgeon prefers. Lastly the class will discover the types of pollution that Sturgeon can run into in the Eastern Shore waterways.

All of the lessons are interactive, with hands-on exploration activities and group based conversations. ShoreRivers works closely with local elementary teachers to create programs that can be replicated each year. "The end goal is for the teachers to be able to teach their own lessons, and then we can offer support in a smaller way," Corasaniti said.

ShoreRivers is constantly working with teachers to improve the environmental education students receive. In the future, the organization hopes to take it a step further: "[We want to start] working with institutions of higher education, like Salisbury University, that are preparing a graduating class of pre-service teachers...your average everyday teacher isn't learning that information [environmental literacy]. I would say that is another goal... to incorporate environmental literacy into those pre-service teacher programs," Sullivan added.



ShoreRivers Office

Photo: Annika Geitner

The ShoreRivers staff is comprised of many different types of employees, from River

Keepers to Community Outreach Coordinators. Each one of them had their own personal 'spark' experience with the environment to ignite their passion for conservation and restoration.

Education Director Sullivan is a longtime lover of the outdoors, but she really started to consider science as a career after participating in a high school science lab.

"When I went to high school, ultimately the pivotal moment was when I got to dissect a shark in a marine bio class. Previously, I wanted to be an English teacher," Sullivan said. "But when I did that I was like, 'Whoa! And I think I just felt so empowered that I was really opening something up and exploring... I loved it.'"

Like Sullivan, Demetrio Gutierrez Finley, Education Programs Manager, can pinpoint the experience that set up the rest of his environmental educational career.

"When I was really little--this is kind of funny because right now I'm doing the work that kind of inspired me-- had a science teacher in 7<sup>th</sup> grade, Mr. Zoller, and we did a bio swale in front of our middle school soccer field. And that kind of started the whole thing... planting and getting my hands dirty with my middle school teacher. From there on, I always knew I wanted to do environmental work," Finley said.

Finley works primarily to maintain ShoreRivers' high school programs. These programs are centered on the oysters of the Chesapeake Bay. "I work in the high schools. During the school year we work within schools providing Meaningful Watershed Educational Experiences (MWEE)."

In 2011 The State of Maryland became the first state in the U.S. to implement environmental literacy as a graduation requirement.

ShoreRivers is one of many organizations throughout the state that creates programs for

## Advocacy through Education (continued)



Demetrio Gutierrez Finley

Photo: Annika Geitner

students to complete.

While Maryland requires an environmental education program to graduate high school, there is still a lack of funding which can make these programs costly to implement. A goal for the Education Department would be to advocate for more funding for these programs. Making environmental education more accessible would allow a greater impact on students.

“For me personally, I see [for the future] incorporating our advocacy department and advocating for environmental education. Right now, the funding to support education is minimal compared to, let’s say, restoration,” Sullivan said.

“People in our agriculture department can get million dollar grants but some of the grants we work with our maximum is \$40,000 and it shouldn’t be that way. So, advocating for state budgets and school budgets to have environmental education funding [is another goal of ShoreRivers]. If it is going to be a graduation requirement it should be supported and have funding for that.”

“Our programs help schools meet this

graduation requirement through the MWEE framework, which means basically students are acting like riverkeepers,” Sullivan said. “They are identifying a local issue, collecting data, analyzing the local issue and ultimately, they create a solution and do their own action project that helps solve that location issue.”

There have been many different kinds of action projects as a result of the ShoreRivers work with local high school students and teachers. Action projects can range from building oyster reef balls, designing and printing outreach coasters for restaurants that recycle oyster shells, to planting trees and conservation gardens in local schools.

Finley, Sullivan, and Corasaniti work directly with local high school and elementary school students in and out of the classroom as environmental educators. Every day they go into classrooms hoping to foster view altering experiences. ShoreRivers is trying to inspire the students of today to become the environmental stewards of tomorrow.



Student Action Project--Oyster Coaster

Photo: ShoreRivers

“For me... it’s arming kids, arming young



## Advocacy through Education (continued)

people with the ability to make educated decisions on their own. Giving them the tools and knowledge to do that," Sullivan said.

