

Spring Greetings!

Spring has finally arrived on Cape Cod...in Cape Cod style! 60's or 70's one day and 40's the next! But the good news is that change is coming—summer IS around the corner. And the seasons are not all that is changing on Cape Cod. We at CPWB find ourselves under new leadership as Matt Patrick takes a (short, we hope) leave of absence from the Board. Matt reached out to the Board at the end of January to share the news of his recent cancer

of the jaw diagnosis. He asked to be relieved of his duties as President of CPWB so he could focus on treatment and recovery. Since then, Rick Otis has stepped into the role and is leading the board forward. Matt reports that he had a successful surgery and is now walking two miles/day as

he recovers. He has felt a lot of support from his wife, Louise, and his family and friends. He continues with ongoing radiation and chemo treatments. Matt, we wish you the very best and look forward to working with you again on issues that pertain to our cherished Waquoit Bay.

The Wetlanders, the enthusiastic new subcommittee of CPWB, are continuing to make progress with their research. Be sure to check out Win's article giving you an update. And with Spring in the air, we would be remiss if we didn't offer some helpful information about landscaping and some of the latest (or is this the old, tried and true?) methods to maintain your lawn. You will also find Red Brook updates and information about the summer programs and the Jayne Abbott Scholarship Fund available through the Waquoit Bay National Estuarine Research and Reserve

(WBNERR). Our newest series, Around the Bay, features a young man with a commitment to our waters. Read about his award winning science project and his note to CPWB thanking us for support in his efforts.

As always, we hope you find this newsletter informative and if

something really sparks your interest and you'd like to learn more or join our efforts, please reach out to us. Our email address is <u>cpwb1981@gmail.com.</u>

Our mailing address is PO Box 3021, Waquoit, MA 02536.

Enjoy the beauties that Waquoit Bay has to offer!

- Patty Waltner, Editor





Rick Otis, President Mike Bingham, Treasurer Bobye Anderson Joan Muller Winthrop Munro Matt Patrick Dan Rothenberg Joan Ryan Marc Turgeon



Contributors

Win Munro Bobye Anderson Joan Muller

Meet our Newest Board Members

We continue to introduce you to the committed individuals who serve as Board Members at CPWB.



Joan Rosenberg Ryan grew up on Waquoit Bay and often says that this area feels most like home. She is an attorney, an organization development professional, a leadership coach and a teacher. Working to try to protect this amazing resource is one of her ways to give back for all she gained. Her family still has a summer house on the Moonakis River.

Rick Otis has spent the bulk of his professional career working on environmental issues and has a solid

Around the Bay: Patty Waltner

Editor Patty Waltner

Newsletter Design Sara Slaymaker

Photos Courtesy of: Baltimore National Aquarium

Texas Community Watershed Development

Rick Otis

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understanding of laws such as the Clean Water Act as well as the processes used to accomplish public policy goals – something especially relevant to Waquoit Bay's degraded condition. He has a long family history in Waquoit and Cape Cod, with clear

memories of what the Bay looked like in the 1960s and how it has changed for the worse. He looks forward to shepherding CPWB into the next phase as we all work to ensure the next generation of Waquoit, Falmouth, and Mashpee residents can experience a Bay beginning to be restored to its former glory.



Can Floating Wetlands Clean Up Waquoit Bay?

e all recognize that Waquoit Bay has a eutrophication problem, and that we are causing it. Excess nitrogen from our septic systems and lawns enters our groundwater and makes its long slow journey to the Bay where it overwhelms the ecosystem with nutrients it cannot handle. As a result, the bay has lost all of its eelgrass and the scallops and other marine creatures that depended on it. Algae blooms have grown frequent, fish kills occur more often, and some parts of the bay are turbid and stink toward the end of the summer. The problems are getting worse.

