A photograph of two people in a forest, focused on planting a sapling. The person on the left has long, curly brown hair and is wearing a light blue hoodie and black gloves. The person on the right has long blonde hair in a braid, wearing a brown knit beanie, a blue sweater, and grey gloves. They are both looking down at the ground where a sapling is being planted. The forest floor is covered in brown leaves and some green grass. The background shows many thin tree trunks.

Chesapeake Stories

The Bay in Words and Pictures

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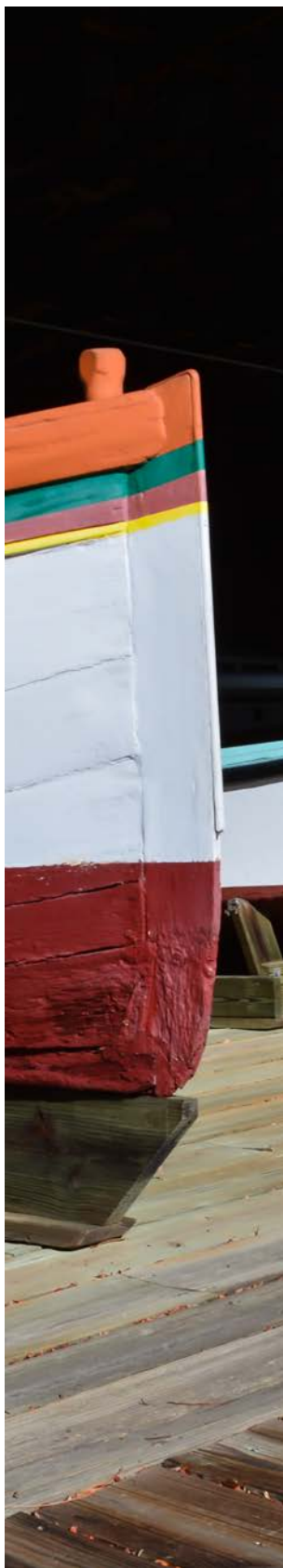


Photo: Anikka Fife

Cover photo: Katherine Smith

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Burdensome but Beneficial

Regulations protect valuable seafood species and encourage increased harvesting of invasives

----Dylan Burl, Jacques Remmell, Nick Tyler



Crab Sculpture, Crisfield, MD

Photo: Nick Tyler

The Chesapeake Bay has been the heart and soul of Maryland since the time of the first inhabitants of the regions that surround it. The Bay is the

Burdensome but Beneficial (continued)

backbone for Maryland and Virginia's travel, recreational activities, and commercial seafood market, and it offers many aquatic foods including but not limited to oysters, blue crabs, perch, and rockfish (striped bass).

Areas such as Crisfield, Oxford, and St Michaels remain some of the largest commercial seafood ports on the bay side of Delmarva. Towns like Crisfield, once known as the "crab capital of the world," have seen a growth in industry and harvesting, which has led to a decline in many aquatic food sources. In the past few decades, state agencies have been hard pressed to combat the overharvesting of these marine creatures in efforts to protect their populations and sustainably provide them for harvest in the future.

The Maryland Department of Natural Resources enforces the regulations required to limit overfishing in the Chesapeake Bay, its tributaries, Maryland's fresh waters, and the Atlantic Coast regions of Delmarva. These restrictions and regulations are enforced by the Natural Resources Police, who patrol these waters and issue fines for any violations encountered.

Licensed harvesters are required to obey seasonal fishing windows, only harvest specific sizes over a minimum amount, and obey limits on how many fish can be caught per day or otherwise specified period of time.

According to Corporal Brian Hunt of the Maryland Natural Resources Police (NRP), many violations of rules on size are committed by violators who are unclear or uneducated about the regulations.

Commercial fishing is different, however, as the commercial vessels are more likely to

follow the regulations due to limitations on anglers-per-boat if they are found to be in violation of these rules. An eight-year veteran of the NRP, Hunt has observed that the Striped Bass populations have been overall declining, likely due to overfishing and harvest infractions.



Corporal Brian Hunt

Photo: Maryland DNR

The punishments for these infractions can include the revoking and/or suspension of fishing licenses in addition to strict fines. Fishing without a license carries a penalty of a one thousand dollar fine for the first offense. To prevent overharvest and overcrowding for fishing, a harvester may typically use only up to three poles for bay and coastal fishing). These are only a couple of examples of the regulations for Maryland aquatic harvesting.

Less regulated fishing for species that are invasive to the Chesapeake region can also be seen in Maryland. The North Snakehead (*Channa argus*) is one species that has attracted many eradication methods and sport fishing

Burdensome but Beneficial (continued)

incentives. This species, likely brought to the area from Asia as exotic pets, devours smaller fish and aquatic animals and has been the target of eradication efforts since its first appearance in Maryland in 2002. The season for capturing and harvesting snakeheads extends throughout the year in hopes to completely rid the Bay and local waterways of this species. Tagged snakeheads should be reported to the US Fish and Wildlife Service (phone 800-448-8322) if caught, and may also merit rewards for their capture.



Northern Snakehead

Image: Maryland DNR

protections, such as the Blue and Flathead Catfish, Zebra Mussel, and Chinese Mitten Crabs.

The seasons for fishing vary and are designed to limit the overharvesting of aquatic animals in both tidal and non-tidal areas of Maryland's waterways. These fishing regulations also extend to catch-and-release and charter boat methods in off-seasons, and do not always have simple on/off dates throughout the year. For example, the first closed season for Striped Bass (*Morone saxatilis*) was from April 1st to May 1st, while the second closure went from July 16th to July 31st. These closures and restrictions require a minimum size of 19 inches and catches are limited to one bass per person, per day.

Stock assessments are required for the predictions of seafood populations which determine the appropriate seasons and closures to help boost their populations. In the

case of the Striped Bass, the Atlantic States Marine Fisheries Commission (ASMFC) requires conservation methods to prevent overfishing and mitigate the decline in the population of Striped Bass. Maryland is subject to the ASMFC's judgment and coordinates habitat and harvesting management plans in accordance with their conservation requirements.

Striped Bass mortality is higher in late July due to poorer air and water quality. Environmental factors such as this can contribute to the health of the fish populations and are considered to determine the best seasons for harvesting. Without these closures and limits, species are subjected to possible overharvesting, which will result in lower populations and poorer species health.

Commercial fishing has specific limits and quotas by permit. Fish caught for commercial harvest are reported within three hours of trip completion and are checked to make sure that



Striped Bass

Photo: Dylan Burl

Burdensome but Beneficial (continued)

regulations and harvest limits are followed. Regulations slightly vary amongst various types of fishing gear and methods.

The regulations on size, limit, and season still apply to commercial fishing, but unlike private or sport fishing, licenses are limited to only a certain number of participants. Commercial fishing licenses for fish such as Striped Bass were capped at 1,231 in 1994 as the populations began to recover.

Licensing restrictions helped boost the striped bass population in 1995, and the species was declared recovered. The cap is still in place as the DNR and the Maryland State Government seek to mitigate the overfishing as seen at its worst in the 1970's. In the process to apply for a competitive permit, commercial harvesters must declare the amount to be harvested, the period of harvest, and must renew the license in order to stay in good faith with the state.