But inspiring students seems to be getting more and more difficult with each class due to the worsening of the environmental crisis. "A lot of the kids have environmental defeatism, which is opposite of when I was in high school. When I was in high school it was like climate change isn't there and now its climate change is here and we can't do anything about it," Finley said.

"I think it is really important to show them that you can do something and it's an ongoing effort. It's not over. It's always fun to show them, X, Y, Z, that we are doing now and that they can do later too."

Sullivan, too, finds that students feel as though the condition of their local waterway environment is a lost cause.

"I see it every day. We have a lot of activities for students to complete before we visit them in the classroom and one of them is to get a sense of how they see the Bay. How do they see our local rivers? And their responses are always, 'dirty, disgusting, low diversity'. And that's just not true," she said.



ShoreRivers Logo

Photo: Annika Geitner

"We have data to show us, and we all know there are challenges and issues with water quality and land use, but the Bay is still, despite all of those things, able to support vibrant fish populations... The Chesapeake

Bay is still a nursery for fish and other species that go out into the Atlantic Ocean. So, despite all those things, the Bay and life in the bay continue to persist. If we could just change our behaviors just imagine how much better it could be. But for sure we are hearing from students that they are perceiving it as a lost cause."

When it comes to ShoreRivers' educational programs, community collaboration is a high priority. "We really are asking teachers in schools, 'What do you need help with, how can we help you?' Instead of being like here's a program, come do it," Sullivan said.

Not only is it imperative that ShoreRivers collaborates with local educators to create these programs but collaboration between students and community is vital to the MWEE framework.

She reminisced on one of her favorite memories with students. It was when ShoreRivers was working with St. Michaels and the students were investigating the storm water run-off from the school.

"And of course, they wanted to figure out a way [to clean this runoff and] have it absorb into the ground instead of going into the river. But in their investigation, they found there was a sewer or drain [on] their school grounds. They worked with maintenance and the building supervisor and they looked at actual plans of the school grounds," she said.

"They found this sewer that they realized nobody could figure out where it went, which sounds really ridiculous. But at one point the school engineer and the school head of maintenance spread out these design plans with students. And everybody is huddled around just to figure out where this runoff is coming from and where it is going...it was such a cool moment of a school facilitator really respecting that the kids wanted the answer to this. And he was like 'Wait a minute, I don't have it--let's find this answer'. So, it's nothing earth shattering. But it's one of my

## Advocacy through Education (continued)

favorite moments because it's adults and students combining together."

This collaborative spirit is the pride of ShoreRivers as it serves the teachers and

students of Talbot, Dorchester and Queen Anne's Counties. Their hope is that through education, ShoreRivers can inspire and engage young people to become part of the fight for clean waterways.



Choptank River Shoreline

Photo: Annika Geitner

# Wet Threat

Snapshots from a Sinking Peninsula  
----Michael Larger, Cameren Watkins



Shad Landing, Pokomoke River

Photo: Michael Larger

The Delmarva Peninsula is full of rivers and creeks, and surrounded by bays and the Atlantic Ocean. Over the years, this land has seen

## Wet Threat (continued)

significant changes, and communities on the peninsula currently face environmental problems due to rising tides, sinking land, erosion, and dying barrier plants. Here are some brief snapshots of conditions around the region and efforts to make changes for the better.

At the Shad Landing area of Pocomoke River State Park in Worcester County, Maryland, a man who asked to simply go by “Ed” was checking his boat. Ed is from Baltimore, but said that he owned property for deer and duck hunting across the highway from the park, and added that his hunting club has been coming to this area for duck hunting for the past five years because it is less devastated by rising water levels: “Several rivers I hunt overflow often, killing the trees and making it difficult to find spots for cover,” he said.