The Towns of Falmouth, Mashpee and Sandwich are jointly under orders from EPA, Massachusetts DEP, and the Cape Cod Commission to remove excess nitrogen from Waquoit Bay and its sub-estuaries (Eel Pond, Childs River, Quashnet River, Great River/Hamlin Pond, Little River/Jehu Pond, and Sagelots Pond) and to return the Bay to its condition in 1950 when fewer people lived here. Connecting most of the homes in the watershed to municipal sewers is one way to do this. In fact, all three towns have plans to eventually extend their sewer systems into the Waquoit Bay watershed. But this is very expensive, and will take many years, perhaps decades, to complete. And current sewering plans omit major parts of the watershed. Both Falmouth and Mashpee are discussing by-laws requiring that all new or replacement septic systems must install expensive advanced denitrifying equipment. If and when such by-laws are enacted they will slowly spread nitrogen controls through the housing stock. These plans will take decades to rid the Bay of excess nitrogen. Recognizing this, both Falmouth and Mashpee have active oyster aquaculture programs that remove nitrogen directly from the Bay now. Oysters can indeed remove lots of nitrogen, and the cost is low. However, the programs are too small to do a great deal for the Bay and there are obstacles to extending them.

The Citizens for the Protection of Waquoit Bay (CPWB) do not want to wait decades for improvement of the Bay's waters. We want the towns to act now, and to see improvements within, say, the next decade, instead of the further deterioration that is currently predicted. We are already urging residents to reduce fertilizer use, and advocating for towns to build nitrogen removing stormwater infrastructure. We provide dog-



walkers with dog-poop bags on roads and trails around the Bay. Such actions help, but only marginally. We also support the towns' aquaculture initiatives and by-laws to require high efficiency nitrogen removing septic systems in new construction and replacements. But more is needed.

The Wetlanders, a subcommittee of CPWB, have spent the past six months studying ways to clean up the Bay sooner than current activities promise to do. We looked at measures like permeable reactive barriers (barriers of biologically active wood chips or vegetable oil) placed across groundwater plumes as they enter the Bay. But these are expensive and difficult to site.

We reviewed proposals to widen the Bay's two inlets to Nantucket Sound. Each day tidal flushing with relatively low nitrogen water from the Sound does a lot to keep concentrations of nitrogen down inside the Bay, especially near the two entrances. But studies show that widening the inlets would not actually increase this flushing action. One technology has captured our attention: Floating constructed wetlands

operating in the Bay and/or its sub-estuaries. The remainder of this article will focus on the promise of floating constructed wetlands.

What are floating constructed wetlands? They are engineered structures that may be anchored on a lake, stream or other body of water. They are composed of natural and man-made materials in and on which a carefully chosen selection of wetland plants may grow. The resulting environment in, on and around this structure can use the natural capacities of its constituent living elements (plants and their roots, microbes and marine animals) to remove or break down pollutants from the water in which it is floating: excess nitrogen and phosphorous; heavy metals; pharmaceuticals, pesticides and herbicides, or complex hydrocarbons. They are frequently used as treatments in wastewater holding ponds for such tasks. Floating wetlands are beautiful and versatile. Recently they have been increasingly used as elements of design in urban waterways and harbors to soften hard, ugly urban embankments. They can be deployed to provide protection for shorelines from storm damage. Specialized harvestable wetland crops can be grown on them. They can be combined with shellfish aquaculture.

Floating islands are included among the nitrogen and phosphorous removing technologies in the technology matrix developed by the Cape Cod Commission as part of its Section 208 Plan update in 2014 and 2015. They have the distinction of being rated one of the least expensive technologies in terms of the costs per kilogram of nitrogen removed, less than a tenth of the cost of centralized municipal wastewater treatment. Nevertheless, while the Cape Cod Commission listed them in their 2017 Watershed Report on



Waquoit Bay among the alternative technologies that might be useful, that report did not include a floating island component in its alternatives-to-sewering scenario. And they are not mentioned in the current plans of either Falmouth or Mashpee.

We think they ought to be. They can begin to clean up the Bay as soon as they are installed, and they have high potential. There are, of course, some questions that must be answered. While floating islands are well-established for use in freshwater, they have not been tested adequately in salt or brackish estuaries for their ability to remove nitrogen and phosphorous, the durability of their components or their ability to withstand storms. Pilot programs around the world are testing for these capabilities as you read this article.