Some gear used by harvesters is allowed only at certain hours of the day or season. Shellfish dredging occurs during the normal workday while other gear may be used until sunset. Vessels may have a maximum occupancy depending on whether or not the method of harvesting fish includes the use of hooks, fishing line, and rods. While personal and sports fishing might be heavily regulated, the commercial fishing industry is under heavier regulation to prevent overharvest as they collect a higher volume of seafood that is for restaurants and seafood markets or wholesale.

Aquaculture is a young industry in the Chesapeake Bay region, but still faces regulation similar to wild harvesting. However, aquaculture has become a more prevalent industry to ease the demand of wild caught seafood. This industry has been

supported and recommended by the DNR and the Maryland Department of Agriculture to regenerate the Bay as well as mitigate the demand for seafood, which might lead to overharvesting. The regulations put in place are deemed necessary by the state to ensure species health, but require full compliance by harvesters who might even disagree with the level of regulation.

The 64,000 square mile Bay watershed is home to more than 18 million people and supports a booming seafood industry, producing around 500 million pounds of seafood each year which has created many jobs in commercial fishing, recreational fishing, and seafood markets.

While regulations are put into place to protect the Bay and its seafood species, they obviously also affect fishers.



Capt. John Whitman

Photo: Patent Pending Charters

Captain John Whitman is a second-generation charter boat fisherman who has been fishing out of the Chesapeake Bay for 50 years. When Whitman first started fishing the Chesapeake with his father, he remembers that in a typical trip they would catch anywhere from 200 to 300 fish. Now fast forwarding around 40 years, Whitman says that it is not hard to see the

Burdensome but Beneficial (continued)

dramatic decline in the fish population.

Typically, Whitman and his crew on the Patent Pending charter boat will focus primarily on rockfish during the fall seasons, and during the summer season will fish for species such as mackerel, bluefish, red drum, and if they are lucky, cobia. Whitman said that recently “fish patterns have changed dramatically,” which is very problematic when you only have a certain frame of time to catch specific species.

Whitman also said that because of the varying patterns of fish populations in the Bay, people are beginning to notice more and more the effects of overfishing. Through regulation there has been a recent increase in the rockfish population.

Whitman added that the regulation that has helped this spike in population the most is a new program that was developed by the Maryland DNR that requires charter boats such as his to report every fish that is caught and either kept or released. As a charter boat, Patent Pending is allowed to keep only two fish per person on the boat, and for recreational fisherman (on private boats) that number is cut in half.

If the regulations that have been put into place have been working to restore fish populations and the whole Chesapeake Bay ecosystem, what could possibly be bad about them? People like Whitman have found that due to these regulations the industry has become less lucrative. And although Whitman is not a recreational fisher, he expressed major empathy for people who are, because he understands how much money has to be spent on gear, bait, and other essentials to catch these fish. “It’s too expensive to just be able to keep one fish,” he said.

Whitman also expressed his dislike for having to use circle hooks when live-lining and chumming. Circle hooks are designed to hook a fish closer to the corner of its mouth, which makes it easier to release fish and in turn lowers the mortality rate of caught fish. Whitman explained how this was a learning curve for a lot of the old-school fishers, but it is also understood that these regulations are being implemented to not only protect the fish in the Bay but to also protect the longevity of the fishing industry.

Not only are fishing charter captains and their boats affected by overfishing, but other businesses in the Bay area as well, like fish markets, which sell fish and shellfish fresh off of the boat. Overfishing is one of the biggest threats to the success of a fish market. If the fish and shellfish populations are too low, then the market will run out of food to sell.

Captain Moses Wells, owner of the Trident Seafood Market in Hebron, Maryland, is a fourth-generation Chesapeake Bay commercial waterman. He has spent his entire life on the water and even lived on a boat for 7 years. He has tried to find a different career multiple times, but his love for the Bay has pulled him back to being a waterman every time.

His seafood market, Trident Seafood, is one of the places on the Eastern Shore to find the freshest catch to bring home. He and other charter captains around the area supply the store at all times with fresh catches. Wells says that the amount of fresh catches that come into the store depend on market price and demand.

Wells fishes for and keeps his store stocked with a variety of different fish throughout the different seasons. In the late spring into summer, species such as striped bass, flounder,

Burdensome but Beneficial (continued)



Capt. Moses Wells Photo: Trident Seafood Market

white perch, and sea trout are found throughout the bay and are sold in the market. During the end of summer into fall, rockfish are a main priority to keep in the market because of such high local demand. Moses mentioned that the success of the different seasons varies every year, because fish come in cycles and have certain patterns.

An example he used was the Atlantic croaker, which has a seven-year life span and constantly migrates. This makes it difficult to find these fish at certain times of the year. The charter captains follow and understand these fish migration and activity patterns, which helps them stay on top of the fish. He said that the winter months are always slow as the

water temperature gets too low for the fish to be actively hunting in.

Finfish are very important to the Chesapeake Bay and its culture, but there is another type of seafood that is just as important, and that is blue crab.

From April to November, blue crabs can be found and caught in the Chesapeake Bay. Wells keeps blue crabs in his seafood market during the late spring into early fall months. He says that over the past ten years it has become harder to catch blue crabs in mass amounts like they did years ago. He thinks this has to do with the amount of new commercial boats on the water along with a growing population of recreational crabbers.

He mentioned that during the height of the Covid pandemic in 2020 to 2021, he saw the largest rise in crabbing boats out on the water. However, he does not place all of the blame on the new fisherman in the area, but also on the enforcement of regulations for blue crabs. Commercial boats are supposed to log what they caught for the day and report it, but not every boat is doing so. This along with illegal crabbing can make the crab populations shift and make it difficult for commercial boats that use the crabs to make a living.

Wells also has some opinions on the most recent limits that have been put into place for blue crabs and striped bass. A change that he would like to see is commercial boats being able to keep female crabs. He said that the amount of female crabs he has seen has increased over the last couple of years.

In regard to striped bass, Moses is very much in favor of the 1-2 fish limits per person and

Burdensome but Beneficial (continued)

the size requirement of over 19 inches. But he noted that it is hard to regulate when people aren't recording their catch and are also fishing illegally.

He also noted that law enforcement out on the water had not been what it should have been. There was a four-month period where he did not see a single DNR boat out on the water. He was out almost seven days a week fishing in popular striped bass locations and did not see a single law enforcement vessel. The problem with this, he said, is that if the commercial boats aren't constantly seeing law enforcement, then the poachers and illegal fishermen aren't seeing any either, meaning that they will continue to poach in those areas.

When it comes to the problem of overfishing, Wells said that his market and his fishing have not been dramatically impacted over the years, and that even though it has gotten harder to catch blue crabs, that has not affected his market very much. He also said that overfishing is much more prevalent for imported seafood than for local.

As an example, he explained that boats will come all the way from Taiwan to far off the coast of Ocean City to catch whatever they can in mass amounts. US regulations have no effect on them because they ultimately do not dock in the US, but back in Taiwan where it is legal. This can have an effect on the seafood market because it means there are fewer fish for commercial fisherman to catch and sell. He said that it all comes to one thing and that is enforcement: even though we're doing our part to keep populations stable, not everybody else is.