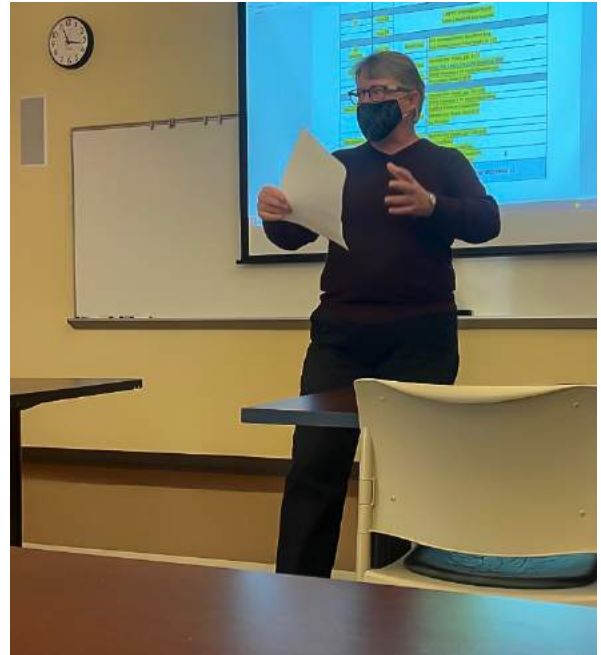


“Ed” at Shad Landing

Photo: Michael Larger

But according to Ed, the northern part of the Pocomoke River is wide enough, and doesn't have a lot of boat traffic, so there isn't as much of the kind of movement that is harsh on the river banks, leading to erosion and the loss of barrier plants needed for a living, thriving shoreline. He also noted that the area is protected and cared for by the Nature

Conservancy and Department of Natural Resources, as they remove fallen trees from the river.



Diana Wagner teaching

Photo: Michael Larger

Farther downriver, Dr. Diana Wagner, an Outdoor Education Leadership professor at Salisbury University, lives just outside of Shelltown, in a part of Somerset County that is zoned agricultural. The clouds of pesticides and dust from nearby farms are a challenge to her environmental beliefs and teachings.

Wagner said, “Being outside is a happy place, and I want to protect it.” She bought five acres along the river to donate to a nature sanctuary, and notes that this land also serves as a filter for the runoff of chemical and sediments polluting the Pocomoke River. She observed that the vegetation on the banks was non-native and doing a poor job at holding the land, and since she already had a “passion for helping native plants,” Wagner began replanting the river bank, but said she knows this is “not enough.” She created the term “nutrient erosion” to describe the premature death of plants and bacteria in the soil caused by rising tides, ruining the micro ecosystem of the land by the river.

## Wet Threat (continued)

A few miles to the east of the Pocomoke River in Worcester County is Public Landing, just outside of Snow Hill. Wayne Young, a native of Snow Hill, left the area for 25 years to serve in the United States Air Force. Now he was checking on his boat, a Carolina Skiff that he uses for recreation since his retirement from NASA in Wallops Island, VA.



Wayne Young

Photo: Michael Larger

Public Landing provides a beach, pier and boat ramp for family fishing, crabbing and swimming, but older locals like Young recount stories from their parents about the 1920's and early 1930's when Public Landing was a hotspot for people who enjoyed nightlife and amusements including a bowling alley, movie theatre, dance hall, ferris wheel, large water slide and more.. "My parents used to go there every weekend," Young said with a smile, but then his face began to dim as he continued: "There was a wild hurricane that destroyed it all and even took the beach with it."

The beach has recently been replenished and "plenty of sand" has been brought in. "Of course, this is not the first time since the hurricane that the beach has been replenished," Young said, "and it won't be the last."

South and east of Public Landing, residents of Chincoteague Island, Virginia like Janet Trader, love living there, but are worried by rising tides and failing bulkheads as the tiny island shrinks.

Trader and her husband retired to Chincoteague due to its quaint character and abundance of wildlife, but now Trader is having to tear up her deck, reinforce her bulkheading with fill dirt and gravel, and install a new deck, as the constant beating from the sun and Chincoteague Bay have taken their toll on the existing structures.

"Flooding is [only] an occasional issue," Trader said, "but I'm worried about my land leaving me and my house," although with Assateague Island as a barrier, and tidal wetlands that soften the blows created by the storms, she knows that among the other older residents of Chincoteague, she may be "gone by the time this island becomes a sandbar."



