

Ripples

2021

Citizen Science Takes Center Stage

Cutting-Edge Research Begins In Brewster



Protecting the health, beauty,
and enjoyment of Brewster's ponds

A MESSAGE FROM THE PRESIDENT

Dear Friends and Neighbors,

Water quality issues have been in the news a lot lately. On the Cape and across the U.S., warmer air temperatures and man-made pollution have contributed to dangerous levels of bacteria, resulting in toxic blooms in ponds, lakes, and the ocean.

So, what are we doing about it here in Brewster? Well, the Brewster Ponds Coalition, with the help of our dedicated members, volunteers, and business partners are doing a lot!

As you'll read in this issue of *Ripples*, our three main areas of focus include groundbreaking cyanobacteria research, water quality education programs for adults and children, and support for neighbor pond groups with a variety of remediation projects. Clearly our work is timely and relevant. Thank you, members, friends, and business partners for supporting us financially and for volunteering your time. As an all-volunteer organization, we wouldn't be able to fulfill our mission without you.

Sincerely,
Susan Bridges



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On the cover:
Citizen Scientist Chuck Madansky sets up an aerosol sampling device on Cliff Pond. Photo by Steve Heaslip, courtesy of the Cape Cod Times.

BPC 2020 Splash Award Winner



Karen Malkus Benjamin (center), BPC's first President, receives Splash Award.

The Splash Award is presented annually to a volunteer who has made a big splash toward furthering the BPC mission through their efforts and contributions. Past recipients of this award include Nancy Gufstafson-Smith (2017), Jim Holland (2018), and Jan McGann (2019).

This year the Splash Award was given to Karen Malkus-Benjamin, founding member and first BPC president. Karen has followed her passion for freshwater ponds throughout her studies, career, and research, to the Brewster Ponds Coalition, and on to the Town of Barnstable, where she now serves as the Coastal Health Resource Coordinator. While with the BPC, Karen led us in the creation of our two signature programs: the Citizen Science program and the Pond Education program.

Eco-Paddle Fun-Raiser

On a beautiful Saturday morning, a dozen happy paddlers on Upper Mill Pond learned about the history and health of Cape ponds. Sponsored by business partner SUPfari Adventures, the eco-paddle featured commentary by guide Ryan Burch and naturalist Peter Trull. Kayakers and paddle-boarders enjoyed seeing a variety of pond flora and fauna, including a demanding baby bird on a buoy being fed by its parents and a bevy of different dragonflies.



NATIVE PLANTS WORKSHOPS

In September, Crocker Nurseries hosted a free morning workshop about using native plants and alternative lawn covers. The workshop was so popular that it was repeated in the afternoon and there still was a waiting list! Reflecting the strong interest that many Cape Codders have in finding alternatives to traditional lawns, the Crocker team showed a number of plants to the audience and fielded numerous questions from attendees. The workshop was videotaped and is now available on the BPC website and YouTube channel.

Evening Glow Paddle

As the sun went down on a Saturday night, SUPfari Adventures sponsored a guided evening glow paddle that began at Arey's Pond. There were magical lights that illuminated marine life beneath the surface, and our president and vice president reported that the sunset was beautiful. Given the popularity of this event, BPC and our business partner plan to offer it again next summer. Please see our new YouTube channel for short video highlights.



Robinwood HOA Bank Restoration and Revegetation Project

In keeping with our mission to “preserve and protect Brewster’s ponds,” BPC worked with the Robinwood Homeowners Association to help them address issues that were threatening a precious kettle pond. The small neighborhood landing had become trampled down by years of use. Additionally, several sources of stormwater were running into the pond. The Town of Brewster Conservation Commission and MassDEP approved a plan to restore and stabilize the bank leading down to the pond. Coir rolls and 100% biodegradable erosion control netting stabilized the bank, which was then revegetated with organic topsoil and approved plant species. This project will directly improve the water quality in the pond by eliminating stormwater runoff, erosion, and the soil compaction of the banking.



In addition to input on the project, BPC was happy to assist the homeowners association by holding their donor funds in our tax-free account for use in this important water quality project.