He has personally had people come to his

seafood market with undersized crabs and has refused to take them. He denied them not only because he could get into financial and legal trouble for having them available in the market, but because if he buys them, then the person will continue to catch undersized crabs.

His main thoughts were that without regulation and enforcement of those regulations, it will continue to happen.

There is no doubt that the Chesapeake Bay is economically one of the most important assets of this region because of how many jobs it has created and how much money it has provided over the years. In 2009, the National Oceanic and Atmospheric Administration (NOAA) reported that the commercial seafood industry in Maryland and Virginia contributed \$890 million in income and \$3.39 billion in sales, and created around 34,000 jobs in the local economy.



Crab Mural, Crisfield, MD

Photo: Nick Tyler

Fishers are not the only people losing money

Burdensome but Beneficial (continued)

due to overfishing and the implementation of regulations to prevent it. For oysters alone, both Maryland and Virginia have suffered more than \$4 billion in annual losses because of the decline of harvesting in the past three decades. Loss of blue crab population in the Bay has cost Maryland and Virginia about \$640 million cumulatively from 1998 to 2006, and this number only keeps getting higher.

The impacts caused by overfishing are endless. Ecosystems, livelihoods, whole industries, and a large portion of our economy are now at stake if current and future protective regulations are not effectively implemented.

Sailboats and Seafood

Celebrating and advancing the Bay region's water-oriented pastimes and seafood-focused cuisine.

--Logan Carey, Anikka Fife, Heather MacMaster



Home on Saint Leonard's Creek

Photo: Anikka Fife

With 16 of 23 counties bordering either the Atlantic Ocean or Chesapeake Bay and its tributaries, Maryland has developed a rich recreational and culinary culture centered on its waters, seashores, and salt marshes. This

Sailboats and Seafood (continued)

culture, which has connected people to the natural environment throughout the state's history, is dependent on the health of increasingly threatened watery ecosystems, whose protection in turn relies on regulation, research, education, and constructive activities by local residents.

For example, restaurants across Maryland have participated in the oyster restoration process as they are partnering with organizations like Oyster Recovery Partnership, Chesapeake Bay Foundation, and the Smithsonian Environmental Research Center.



Vintage oyster cans Photo: Anika Fife

Restaurants are encouraged to donate old shells to be recycled to support spat (baby oyster) production, which helps to create new oyster reefs. These efforts are fairly recent as Marylanders have become aware of the connection between a healthy bay and lively oyster reefs.

Elementary schools have implemented these local restoration efforts in their curriculum, helping to connect young students directly to their community and natural space through environmental care.

Other local spaces like exhibits that explore the

maritime history and the cultural interest of the Chesapeake region help to involve the locals with their home's environment. It's not just a body of water but a complex system that they are connected to.

In Calvert County, Maryland, on the western side of the Chesapeake, is a peninsula bounded by the Patuxent River with a famous history, including one of the biggest naval battles in Maryland. The story is even more specific to a deep-water tributary of the Chesapeake, Saint Leonard Creek, where two battles took place under Commodore Barney during the War of 1812.

Saint Leonard Shores is a community along the creek, where residents on Commodore Barney Drive are only four miles away from the Calvert Marine Museum where they can learn the rich history of the creek they reside on.

The museum is filled with artistic images and artifacts displaying the culture of the various communities, each unique.

One of the three full time educators at the museum, Mindy Quinn, discussed how her job contributes to the community's engagement with their immediate environment.

She enjoys her job as an educator, as she never has a day exactly like any other. The educator's job is to "cover natural history, or ecology of the Chesapeake Bay, and surrounding areas. We cover paleontology, mostly of the Calvert Cliffs, and also the maritime history of the area as well."

Many visitors are young families or older folk that come to the museum already with some sense of appreciation for the Chesapeake. The programs Quinn educates the youth and public

Sailboats and Seafood (continued)



Mindy Quinn

Photo courtesy Mindy Quinn

on include oyster dredging on the museum's skipjack and dissecting oysters, story time programs for young children, and educating older groups. Quinn says, "Most people do come in with a sense of stewardship." Her job is really to engage them and deepen their appreciation, "in hopes that they want to have more stewardship."

The most exciting feature of the museum for young visitors, Quinn said, is the Megalodon jaw. The replica welcomes visitors to the paleontology exhibit which features the many fossils that come from the Chesapeake Bay.

Nearby is Calvert Cliffs, which has provided the museum with Miocene period fossils, a huge interest to local residents living near the

cliffs. The exhibit showcases a giant timeline mural explaining the evolution of species that are long gone, extinct creatures turned to fossils. The exhibit also features a paleontology gallery and fossil room which allows visitors to watch paleontologists clean, study, and replicate fossils.



Megalodon Jaw

Photo: Anikka Fife

Maritime history also engages the older generation, according to Quinn. "They can even recall when cruisers were around," she said. Visitors are able to explore the history of boats on the Chesapeake and the cargoes they carried.



Small Craft Center

Photo: Anikka Fife

Sailboats and Seafood (continued)

“We have a small craft shed, where we walk people through the evolution of boat design and talk about work boats and the different jobs that they would have,” said Quinn. This facility can keep boat building and woodworking traditions alive as they restore historical canoes from the surrounding area.

The museum also features Drum Point Lighthouse (photo page 17) which is one “of three remaining from forty-five that once served the Chesapeake Bay at the beginning of the twentieth century.” The lighthouse is

preserved and has been restored with early twentieth century furnishings and pictures of the families that once resided there.

It was originally located at Drum Point Cove which sits at the mouth of the Patuxent but was moved to the museum to be restored and displayed. Since having it, the museum, with the help of National Archives of Washington has gathered the historical information on the lighthouse, including the legal processes the lighthouse was developed and maintained under.

Its lighthouse keepers' logbooks record their time as residents and note sinkings, strandings, the coming of inspectors and visits by Light House Service steamers, and their various trips to shore for things like mail, supplies, church goings, and any other visitors.

The culture of the Chesapeake depends upon education, according to Quinn: “History is very important for the culture as you have to understand where you’re coming from to understand where you are and where you’re going.” Education work that Quinn does allows the public to receive first-hand

experience and further their stewardship. Quinn runs a junior docent program that helps 8th and 9th graders to become experts who help to run the museum. They develop skills on approaching people, answering questions, and sharing their knowledge of the Chesapeake with visitors in the exhibits.

Education also involves information on climate change and nuisance pollutants that affect the Bay. Right now, the museum is “pushing plastic pollution and looking at how much plastic we see on the marsh when we’re out there,” Quinn said.

The next generation in Calvert County has more than enough opportunity to take an active role by participating in the Museum's various educational programs. One special part of Quinn's job that differs from most outdoor educational programs is that the children find a place in the museum at a young age and are able to continue this relationship as they grow in their community and its environment. “We get to watch some of the young visitors grow up in these programs,” Quinn said.