Janet Trader

Photo: Michael Larger

## Wet Threat (continued)

Across the water from the Traders' property is the Virginia side of Assateague Island. There you can find beaches, nature trails, wild horses, and plenty of other wildlife. You can also find wildlife officers James Fair and Gene Magnen, who both work for the U.S. Fish & Wildlife Service.



Officers James Fair and Gene Magnen Photo: Michael Larger

Fair is a 26-year veteran, while Magnen is an "officer in training" who has been assigned to a park in South Dakota once his training is complete in January, 2022.

The US Fish and Wildlife Service understandably focuses on the management of fish, wildlife and natural habitats but also works along with the National Park Service. The two agencies' sectors of work are handled separately, but "they rely on each other like Officer Gene and I," Fair said. Both officers agreed hurricanes, storms, and rising tides are, in Fair's words, "sweeping away the ocean side of the beach."

Only about a hundred yards inland is the bay side of the beach, where Fair is in charge of checking the health of the oysters and

assessing where new artificial oyster shoals



Assateague Bay Side

Photo: Michael Larger

should be created. The environment can change very much when going from the ocean to the bay, but oysters can be seen all around and are important to the environment. As Fair explained, "Them there oysters have a few purposes: to clean the water, create homes for fish, protect the land, but more importantly to be a free lunch."



Assateague Beach Repair

Photo: Michael Larger

## Wet Threat (continued)

Environmental Officer Gretchen Knapp works at the Educational Center at the Assateague Island National Seashore, educating visitors and locals about the many species of plants and wildlife on the island and why they are important. "The science and solutions to fixing our island are nothing without awareness," said Knapp. "If no one cares, nothing changes."



Officer Gretchen Knapp Photo: Michael Larger

Dr. Michael Lewis is one of the founding members of the Environmental Studies Department at Salisbury University. "I grew up in a swampy area in South Florida by the Everglades, and I would say I thought it was normal till I left," he said.

"Climate change deniers often use the word *erosion* to explain the undeniable climate-induced changes they see in their homes," Lewis said, "so talking about erosion is a politically useful way to get support for climate change adaptation actions from people who would vote against such programs if they

were actually labeled "climate change."

Land subsidence in the Chesapeake region has been happening since the last ice age," Lewis continued, and explained that when the weight of glaciers pushed down on the continental plates, the areas of the plates not covered by the glaciers, including Delmarva, were pushed upward like the high end of a seesaw.

When the glaciers retreated and the plates began to sink down again, sea level appeared to "rise" relative to the land. "Subsidence has been causing erosion around the Bay for thousands of years," he said, and now that it's combined with genuine climate-change induced sea level rise, the area, including Wicomico County, is seeing very rapid change.

Climate change impacts are not just something that will happen in the future, according to Lewis. He has worked with a group of Salisbury University students to create a website focusing on the impacts that are already being felt in the Bay region.



Flooding at Salisbury City Park

Photo: Cameren Watkins

Dr. Bhaskar Subramanian heads the Shoreline Conservation Service of Maryland's Department of Natural Resources. This program is designed to give technical and financial assistance to waterfront property owners. Subramanian is an environmental chemist who believes what is needed is good