We propose a floating island pilot project in the Moonakis River, supported by grant funds. Why the Moonakis? While the Moonakis is a relatively small area, the Moonakis/Quashnet river system is a major

source of the excess human-source nitrogen entering the Bay from streams and groundwater. This was demonstrated in July and August 2016 by measurements of the difference between total nitrogen entering the river from the Bay on the flood tide and the total nitrogen exiting the river on the ebb tide. The average difference was about 12 kg of nitrogen every day, or more than 4,000 kg per year. This turns out to be between 18 and 25 percent of the total human-source nitrogen entering the bay, depending on whose data you use. This means that a reduction in nitrogen in the waters from the Moonakis can have a significant impact on the health of Waquoit Bay. In addition, the small area of the Moonakis might make remediation and the impact of our efforts easier to measure.

Could floating wetlands installed in the Moonakis actually reduce the net flow of nitrogen from the river to the Bay significantly, and do it year-in year-out at a reasonable cost, despite storms and other problems. That is what a pilot project would determine. If successful, the Moonakis floating islands project could serve as a model for remediation elsewhere in the Bay or in other heavily impacted estuaries.

The Wetlanders sub-committee will need help if we are to make this important pilot project a reality. If you are concerned with the health of the Moonakis River and Waquoit Bay, and are able to join us in our efforts, we welcome you. You can write us at CPWB, P.O. Box 3021, Waquoit, MA 02536, or email us at cpwb1981@gmail.com.

Winthrop Munro with the Wetlanders Sub-committee, May 11, 2022

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CPWB Newsletter Aug 2020, Shellfish Aquaculture <u>https://www.protectwaquoitbay.org/wp-content/uploads/2020/08/CPWBSummer2020.pdf</u>



Around The Bay An interview with people making a difference in the waters of Waquoit Bay.

which flows unimpeded into the Quashnet River in Waquoit. Aksel graciously accepted our request to share some of the insights into his project while he is wrapping up his high school career and making plans to head to Worcester Polytechnic Institute (WPI) in the Fall.

We encourage our readers to look through Aksel's entire report on this project. It is posted on our website (https://www.protectwaquoitbay.org/)

and on our Facebook page (https://www.facebook.com/protectwaquoitbay). Please pass this along to others who share a concern for our waters. And now, here's Aksel!

What was your inspiration for this project?

My inspiration for this project came from originally wanting to base a project off of what I had worked on last year. I had previously conducted a bioassay science project on ponds and puddles at 5 locations in Falmouth and observed unexpected results. I was expecting the application of road salt to cause toxicity in the water samples, but instead I determined the toxicity came from other factors related to road runoff. I wanted to do a similar project on the effect in an ecosystem but one that was actually observable and, with the assistance of Matt Patrick and CPWB, I ended up deciding on Martin Road. I became interested in that location because of its identifiable problems of not having any preventative measures for road runoff. No drainage or catch basins are present and I was interested in starting a study in order to lead to a correction of this issue and worked on assessing water samples with various organisms such as Daphnia because I was already familiar with them.



In both of the above charts the effect of the runoff toxicity is especially notable compared to the rest of the data points. In both graphs the order of mortality from low to high goes something like, Control, Up, Down, Runoff. This is exactly what was expected from my hypothesis and is revealing of the runoff creating potential toxic environments for the organisms.

What was the timeline for the planning, testing, data collection, and report composition?

The project planning began sometime around April of 2021. I received the Marjot Foundation Grant for the project and money from CPWB for other project expenses. Samples were collected from July to August during rain events to evaluate the runoff. It took about a week after that to get all the water concentrated, organized, and the experiments setup for the beginning of the project. Testing using only the original water samples ran all throughout August. When I decided on completing the second phase of the project, ordering the materials and more Daphnia took quite some time so the chemical toxicant testing process began in January of this

year. Finally, the report and project were completed during February for the fairs which took place in early March of 2022.

How did you select the types of specimens (Artemia salina, Daphnia magna) you used for testing toxicity?

Daphnia Magna, interestingly enough, was the species my brother had used in a past project experimenting on the effect of caffeine on organisms. Daphnia are very small and are translucent so their heartbeat can be seen through their bodies with use of a microscope. Artemia salina are what some people may know as Sea-Monkeys, sold as novelty aquarium pets. I thought it would be interesting to include a second testing species, but also because Artemia Salina live naturally in salt water. While, due to this fact, Artemia Salina may not be an ideal test species in this environment, I found a sort of formula that would allow them to survive in the conditions and found it amazing to still be able to test another sample. Both specimens were fairly cheap in cost, were able to be bought online, and fairly easy to take care of and store.