Chris Miller, Brewster DNR Director, and Susan Bridges, BPC President.

WALKERS POND ENGINEERING STUDY

The BPC and Brewster DNR shared the cost of a stormwater remediation engineering study at Walkers Pond this summer. Walkers Pond, along with Upper Mill and Lower Mill, is one of three connecting ponds making up the publicly owned Mill Ponds. Water quality testing since 2001 has shown that all three ponds are impaired. All have experienced unhealthy levels of cyanobacteria, resulting in occasional toxic blooms, including a bloom at Walkers Pond this past summer. The location of the engineering study is one of six sites identified in the 2014 “Mill Ponds Management Report,” where stormwater runoff was contributing to pollution in the ponds. Of the other sites, two of four at Upper Mill, and most recently, the one site at Lower Mill, have been remediated. The Walkers Pond location is a particular challenge because the paved road leading down to and from the public landing is long and steep from both directions.

Blueberry Pond Yard Sale

This year, the Save Blueberry and Sol’s Pond annual yard sale, normally held at the Brewster VFW, was hosted at 12 homes in the two pond neighborhoods. Event organizers wanted to stay safe and reduce crowd size, but worried that it would impact sales. Those concerns never materialized. The group raised \$5,200 for water quality improvements.

The BPC supports the SB&SP group’s efforts by holding tax-deductible contributions in a BPC restricted fund under the umbrella of the BPC’s 501(c)(3) charitable tax status. The BPC also provides event communications support.

SB&SP has constructed two stormwater retention projects to date and has more plans in mind for the future. These projects stop nutrient-rich, polluted waters from reaching the ponds.





ELBOW POND HARVEST

The Elbow Pond plant harvesting demonstration project continued this year. The goal is to remove phosphorus from the sediment and water column – in a similar manner to mowing a lawn, where the top foliage is removed but the roots continue to grow and uptake nutrients.

The BPC supported the Friends of Elbow Pond (FOEP) efforts, first by setting up a restricted account so FOEP could deposit tax-deductible contributions from neighbors. Next, BPC provided a challenge grant of \$3,300 to FOEP when they met certain fundraising benchmarks. BPC provided insurance coverage for volunteers, and neighbors and members helped provide labor for the harvest.

The most recent campaign occurred on Sept 23, 24, and 25 this fall. Three harvests, in September 2019, July 2020, and September 2020, have resulted in the removal of 36.6 tons of aquatic plants and approximately 110 lbs. of phosphorus from the pond.

Lower Mill Pond Retention Basin Built

This past spring, BPC board members Rob Condon and Nancy Ortiz, along with Rob's wife, Nancy, were busy resolving a Lower Mill Pond erosion challenge off Mill Pond Drive. Major erosion created by years of traffic to the pond was causing runoff from the road to flow directly into the pond. Rob Condon created a basin design after numerous consultations and visits to the Seymour and Blueberry Pond erosion projects. Thanks to many generous donations from residents around the pond, along with a successful yard sale in late July, BPC was able to help the Lower Mill Pond group raise the necessary funds to complete the project. Project costs were kept low due to the helpful donation of Bobcat services by Glen Ralston of Arbor-Way Gardens and volunteer labor from Mill Pond residents. The riprap basin passed its first test during an August storm, filling two-thirds with storm-water flowing from the asphalt road and slowly subsiding over the next six hours as the polluted water filtered through the soil.



Left to right: Nancy Ortiz, Susan Bridges, Lucas Farber, Nancy Condon. Glen Ralston driving front end loader.

The next step is adding a rain garden this fall with plants from Crocker Nursery.

Slough Pond Land Purchase

Pondfront land plays a big role in keeping our waters clean and healthy. It filters groundwater that is in intimate contact with ponds and serves as a buffer to nutrient-rich surface water runoff. That's why the BPC recently contributed \$2,000 towards the Brewster Conservation Trust's (BCT) purchase of a pondside parcel on Slough Pond.