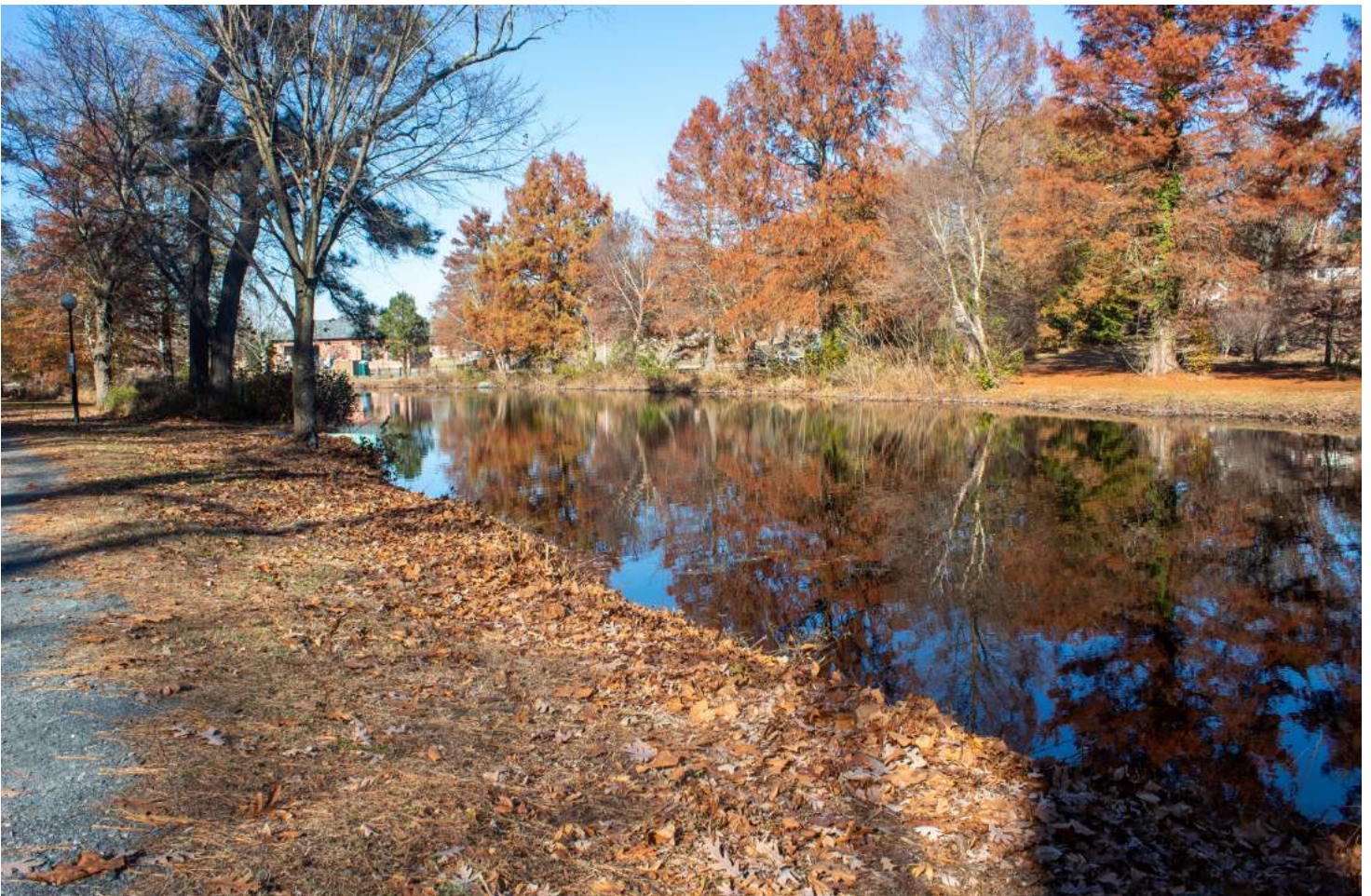
## Wet Threat (continued)

communication and management. "The Chesapeake Bay itself has 7,000 miles of shoreline, and 85 percent is owned by the private people such as individual homeowners and communities," he said. "I come into the picture and try to understand what private groups want to do, and I provide a 0 percent interest loan to property owners to get shoreline protection."

He wants to ensure that the people's land and Nature are protected, restored, and enhanced in the natural shoreline habitat. "I have monitored 200 plus projects; you can see how the shoreline has changed to see all the

problems," Subramanian said. "Nature is a huge part of the project--man put a project there, and humans came in to protect their shoreline, but then two or three years later when I come back, I see what nature has done with the shorelines, and I take notes from nature, and that helps with all my projects."

Subramanian has many such projects in the works, about 13 at the time of this writing. Two of them are close to Salisbury, one at Cove Point Beach to help protect the shoreline. "I have to talk to the legislature to get that contractor started," he said. "I'm also helping a class at Salisbury University to design a project for a shoreline property."