Artemia salina (Brine Shrimp)



You state in the conclusions of your report that your hypotheses agreed with the outcomes of the testing. Were there any surprises along the way?

Yes, there definitely were a couple surprises along the way, especially in the second phase of the experiment. While testing the effects of different chemicals on the Daphnia magna population, I noticed that in the highest concentration of aluminum, while there was not a particularly high mortality rate, the organisms were turning a whitish color for no particular reason. Additionally, during the second phase in the heart rate trials, there was a noticeable *increase* in heartbeat in the asphalt concentrations which could still be indicative of stress due to harsh conditions, it was expected to more likely lead to a *decrease*.

In Phase 2, your data indicates that iron is very toxic and PAH (asphalt) sediment is found to be deadly to countless species that call our waters home. What is the next step for your valuable research data? In your opinion, what should the response/follow-up be to this information by political leaders, conservation agencies, concerned citizens, etc.

Yes, Iron and PAH in higher concentrations lead to high mortality rates in Daphnia Magna and an increase in heart rate which is indicative of toxic effects. The next step would hopefully be being able to test other chemicals and concentrations to get a better idea of everything that is present in the water system. Additionally doing this project over a longer period of time with lots of collecting locations could show a greater overall timeline of the effects in action on the stream. While this individual location is strongly affected by runoff there are plenty of other locations around the world that are equally suffering from road runoff toxicity.

Conservation agencies should work on focusing efforts on creating things like proper drainage or catch basins on streets with high impacts on rivers and streams in order to divert the runoff away from these locations. Additionally, concerned citizens can make an impact by spreading awareness of these issues in hopes of finding long term solutions but also prevent their own pollution by cutting back on other toxic potential runoff products such as harmful fertilizers that also end up in these locations.

Lawn by Lawn, Yard by Yard

If the uman beings are hard-wired to resist change. A pertinent quote: "Change feels like a journey to an unknown place in a leaky boat with a mutinous crew." Recognizing this, we also know that change is most effectively achieved in small, incremental stages, in baby steps. But we are capable of it.



Not that long ago, many of us "older" Cape Codders grew up in a home with an original Cape Cod lawn. The bulldozer took the sandy soil from the foundation and repositioned it around the completed house. Maybe a thin layer of topsoil was added but probably not. The local hardware store supplied any grass seed that was used and the result was some combination of stem grass, native plants/weeds, and moss in the shade. It required no fertilizer or irrigation and only occasional mowing. It was what it was.

And things do change. Americans now seem to have a love affair with their lawns. There are over 50 million lawns in our country, with a lawn care industry that generates \$99 billion each

year. It is the largest single irrigated crop grown in the USA. Our culture defines a deep green, lush, Kentucky bluegrass, weed-free lawn as the envy of other homeowners.

Lawns do have multiple benefits; they define the space in a yard, form a backdrop for flowering

plants, and provide a place for children to play, adults to gather, pets to roam. But. We now know the cumulative environmental effect of these lush thick lawns but they are worth repeating. The chemicals (herbicides, pesticides, insecticides for mosquitoes and ticks) are broad- spectrum and kill many non-targeted species like bees and butterflies. The nitrogen/phosphorus fertilizers make their way from the lawns into all of Cape Cod's water bodies (and water table), causing algae growth that smothers the formerly sandy bottoms of fresh and salt water ponds. They kill off the eel grass needed by salt water species and shellfish and can lead to the toxic cyanobacteria growth. The clear, welldocumented research across the Cape shows an incremental deterioration in water quality. Many of the new mansions near the ponds and oceans turn their nearby fields into fertilized lawns, destroying plant and animal habitats. A quote from a sod farmer: "People should fertilize more than they do. Six to 8 pounds of nitrogen a year. Most people don't



even begin to do that." He's doing what he's supposed to do; what are we supposed to do?

So where is the middle ground? In looking at our current lawns, what can we do to find the balance between having an enjoyable outdoor living space and having one that respects the fragility of nearby animal/plant habitats and waters?