The BCT is working hard to meet its goal of raising \$125,000 for the purchase of this property. They have applied for a state grant as well as grants from private foundations. But they still need help raising approximately \$40,000 to fully fund the purchase of this valuable piece of pondfront property.

If you would like to learn more or participate in this project, please contact Amy Henderson at amy@brewster-conservationtrust.org.

Join The BPC Today!



John Keith (Left) and Brian Penney remove harvested pond plants for composting at Brewster Transfer Station.

Members And Volunteers Are The Key To Success

BPC's mission to protect the health, beauty, and enjoyment of Brewster's ponds is what drives us every day. As donor members and volunteers, you understand this mission through your active participation and financial support. Thank you!

You share our passion for maintaining the health and beauty of Brewster's freshwater ponds. You support our goal to be a sounding board for citizens and pond neighborhood associations in Brewster. You value our efforts to serve as an ear to hear, and a voice to answer your questions about pond ecology and ways to keep your pond clean. You understand the importance of our work in public education and outreach to the

Volunteers construct Lower Mill Pond stormwater retention basin. Pictured front to back - Matt Sturgis, Nancy Condon, Melanie Condon.



community — how teaching our schoolchildren the importance of conservation today will raise awareness and better citizens for tomorrow. You value our informative talks, remediation assistance to pond groups, and plant harvesting from ponds.

We understand the importance of getting to know you, your interests, and why you joined us. To that end, we look forward to speaking with you during our annual appeal campaign for your suggestions, to answer any questions, and discuss ways you might get involved.

Volunteering is one of the most rewarding things you can do. Getting involved is something that many of you would like to explore. Volunteers benefit BPC and the Brewster community, of course. But volunteering can also deliver important benefits to you: the satisfaction of knowing you are contributing to a valuable cause, meeting different kinds of people and making new friends, learning new skills, and having fun.

We ask you to become a part of the BPC volunteer community in these important areas:

- Monitor Brewster's ponds -
join the Citizen Science Team
- Help BPC grow financially -
join the Fundraising Team
- Communicate with our subscribers -
join the Communications Team
- Partner with local pond associations -
join the Pond Outreach Team
- Work with children and adults -
join the Education Team
- Keep things running smoothly -
join the Events Planning Team
- Help build our membership roll -
join the Membership Team

Please join us as a donor member and/or volunteer today and help us promote the stewardship of our ponds in Brewster.

Your membership
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\$100 donation supports
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Gwen Pelletier and Chuck Madansky erect cyanobacteria aerosol sampling device on Cliff Pond.

Toxins Found In Air Above Ponds

By Susan Spencer

In a first-of-its-kind study, funded by the Brewster Ponds Coalition and assisted by BPC Citizen Science volunteers, University of New Hampshire researchers found that tiny cyanobacteria and their toxins became aerosolized and entered the air in two local ponds tested during the summer of 2019.

The report by Professor Jim Haney, PhD, and project manager Hailey Carter, from the UNH Center for Freshwater Biology, was presented to BPC by video in August 2020. Haney's team was supported by a \$3,500 grant from BPC as well as the assistance of BPC volunteers Gwen Pelletier, Marty Burke, Chuck Madansky, Nancy Ortiz, Sherri Townsend, Rob and Nancy Condon, and Karen Malkus-Benjamin. Nancy Leland from Lim-Tex provided logistical assistance in the field and helped with the sample preparation in the lab.

Cyanobacteria blooms appearing as scum on the surface of lakes and ponds have been the focus of much study. Yet, little has been done to examine what Haney called "the invisible problem" — dissolved