Shoreline, Salisbury City Park

Photo: Cameren Watkins



# Concern for Crabs

Blue Crab Populations Affected by Many Variables  
Lexy Gacek, Joshua Miller, Alyssa Santoro



Waterman Scott Wallace

Photo: Joshua Miller

Warm air, paper-covered tables, wooden mallets, and the smell of Old Bay. All of these things have become synonymous with summertime on the

## Concern for Crabs (continued)

Eastern Shore, and they all revolve around one crustacean. The blue crab, *Callinectes sapidus*, is a common sight in Maryland. Considered a flagship species of the area, blue crabs are easily recognizable to locals and frequently enjoyed at backyard gatherings and restaurants alike.

As well as being a part of local culture and a staple of most Marylanders' diets, these animals play a crucial ecological role in our local waterways. They are a keystone species, meaning that they occupy an important niche in the food web that the rest of the environment relies on for its health.

For these reasons, blue crabs are considered important animals, and most people on the Eastern Shore will agree that these are critters that we should keep around.

But this popularity also brings concern. With these crustaceans being enjoyed by so many annually, are blue crabs under any threat of being depleted and wiped out of our bays and coasts? It's something that is on a lot of people's minds, and the answer to this question depends on who you ask.

Currently, the Department of Natural Resources (DNR) has regulations in place to help maintain the blue crab populations in the

Chesapeake Bay. Genine McClair, manager of the Blue Crab Program for the DNR, said that the crab populations are "managed through a bay-wide cooperative agreement that, since 2008, focuses on female-based management strategies. Working together, Maryland, Virginia and the Potomac River Fisheries Commission strive to meet a target of 196 million spawning age female crabs each year. Protection of a sufficient number of spawning age females helps ensure enough young crabs are produced to sustain the population."

At the end of every year, they review the results of the Winter Dredge Survey in order to, "provide guidance to the three jurisdictions on what, if any, management measures are needed." With this information, they can then set regulations on how many female crabs can be caught so that the populations don't get overfished in these fisheries. The only other factors that determine regulations each year are "based on resource needs and requests from stakeholders."

"As both predator and prey," McClair said, "blue crabs serve an essential ecological function in the food web. Blue crabs are also scavengers, which have a crucial impact on the environment by breaking down decaying matter for other, smaller scavengers."

There are many factors to take into account when looking at blue crab populations, including "ocean currents and winds, available SAV and marsh habitat for juvenile crabs, prey availability, predation, overwintering water temperatures, etc.," according to McClair. Climate change also has a potential to affect populations because of "climate factors like increased storm surges and acidification," she said. On the other hand, climate change could actually *improve* the environment for the crabs because of increasing water temperatures which the crabs could prefer.

McClair added, "Currently, the Chesapeake Bay blue crab population is meeting the female



DNR Office, Salisbury

Photo: Alyssa Santoro

## Concern for Crabs (continued)

specific management objectives, meaning there are enough spawners out there to sustain the population. However, the population has had two years of below average recruitment (i.e. baby crabs). This means there is something in the ecosystem that is off balance for juvenile blue crabs. There are a lot of factors that could be causing this, so scientists are beginning to take a deep dive into determining what may or may not be the cause.”

Dead zones could also play a role in blue crab populations. McClair said, “Dead zones are areas of hypoxic water, meaning they have less than 2 mg/l of oxygen. Blue crabs are very hearty creatures that can withstand low levels of oxygen for a relatively long time compared to many other aquatic creatures.

“However, when dead zones move into an area of water very quickly and crabs are not able to walk or swim away, they will come to the surface of the water, which is called a crab jubilee. Sometimes crabs will even come out of the water crawling onto beaches, logs or any other structure. Crabs do this because they are facultative air-breathers, which allows them to obtain oxygen from the air and to survive relatively short periods of time out of water.”