Calvert Marine Museum Dock

Photo: Anikka Fife

As the consequences of overharvesting and climate change become increasingly

Sailboats and Seafood (continued)

undeniable to the inhabitants of the Chesapeake region, another local museum seeks to combine education, culture, and art surrounding the bay. The Chesapeake Bay Maritime Museum, located in St. Michael's in Talbot County, has responded to this need for action by facilitating exhibitions that involve the community in the preservation of the Chesapeake culture and environment.

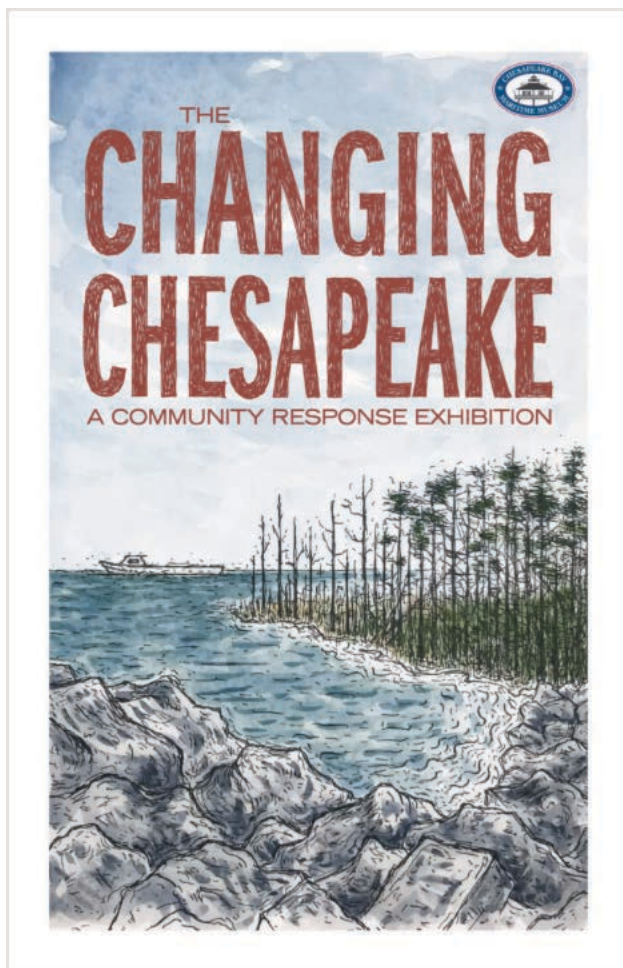
Despite their historical focus as a museum, they have attempted to modernize the viewpoints on some of the issues presently affecting the area through community response exhibitions such as their forthcoming (March 2023) one titled: "The Changing Chesapeake."

This exhibition will feature art in the form of photography, music, literature, paintings, and videos that aim to document the changes in the landscape and life around us, and assess the intersection of culture and the environment.



Jenifer Dolde

Photo: CBMM



"Changing Chesapeake" poster

Image: CBMM

Associate Curator of Collections Jenifer Dolde has lived in the region her whole life and has family history dating back to Jane's Island in the 1600's. Dolde spoke on the essence of this exhibition: "For many people in this region, their lifestyle, familial and cultural experiences, and personal identity are intrinsically connected to the Chesapeake. As the fabric of our community evolves and the very appearance of the surrounding land and water is transformed during a single lifetime, we are called to mark this change, to voice our histories, our passions, our fears, and our hopes. Calling for and sharing these voices in a public exhibition document who we are as a community and represents the ebb and flow of our cultural traditions over time."

"The Changing Chesapeake" also looks to capture the fact that the vibrance and health of the Bay are not just important for the individuals who make their living off of the water, but how it is also an integral part of the culture of the area. Simply living in the region

Sailboats and Seafood (continued)

or even just visiting for a time impacts people's identities.

In line with this goal, the museum recently updated some of their "interpretive themes" which are the lenses through which they look at history, up through the present. Dolde said that one of those lenses is about the Chesapeake in the form of identity and inspiration. The inspiration portion of this lens allowed for the museum to highlight the beauty and importance of community members and their portrayal of the Bay through fine art. Out of over 142 submissions to the exhibition, 78 were chosen by community panelists to be featured.

The museum chose to go the panel route to further the idea that the exhibit is a community project. The panel included scientists, educators, artists and "plain Janes" from around the area.

Some of the submissions came from well known artists who have made their living capturing the beauty of the Bay, whether that be through photography or paintings.

Alongside the traditional mediums that one might expect to see, the identity portion of the lens called for diversity in the submissions that were to be featured. The exhibit was designed to call to all different types of people to express what they were seeing through multiple forms of expression. On this topic, Dolde said, "Preserving culture is not about preserving culture at one point in time, it's about

documenting change at all times from all perspectives," including songs, fiber art, poetry, and other forms of literature.

The museum also looked for diversity within the individuals who were making the submissions, making the submission platform questions available in multiple languages.

The Museum asked that all submissions be coupled with an artist's statement. This is because through the lens of identity and inspiration, the meaning of the art to the artist is just as important as the piece itself. The Maritime Museum aimed to cast a wide net to gain insight on the people of the Bay and their views on climate change. The variety of submissions created a space for individuals who might not consider themselves artists, but instead are simply dealing with the emotion of the changing environment.

Not all of the submissions were negative, but Dolde divulged that many of the pieces represented feelings of despair, uncertainty, and fear that the individuals face as the land they love is threatened by environmental neglect right before their eyes.

The Chesapeake Bay region provides many with a sense of stewardship, but it is the educators, local people and businesses that keep the stewardship alive for future generations. Many are hopeful that the Chesapeake will continue its resilient legacy, and it is that local knowing and connectedness that keeps this hope alive.