The first thing, of course, is education. Cape Cod is fortunate to have the Association for the Preservation of Cape Cod; formed in 1968, APCC is the largest nonprofit environmental organization and works with all 15 Cape towns to "restore and protect waters, preserve natural landscapes and wildlife habitat, and have growth that respects town centers and rural lands." It has pertinent articles on its website and newsletter, trained staff in native plant yard development, resources (such as <u>Bringing</u> <u>Nature Home</u> by Doug Tallamy), native plant sales, ongoing webinars (such as Diversify Your Lawn on June 16th), and much more. Start here, visit other Cape Cod eco-



friendly websites/newsletters (including CPWB), and then plan.

There are so many small tweaks that are both simple and possible. Start by reducing the mowing frequency; try No Mow May, a national initiative. Reduce your lawn in size and add a border of native grasses and shrubs with berries. Plant native species. Change the lawn make-up to include more small flowering species like native violets and Dutch clover. Or use a Cape-style grass blend of tall fescues and perennial ryegrass, not bluegrass. Plant native species. If necessary for your



dandelions, replace chemicals by using an organic compound hand spray. Top dress your soil with compost each spring. Plant native species that will increase beneficial insects and insect predators which will eat pests. Turn off the sprinkler system and depending on rainfall, give your lawn a good soaking 1-2 times a week; there will be deeper grass roots and less fungal diseases on your nearby Knock-out roses. Plant native species. Avoid wasting our drinking water with over-soaked lawns that form puddles in the streets. There are so many ways we can change our lawns for the better. Maybe plant native species?

Want to do more? Cut your lawn in half and sow a wildflower garden; it's a win-win for all, with no care for the homeowner, a habitat for many species and pollinators, and it's a statement to others of a better way to live with nature. Attitudes are changing. Start big or small. Just start.

Red Brook Update from Conservation Agents Andrew McManus (Mashpee) and Mark Kasprzyk (Falmouth)

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In addition to the data collection by Horsley Witten Group, engineers conducted an inspection of the culvert as required by the MA Office of Dam Safety (ODS). The Red Brook Rd dam is classified as a significant hazard dam by the ODS and thus must undergo these safety inspections every 5 years. The engineers have completed the inspection and a report of their findings will be obtained in the next two months. This report will provide recommendations for improving the dam/culvert but does not address any wetland restoration.



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Dear Citizens for the Protection of Waquoit Bay Committee,

I appreciate the continued support of my project for this past year. I was awarded first place overall at the Falmouth High School Science fair and was awarded 2nd place at the Region V Science fair and will be going on to states sometime in early May. In awards from the two fairs I received \$1,000 from Notus Clean Energy, \$3,000 towards college through The Woods Hole Oceanographic Institution Dr Mary Sears Scholarship, as well as a \$75 gift certificate to the WHOI Gift Shop. All additional award money I relieve will be going towards college expenses. I was accepted to WPI which is where I plan on attending. Thank you again for your help with this project, I couldn't have done it without you.

Sincerely, Aksel Jensen

Jayne Abbott Memorial Scholarships for Waquoit Bay Science School

Do you know a child who would benefit from attending Waquoit Bay Science School but may not have the means to attend? Please help us spread the word about a great opportunity. Thanks to a generous donation, full and partial scholarships are available for all the science school sessions at Waquoit Bay Science School. There are a diverse set of week-long programs for students entering grades two through twelve including one especially for females entering grades 7-9 where they will meet female scientist role models and TIDAL Quest – a program for high school students. Young students get to explore the bay with nets and buckets and older students get to gather data in the field and examine what it means. Check –Summer Science School Waquoit Bay



<u>National Estuarine Research Reserve (waquoitbayreserve.org)</u> for more information about the individual sessions. Use this link to apply for the scholarship, <u>WB-SSS-Scholarship-Application.pdf (waquoitbayreserve.org)</u>.

The scholarship was created in memory of Jayne Abbott, one of the earliest members of CPWB. The group's work, beginning in the 1980's, was instrumental in preserving the natural areas around the bay and in the designation of the Reserve. As a CPWB board member, Jayne was a dedicated proponent for the Bay. She was a great partner to the Reserve, providing a resident's perspective while volunteering for most events, contributing ideas and expertise to planning and sharing her passion and enthusiasm with all so it is fitting that the scholarships are named for her.

If you have any questions about the scholarship or have any suggestions of people we should make aware of this wonderful opportunity, feel free to contact Joan Muller, <u>joan.muller@mass.gov</u>.





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