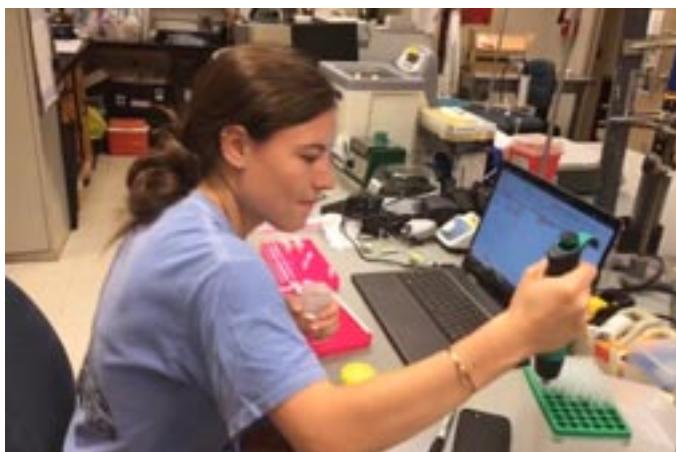
microscopic picocyanobacteria toxins. Two of these toxins, beta-Methylamino-L-alanine (BMAA) and microcystins (MCs), have been found to enter and accumulate in the food web and also to become toxic aerosols.

Aerosols — small particles or water droplets suspended in the air — are easily inhaled by humans and animals that spend time near contaminated water. Recent studies have indicated that inhalation of aerosolized cyanobacterial toxins may have a 10-fold increase in toxicity when compared to ingested cyanobacterial toxins.

BMAA exposure has been linked to clusters of neurological diseases including ALS. Similar statistical associations have been shown between cyanobacterial blooms and nonalcoholic liver disease, indicating a possible effect of the liver toxin microcystin.

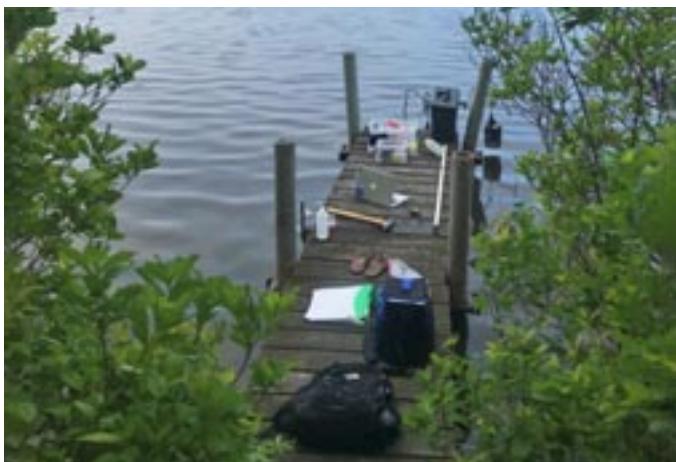
"Citizen monitoring has focused primarily on water, and reasonably so; we focused on blooms," Haney said. "The problems of cyanobacteria also potentially involve the air. This is going to give us lots





Hailey Carter analyzes aerosol samples in lab at UNH.

of fodder for considering our next steps. This is new information, this is high quality information, and we think it is valuable in learning more about aerosols. We are inhaling cyanobacteria and retaining them in our respiratory systems," Haney explained, "Secondly, these could be more prevalent in the air than we think, and it may be just as important or more important to be looking at cyanotoxins in the air and learning about what causes them and how to minimize potential dangers."



BPC citizen scientists tested Lower Mill Pond and Cliff Pond in alternating weeks over a 10-week period from June through August 2019. Additional air and water quality data were collected by Carter from UNH. Volunteers used a compact lake aerosol monitor, or CLAM, to collect over several hours both particulates on filters and dissolved toxins in water traps.

The liver toxins, microcystins, and BMAA were detected in all aerosol samples collected during the summer at Lower Mill Pond and in Cliff Pond. The amount of each toxin and the timing of the amounts varied within and between the ponds over the summer. Haney speculated that the presence of migrating

alewives in Lower Mill Pond, but not in Cliff Pond, may play a role in cyanobacteria proliferation, which he suggested merits further study, along with other possible differences in composition of toxic cyanobacteria between the two ponds.

The study authors said it was too early to speculate on the health risks that aerosolized cyanotoxins may represent. Limits haven't been set for cyanotoxins in the air, in part because of the paucity of information available.

Data collected through the Citizen Science program has been shared with public officials and the news media to inform residents and guide action to preserve and remediate the region's freshwater ponds.



Hailey Carter shows BPC Citizen Science volunteers the proper set-up of test gear.