Marine Museum Snapshots

A photographic visit to the Calvert Marine Museum
in Solomons, MD

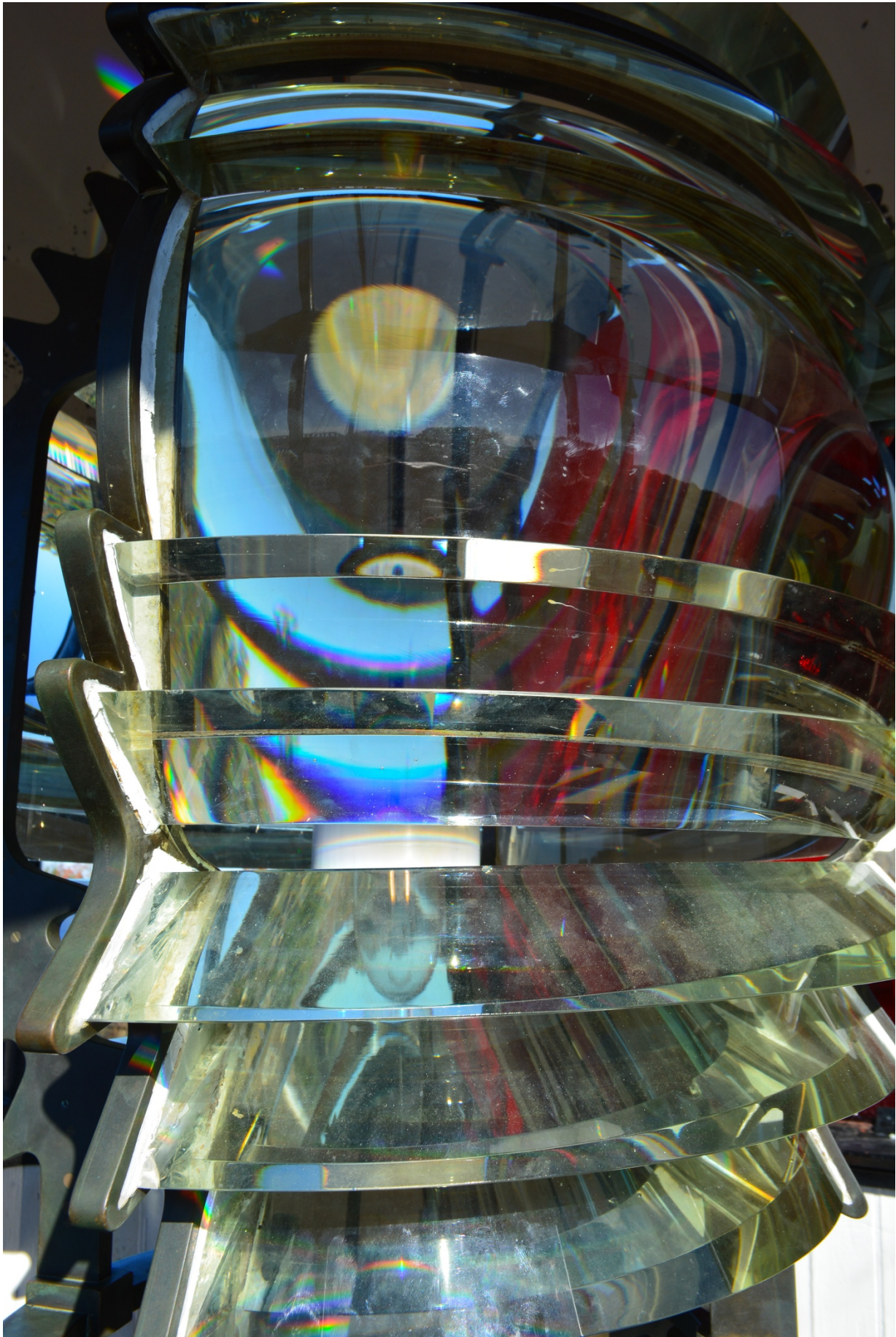
----Photos by Anikka Fife



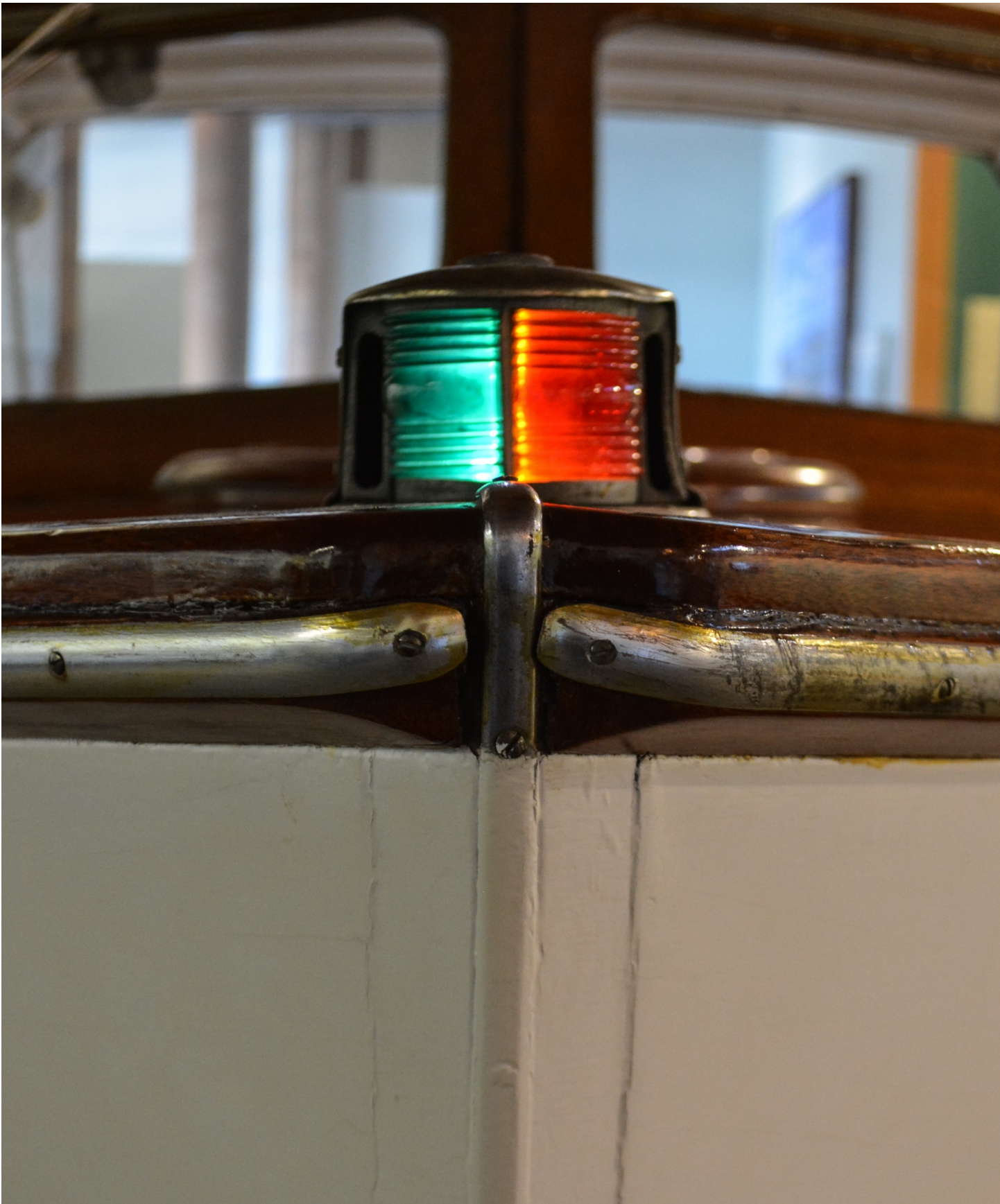












Micro Monsters Lurk Below

The Bay's beautiful surface conceals tiny organisms harmful to humans and marine life

---Brendan Elliott, Christine Keyton, Blake Thomas



Chesapeake Bay (Tangier Sound) view from Crisfield, MD

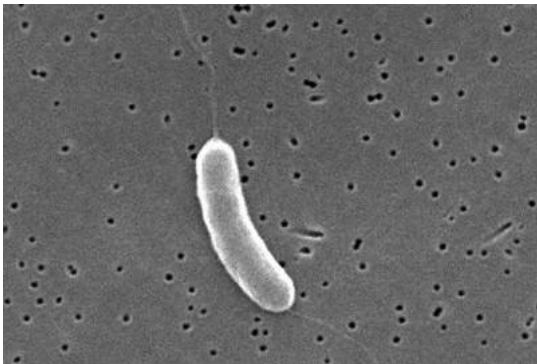
Photo: Brendan Elliott

Chesapeake Bay is a beautiful estuary and a thriving ecosystem with a wide variety of species, but there are dark things lurking in the water,

Micro Monsters Lurk Below (cont.)

waiting for the right time to make their move.