Commercial crabbing could also be seen as a possible contributor to decreasing crab populations in the Bay; however, with regulations, this is unlikely to cause a substantial enough impact to drastically reduce populations. McClair said, “The management framework is designed to restrict the total number of mature female crabs removed ... to ensure we safeguard at least 62% of the spawning stock to make enough baby crabs for the next year. Surprisingly, a single female crab spawns on average 2 million eggs, so you don't have to have that many spawners to sustain the population when the ecosystem is in the perfect set-up for crabs. The problem is, the ecosystem is rarely in the ‘perfect set-up’, so saving 62% of the spawners helps increase the likelihood we will have a good number of baby crabs the following year.”

“Humans are probably the biggest threat to blue crabs in a general sense,” she continued, “not just because we are a very effective predator, but also because of the degradation our daily lives cause [in] their habitat.”

McClair thinks that in the future, we could expect to see some changes in blue crab populations, as their their range expands to the north with the increase in water temperature. This “could mean robust blue crab fisheries in states where they don't currently exist. I'd like to hope we will find that sweet spot in management where the population and the fishery are thriving, which will also require improvement to their habitat.”

While crab populations may fluctuate, the demand to eat these creatures rarely decreases. According to Ethan Kalchthaler, a recreational crabber and employee at his family-owned Marina Deck Restaurant in Ocean City, Maryland, where seafood is a popular food choice on the menu. “The demand is always there for crabs, he said, “since we are in a beach town where there are over 500,000 people a week.”



Marina Deck Restaurant Photo: [www.marinadeckrestaurant.com](http://www.marinadeckrestaurant.com)

The restaurant sells seafood, like blue crabs, because “there is a big profit margin on them” said Kalchthaler. “We buy a bushel for like 125-150 dollars and there’s like 7 dozen in a bushel. We can sell 6 crabs for 38 bucks.”

## Concern for Crabs (continued)

According to him, the restaurant was easy to grow and maintain for many years with [relatively] easy profit and not many things affecting the overall business since they began.

However, this profit cannot be made as reliably when blue crab populations are declining, as they apparently are this year. "The decline in crabs has made it harder to get them in, and we don't have them on some days after a busy weekend," said Kalchthaler, and this has affected many crab-selling restaurants. "For us, the price for getting crabs has stayed the same because we have been buying from the same boat for 20 years, but for some other restaurants, they have had to decrease the number of crabs they get because of the increase in prices."

The decline in crab population has also affected prices for consumers. Kalchthaler explained, "People are less inclined to buy crabs when the prices are up like how they have been, but we have to in order to not lose money." He explains that the decline has not hurt his business as much as other restaurants; however, it certainly has not benefited any businesses.

Currently [late in 2021] the crab population has started to increase again with the normal fluctuation patterns. Kalchthaler enjoys crabbing recreationally on the side and said that the crabs have been "much fatter" this year. He goes on to explain that when the crabs are generally much bigger it makes customers more inclined to buy crabs. He also states that he has noticed more female crabs in his time recreationally crabbing this year, but "that isn't always a bad thing--that could mean it's breeding season and a bunch of new crabs are about to be born."

When it comes to monitoring crab populations, who's better to turn to than the people who work directly with the animals on a daily basis? Scott Wallace is a local waterman who crabs on the Assawoman Bay, across the peninsula from Chesapeake Bay and ecologically very similar. He sells what he

catches to local restaurants and retail markets on the Eastern Shore, and he has been doing so for almost 20 years.

Wallace's profession originally had nothing to do with crabs; he used to own a grocery store which he eventually tore down and replaced with a condominium that he sold. As with a lot of crabbers on the Eastern Shore, crabbing started as a side job that he did with his friend, and it eventually grew into a full-time career.

This summer started out fairly slow for Wallace, and he had trouble filling up his pots. Other crabbers in the area had run into similar issues as well, and this season was beginning to look bleak. According to Wallace, however, halfway through the season they started to inexplicably reappear.



Scott Wallace's Crab Pots

Photo: Joshua Miller

This wound up being a pretty good season for Wallace, all things considered, and this was compounded by the fact that the price for crabs shot up the season before and stayed the same during this most recent season. He's fairly optimistic about crab prices and said, "I don't see the price for crabs going down anytime soon."