"It's important to be part of a group that really makes a difference like we are," said Susan Bridges, BPC board president. "BPC's main areas of focus are research, education, and remediation. We'll continue to do this kind of research because we have a dedicated team of citizen scientists and dedicated members who support these efforts. I'm very proud of the Brewster Ponds Coalition."

Your membership donation supports

Citizen Science Program:

- \$100 donation** supports one cyanobacteria test plus equipment
- \$175 donation** supports one food web test plus equipment
- \$200 donation** supports one aerosol test plus equipment

Citizen Science Cyanobacteria Monitoring 2020



Kevin Johnson of APCC sampling water at Upper Mill Pond.

Another season of sampling and testing our ponds, which began in early May and ended in October, proved rewarding. A season of twists and turns required foresight and initiative, proving that a strong foundation can withstand just about anything. The collaboration among our coalition, the Association to Preserve Cape Cod (APCC), and the Town of Brewster kept the program functioning through a trying fourth year.

Marty Burke, BPC board member, and Nancy Leland, Lim-tex sample water on Lower Mill Pond.

In 2020 our partnership with APCC tested eight ponds in a biweekly rotation. We conducted approximately 140 tests last season. We called on you to help us keep an eye on ponds not in our rotation, and that resulted in our testing an additional six ponds. Our vision to raise awareness in the community of the importance of public participation in citizen science is paying off. We thank you all for your help and support!

For 2021, our efforts will continue with the following cornerstone program plans:

- Test up to 15 ponds in Brewster
- Conduct 180 total water tests
- Test biweekly from May through September
- Build a list of ponds to be tested, utilizing the following criteria: ponds with town landings; high public-use ponds; ponds historically impacted by toxic blooms; ponds where testing supports other research; and ponds with potential for toxin migration to the sea
- Recruit a volunteer team of approximately 25
- Develop a volunteer training package and session to be held in May
- Communicate test results monthly to our subscribers, immediately if an advisory posting is recommended
- Work with the Town Health and Natural Resource Departments on a pond advisory communication model

Our Citizen Science program brings together volunteers and scientists who work together to answer scientific questions and expand scientific knowledge. *Please join us!*



ANNUAL MEETING ZOOMS FORWARD



Sophia Fox delivers keynote talk at 2020 Annual Meeting.

In August, BPC hosted its first virtual annual meeting via Zoom, the popular online conference platform. Sofia Fox, Aquatic Ecologist with the Cape Cod National Seashore (CCNS), presented the keynote address and spoke on the effects of climate change on our kettle ponds and ecosystems. Brewster has more pond acreage than any town on Cape Cod and there are more than 1,000 ponds in the unique Cape landscape. Based on CCNS studies over the past 40 years, the ponds are warmer and less acidic. Core samples also show more heavy metals. All these changes have resulted in more droughts, more cyanobacteria, a decline in water quality and clarity, and more shoreline

erosion. Since the 1970s, CCNS has compiled the largest freshwater database in the country. Sofia gave a special shout-out to BPC volunteers who have contributed to this knowledge and aided in informing the public. Understanding climate changes in ponds is key to tracking the health of these ecosystems, which are at the base of the food web. The full text of Sofia's remarks can be found on BPC's YouTube channel. Special thanks to Annual Meeting business sponsor Michael Leighton Realty.



Pond Education Program Goes Virtual

One of our signature programs, the Pond Education Program for 2nd and 5th graders in Brewster public schools, was scaled back this year due to COVID-19. The schools were closed and pond trips canceled. We were disappointed, but our committee of dedicated education volunteers put their heads together and came up with several exciting virtual pond education activities, including virtual pond visits and storybook reading from prominent Cape Cod authors. They are also exploring the possibility of virtual pond-related games, puzzles, and fun learning activities, which may be made available to the schools and parents on the BPC website and new BPC YouTube channel.

Stay tuned for our finished products! Special thanks to J.M O'Reilly and Associates, Inc. for their support of children's pond education programming.



Gwen Pelletier, BPC board member, reads aloud in the pre-COVID-19 era.



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of Brewster's Ponds

The Brewster Ponds Coalition is a 501(c)(3)
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