The first is an organism known as *Vibrio vulnificus*, a bacterium that makes its home in brackish waters along with other organisms. Many are not aware that such a thing can be found in our local waterways, but it is truly present and very serious. A fun outing on a boat might turn into a trip to the hospital.



Vibrio vulnificus

Photo: Vietnam Aquaculture Network

Vibrio vulnificus can infect humans through open wounds, (even the tiniest of nicks from a razor) which could lead to potentially having to get the affected area removed via amputation. In addition, to the 30-40% mortality rate after contracting it, it works quickly: one in five people die within one or two days after being exposed.

Vibrio vulnificus infections are also becoming increasingly more challenging for doctors as the organism has started to develop a resistance to the antibiotics used for treatment.

Luckily for Sharron Butera, she is a survivor of *Vibrio vulnificus*. Initially she thought she had the flu or hemorrhoids because the pain started in her intestines, and she had no control over her body's bowel movements.

It wasn't until her husband told her that he could see right through her body in that area

that she agreed to go to the hospital, where she spent six months due to severe complications as medical personnel tried to treat her infection. She spent two of those months in a coma. Every time the doctors thought they had gotten rid of the virus, it would reappear somewhere else in her body.

Butera said that she "had 16 operations in 15 days," and that at one point the doctors, "cut me open from the middle of my breasts all the way down to my private region, and from one side of my abdomen to the other side and just left me open."

Signs of Infection (from the CDC):

- Stomach cramping, nausea, vomiting, fever
- For bloodstream infection--fever, chills, very low blood pressure, blistering skin
- For wound infection--fever, redness, swelling, excessive warmth, discoloration, pain

Wound infections can also spread to other parts of the body.

Infections are usually treated with antibiotics.

Additional facts (from NIH):

- Warming temperatures can cause the occurrence of *Vibrio* to increase in Chesapeake Bay.
- *Vibrio* is most likely to occur in moderate salinity zones (like mid-Bay, upper Bay, Patuxent and Rapahannock Rivers).
- *Vibrio vulnificus* is related to the *Vibrio* species that cause cholera.
- People who have underlying liver problems or take medication that lower the body's ability to fight germs are more prone to *Vibrio* infection.

Micro Monsters Lurk Below (cont.)

Butera's husband said that the surgeons "put her back together like Frankenstein," and moved her intestines around after her various operations.

Butera said neither she nor her doctors know how she got *Vibrio vulnificus*, but because they found it in her stomach, it was most likely from consuming undercooked seafood. She also mentioned that the doctor said, "I've seen it before, but I've not seen it this bad in 50 years."

Butera now has some long-term health effects from her experience with *Vibrio Vulnificus*. These effects range from small changes, like not having a belly button, to much more severe effects, like short term memory loss due to brain damage she suffered while she was in a coma.

She also cannot eat certain foods because her body can no longer digest them, and she also has severe scarring from the number of surgeries that had to be conducted and open wounds that have never healed because there isn't enough skin to close them. She still goes to a doctor for her wounds and takes pain medication to subdue the pain.

Butera also said that she still sometimes needs to go to rehab because she was paralyzed during her time in the hospital, so she continues to struggle with that. She also has a massive hernia on her right side that she will not get removed until it starts hurting, because she "has had enough operations for my lifetime."

She said the worst nuisance is dealing with her colostomy bag, and said that if she is traveling long distances, she will not eat the day before.

There are ways to help protect yourself against contracting *Vibrio Vulnificus*: stay out of

brackish or salt water if you have a wound of any kind, or cover a wound with a waterproof Band-Aid to ensure it is protected from the water, and make sure you wash off after swimming or coming into contact with brackish or salt water.

To prevent getting *Vibrio* through seafood, you just need to be sure that it is cooked fully, and wash your hands when dealing with uncooked seafood to minimize the risk of contamination.

Furthermore, stay informed on which areas of the Bay have a higher risk of *Vibrio vulnificus* being present, to know what areas you should avoid. Knowing what region your seafood is coming from is also important, as some regions have much higher infection rates (100% of oysters from the Gulf of Mexico during warm months have *Vibrio vulnificus*).

Vibrio is becoming more prevalent in the Chesapeake Bay region, and increasing levels of infestation have been found in many of the Bay's tributaries, such as the James, Rappahannock, Potomac, Patapsco, and Choptank Rivers. The Mid Bay also has high levels of *Vibrio*.

* * * *

The second monster hiding below the surface of Bay waters is known as the Zombie crab; however, the problem isn't the crab itself but rather a parasite, *Loxothylacus panopaei*, that attached itself to the crab. This parasite burrows into the host and takes over the nervous system, making it impossible to be removed. It is unknown how long these zombie crabs can live in the wild, but in a lab, they are able to survive for four to five days before the host dies.

Micro Monsters Lurk Below (cont.)

Khor Waiho, a researcher at the University of Malaysia Terengganu, has done studies on the Zombie crab. He was able to give some insight as to how the parasite is able to attach itself to the host.

He said that these Rhizocephalan (related to barnacles) parasites are sexually dimorphic, meaning the males and females look different from each other. The parasite is either male or female upon hatching. Then only the "female nauplii will develop into cyprids and infect host crabs by settling on the host tissue. It will then develop into kentrogon larval stage and inject parasitic material into the host.

"The parasitic material will develop into [a stage that infects] the host's central nervous system." One notable effect is the "feminizing" of male crabs--the transformation of the abdominal shell into a shield rather than the natural point.

These types of parasites only impact crustaceans, and "most rhizocephalans are host-specific," according to Waiho.



Zombie crab

Photo:Chesapeake Bay Program

While it is not known how long these parasites can last in the wild, in nature need their host to feed off of so they will try to keep them alive for as long as possible. And we do know that they are able to reproduce and create thousands of larvae which will then continue to infect other crustaceans.

Their overall population, according to Waiho's personal observations, "fluctuates together with the fluctuation of the host population; however, there is yet to be any published papers on this, at least that I know of."

In certain areas of the Chesapeake Bay, thirty to fifty percent of mud crabs have contracted the parasite.

The Bay is already threatened by various other environmental stresses, and a decrease in breedable crabs will ultimately affect the entire Bay ecosystem.

While crabs are the primary source that is affected, humans are also affected because countless individuals in the Chesapeake Bay region depend on crab populations to make a living.

Another thing that we have yet to learn about these parasites is the effect they could have on humans if ingested. Would they do anything or could they cause us harm in some way? Could there possibly be more danger we have yet to uncover?

Research on the possibility of human harm is hard to conduct, because in many cases humans may not even know they consumed a crab that was contaminated.

Randomized control trials would also be unethical, because while there is uncertainty if contaminated crabs cause humans harm, a researcher would not have the authority to purposely give contaminated food to an

Micro Monsters Lurk Below (cont.)

individual.