When it comes to the health of crab populations, what is important to look out for are the numbers of female and juvenile crabs,

## Concern for Crabs (continued)

according to Wallace. He caught a lot of female crabs last season, which could indicate a healthy population.

While there are no laws against commercial crabbers selling female crabs, they are prohibited from selling any egg-bearing females, also known as sponge crabs. This is to ensure that whatever crabs they do catch and sell, they can be quickly replaced by the next generation of juveniles that the sponge crabs carry.

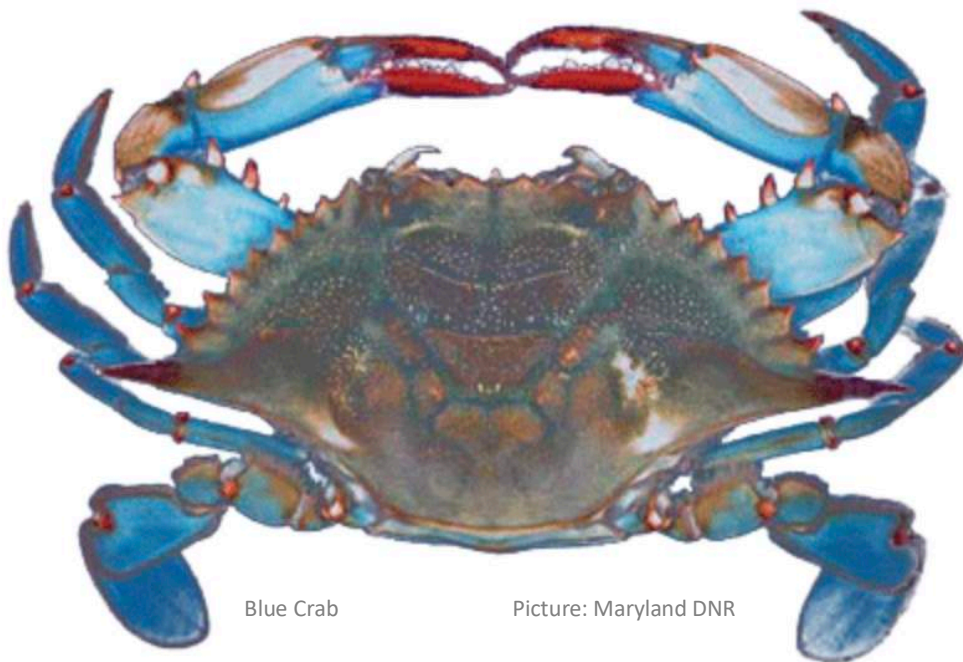
As for juvenile crabs, Wallace does not know about their population because of how his pots are designed, with entrances to his pots large enough so that any juvenile crab can easily escape, in the hope that he will catch only legal crabs, which he can sell. This also reduces the amount of bycatch that he has, which usually consists of conchs and whelks.

Crabbers typically adjust how many pots they put out each season and how long they soak them depending on how well the season is going. Wallace put out 300 pots last season, which is the most that he is legally allowed to have out. Normally he lets his pots soak for

two days instead of one, and he usually only soaks them for one day when the crabbing is especially good.

Wallace believes that the people in charge of managing crabs are doing a good enough job, but he shares a sentiment common among most crabbers and fishermen in the region: “The experts really don’t have a good idea about what is going on. They’re not out here every day with the crabs,” he said. Despite this, he’s not very worried about crab populations right now, because “females can lay millions of eggs, and it doesn’t take many females to continue the population.” He believes that crabs can take care of themselves with little regulation, with one exception: “The biggest detriment to crabs is us building developments along the shore near their territory.” This is the most pressing issue that he believes crabs are facing right now, but as long as this is under control, we can continue to enjoy blue crabs.

“Crabs are always changing, which makes them hard to predict,” said Wallace. “We just have to take it season by season.”



Blue Crab

Picture: Maryland DNR

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Photo: Dr. Tami Ransom

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