During the process of trying to find people to interview on the topics of *Vibrio vulnificus* and the zombie crab, the authors hit a few different roadblocks, most of which were people unwilling to talk to us for whatever reason. Other people completely ignored the messages we sent via text, email, or phone calls.

The only lab tech we were able to get to even talk to us was from a University in Malaysia. The labs we were able to get in contact with had various projects that they were in the

middle of and would not have time to conduct an interview for a few weeks

It is alarming that discourse on a problem that most people are unaware of is being shut down when students want to create more conversation about these topics.

This might take the cake for being the darkest thing lurking in the Bay: the lack of information and willingness to discuss these issues to create a better foundation for the community to understand the problems that are local to them and how they can better protect themselves.



Unsuspecting (?) boaters on the Bay

Photo: Brendan Elliott

Profile: Lower Shore Land Trust

Easements and landowner programs protect land from overdevelopment and encourage biodiversity

---Kelly Seganish, Katherine Smith



Invasive Japanese Wisteria on tree

Photo: Katherine Smith

As development rapidly encroaches upon Maryland's Eastern Shore, and the narrative on environmentalism expands, residents of the Chesapeake Bay watershed are realizing that it

Lower Shore Land Trust (continued)

is more pertinent than ever to protect and preserve the land on which they reside.

In order to successfully approach such an extensive endeavor, devotion and collaboration between community members, nonprofits, and other state and local organizations must be at the forefront of design.

One organization doing just that is the Lower Shore Land Trust, a nationally accredited nonprofit located in Snow Hill, Maryland. The Lower Shore Land Trust has been serving the communities of Wicomico, Worcester, and Somerset Counties for over 30 years since their establishment in 1990.

LSLT collaborates with landowners to help protect their land from development, while also advocating for the habitats and resources that support native wildlife essential to the health and wellbeing of our natural environment.

Despite being a nonprofit whose vision includes ensuring a healthy environment, Land Programs Manager Jared Parks says "We don't really bill ourselves as an environmental organization; I think we think of ourselves more of an agriculture and forestry support, [and] also as a habitat support [organization],"

a sentiment that underlines the nonprofit's strong bond and commitment to the community it works with.

The way the Land Trust oversees the land conservation aspect of their mission is through easements. An easement is an agreement that a private landowner takes up with a Trust or government agency that limits the amount and the type of development on the landowner's property. Parks oversees the legal documentation and other paperwork required by landowners to complete to be a part of the trust.

Another crucial participant in the easement process is the Stewardship Coordinator, Frank Deuter. So far, the LSLT has been able to preserve roughly 24,000 acres of land done through roughly 136 private landowners, most of them farmers.

Parks notes that "[the LSLT has] enforcement authority over [their] landowners," which Deuter clarified by adding, "We're like mediators." Deuter will take out a group of volunteers and check in on properties and do a survey of the land, to make sure the landowners are following the rules of the easement.

Lower Shore Land Trust Mission

"Lower Shore Land Trust is dedicated to preserving rural lands, to promoting vibrant towns, and to building a healthier and more connected Eastern Shore."

Lower Shore Land Trust (continued)

From the farmer's point of view, the entire process is voluntary. They go to the Land Trust and apply to be a part of the easement program. Parks made it very clear that "[they] want that to be an accessory use that's there to help [farmers] but not harm their agricultural practice."



Jared Parks

Photo: Lower Shore Land Trust

A common small conservation practice that a farmer might incorporate is a pollinator garden. There are other practices farmers can implement, but Parks says that "[the LSLT] thinks that conservation of the property under the conservation easement is the first step in what could be a great relationship to work restoration, to work on different things and help them realize their goals."

In order for these goals to be met, there needs to be some form of money coming in that can pay for the supplies and labor needed to implement different conservation projects. The only way that the LSLT can continue doing larger scale projects and not just easement work is by making sure they continue to receive grants from different organizations.

Some grants involve a considerable sum of

money that normally correlates with a large project that needs to be addressed. Parks made it very clear that the money in the grant can only be used for the intended project name that is associated with it. Normally the largest grant takes priority over the others.

Grants are not just given out at random to different organizations, as Parks emphasizes that "the only way for grants to work today is that you have to have a partner, you HAVE to have a partner no matter what." With partners, there are always going to be connections forming, which lead to beneficial outcomes when it comes to getting the word out about the LSLT.

Because the Lower Shore Land Trust is a significantly smaller non-profit with a limited number of staff members, they rely heavily on volunteers to carry out their projects. On average the LSLT has roughly 10-15 volunteers per project.

One recent volunteer opportunity was to clean up an easement site. Two groups were organized: the first was responsible for invasive species removal of Wisteria



Conservation Corps members Kacie Larsen and Katerina Whitman remove Wisteria roots (see also front cover)

Photo: Katherine Smith

Lower Shore Land Trust (continued)

commonly found in heavily wooded areas, using pruning shears, loppers, trowels, and shovels.

The second group was responsible for the cleanup of tree tubes wrapped around young trees planted from a past project done through the Maryland Coastal Bays Program--an example of the connections through partnerships that the LSLT finds so crucial, which may lead to future grants to undertake more projects.



Frank Deuter stomping on removed tree tubes
Photo: Kelly Seganish

Parks said, "[The LSLT] collaborates with each of the counties that [they] are in" and

with "as many [organizations] as they can," such as the NRCS, the Navy's Environmental Protection Initiative, AmeriCorps, and many others.

One of the biggest events for the Land trust is the native plant sale that they hold during the spring in preparation for the implementation of pollinator gardens. This event involves one of their largest collaborations, which is with the Babikow Greenhouses in Baltimore, suppliers of the plants.

The LSLT will also contact local businesses like libraries and ask if they can host educational programs to get more community members involved and support their mission. Through these collaborations the LSLT has been able to expand their outreach and spread their mission.

The Land Trust is very proficient when it comes to different forms of outreach. They post almost daily on multiple different social media accounts such as Instagram and Facebook, and they also send out an Eblast to different groups of people like farmers, stewardship volunteers, and the general public. On top of the digital communication, they mail out letters and postcards regularly, since many farmers have still not gone completely digital.

According to Parks, the most common forms of outreach are the "two full newsletters [and] quarterly newsletters for stewardship and restoration folk." With the non-profit being so small, the more community involvement the better, so members can spread the word to others who may want to participate and join the Trust, all in hopes that a stronger effort will be put forth to preserve our environment.

The Land Trust has noticed that they

Lower Shore Land Trust (continued)

receive more inquiries from people about being a volunteer after their pollinator garden tours.

Fortunately, they have a very simple system when it comes to becoming a certified volunteer. Parks states that the best way to inquire is to “just call” and that doing things by “word of mouth is best,” in order to get out there and start doing.

The LSLT hosts volunteer orientations as needed for those who want to do general volunteer work, but will host specialized orientations for those who want to participate in stewardship roles; these occur in February in preparation for easement property surveys done later in the year.

Due to the COVID-19 pandemic, there was a significant decrease in the number of volunteers, so right now the LSLT is reconstructing their outreach methods in order to get back to the number of volunteers that they were at to continue their conservation efforts. They have a very refined system in play right now, so it is a matter of time and volunteer opportunities to see exactly where they stand in getting projects done.

While a significant portion of their work targets rural lands, the Land Trust acknowledges the gap between developed areas and healthy habitats suitable for pollinators. To help stimulate native green spaces in populated areas, Kate Patton, Executive Director and Master Gardener, created the organization’s very own Pollinator Certification Program that encourages pollinator habitat in urban and suburban settings.

“As we’re locking up land for farming and

forestry and habitat and all of that stuff, we also have to be working to make the areas [nicer] where we want people to live and where we want growth to be,” said Parks. “Those areas don’t need to lose nature because they are getting developed.”

Pollinator Garden Criteria

Food sources (at least 3)

- Native plants
- Host plants
- Fruiting trees
- Feeder
- Diversity of scent, color, size

Water Sources (at least 2)

- Pond, river, stream
- Birdbath
- Hanging drip bottle
- Butterfly puddle area

Cover sources (at least 2)

- Natural shelter
- Constructed shelter
- 3 canopy layers
- Basking/ nesting site

Conservation Practices (at least 8)

- Compost
- Rain garden
- Reduced lawn areas
- Xeriscape
- Native species
- No chemical fertilizer use

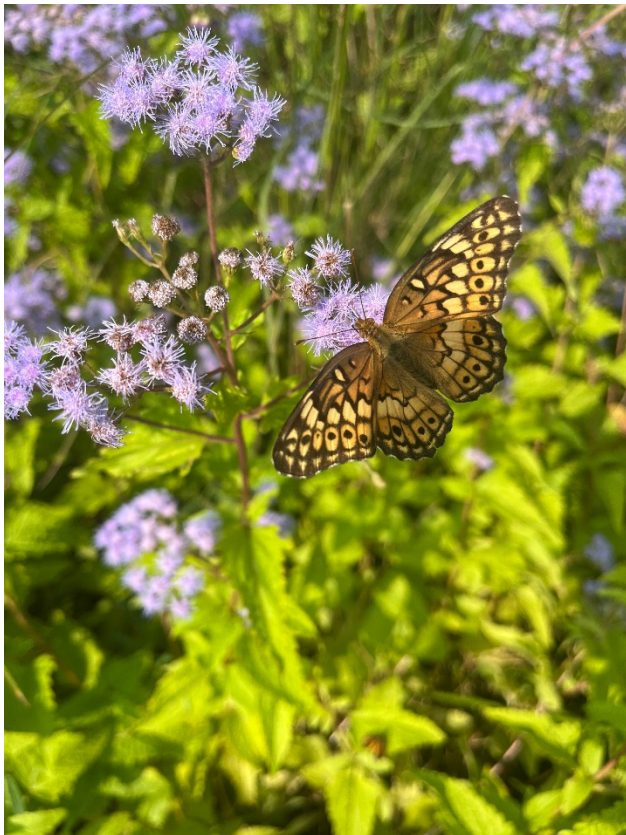
Pollinators, such as birds, butterflies, bees, and other insects are essential in maintaining an area’s ecological function and ecosystem services. Without them, flowering plants are

Lower Shore Land Trust (continued)

unable to reproduce, and biodiversity will in turn plummet. Yet oftentimes, when land use shifts from rural to residential and commercial, native plants and animals get displaced, and manicured, trimmed lawns with ornamental shrubs move in to take their place.

The Pollinator Certification Program helps landowners turn sections of that land back into thriving native plant and wildlife habitats. Any landowner who is interested may reach out to the Land Trust after filling out an interest form. After a short application and approval process, participants will receive a Pollinator Friendly Sign to place within their garden.

The criteria for certification are relatively simple, allowing landowners to exhibit their own personal and creative designs.



Variegated Fritillary butterfly on Blue Mistflower
Photo: Katherine Smith

One of the questions on the interest form inquires about what the applicant would like to see more of, whether that's birds, bees, or butterflies. Depending on their answers, the nonprofit sends additional habitat enhancement resources. This freedom and extra resources permits residents to not only manage for their own vision, but also for their personal garden wants and needs.

Beth Sheppard, the Agricultural Outreach Specialist for the trust, reflected on the originality of each pollinator garden: "You can see the person's personality through each garden," she said with an enthusiastic smile.

It's important to note that a lot of these spaces may not look like your typical flower plantings and landscaping. "Pollinator gardens are not necessarily a pretty flower garden," she added. "It's not just about keeping everything neat and tidy." The gardens are unique in the way that they are nurtured to be a productive part of the environment, and not just purely for aesthetic uses.

The Land Trust doesn't limit their pollinator certification to only those living in suburban and urban areas; they also advocate for implementation of pollinator-friendly practices in agricultural spaces.

Like farmers, insects play an enormous role in the production of fruits and vegetables. Human interference, especially in farming where monocultures and pesticides are prevalent, has led to a rapid decline in food sources and habitat appropriate for their needs. On the Eastern Shore, where agriculture has become an economic powerhouse, LSLT works to bridge the gap between productive farmland and suitable habitat.

Lower Shore Land Trust (continued)

Like the Pollinator Certification Program mentioned above, growers can also take part in a specially designed program that is targeted towards working lands and is aptly named the Agricultural Pollinator Certification Program. This certification is designed to promote an abundance of flowering plants, various clean water sources, and nesting options.

What's different about this program compared to others is that there is no minimum amount of land a farmer needs to put aside to achieve the certification, as long as they are able to meet the criteria. Planning the program in this way can allow for a greater participation rate, as it doesn't force farmers to convert more land than they are willing to.

The first thing they must offer is forage for pollinators. Not only will this ensure that insects and birds will have a food source, but it also provides them with nesting opportunities and favorable mating conditions. Offering forage will provide some habitats, but the trust specifically wants a habitat area appropriate for ground dwelling bees.

The program's pamphlet, which can be found online at LowerShoreLandTrust.org or in pamphlets available in their building,

encourages a few potential ways to do this, like planting meadows, natural brush, buffers, and hedgerows. Next, there must be a diverse community of plants that will allow for an ongoing bloom throughout early spring and into late autumn. There also must be an area where pollinators can receive access to clean water, especially when it isn't already naturally available on the property. Finally, there must be a reduction of usage of chemical pesticides through the practice of Integrated Pest Management (IPM).

In the 30 years this nonprofit has been established, the Lower Shore Land Trust has worked to protect thousands of productive rural lands from being developed while maintaining strong community ties with both farmers and suburban and urban landowners. Lower Shore Land Trust has expanded its initiatives from just conservation easements to pollinator gardens and ecosystem enhancement in order to promote native wildlife habitat in areas where it once threatened to disappear from. Through strong partnerships with outside organizations, growers, and community members, LSLT is able to follow its mission as a supporter of the health and wellbeing of our environment throughout the Eastern Shore.

The Lower Shore Land Trust's vision for their Pollinator Projects is to "Ensure a healthy environment for pollinators on the Eastern Shore by encouraging stewardship of our natural resources and promoting the benefit of pollinators throughout our rural communities."

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Sailing on "Ego Alley," Annapolis, MD

Photo: Anikka Fife