Issue 23, Spring 2023

Barnstable Clean Water Coalition

COALITION Quarterly

Time to Travel

BCleanWater.org

A Note From The Helm

Does time move slowly or fast?

We may each have a slightly different view. For many, the answer is "it depends". For our work on the waters in and around Cape Cod, time has a special significance. We are bound by certain parameters that have to do with time.

Science indicates that groundwater on the Cape moves between 1-4 feet a day and generally moves from the northwest to the southeast. Our groundwaters move at a pace that is dictated by several factors. What are the soil conditions in an area? Glacial moraine, sand, clay, etc. What is happening in our atmosphere and with the weather? Rain, drought, heat, etc.

Groundwater is a finite and precious resource. On the Cape, we rely on "recharge" from rainwater to replenish our sole source aquifer, and the lakes and ponds that provide a "lens" into them. Without recharging, we would run out of water.

Sadly, much of the Cape's recharge is toxic. South of Route 6 lie the most polluted waters in our region. We taint our water with fertilizers, pesticides, pharmaceuticals, and household products both directly and through human waste. In turn, we consume this harmful mix, albeit filtered and treated, as household water via individual, town, and water department wells.

Many of us rely on household wastewater treatment that does very little to address this problem: our on-site Title 5 septic systems and cesspools. Wastewater coming from our homes is 85% of the nutrient pollution problem.

BCWC is on a rescue mission to save and protect the waters of our iconic peninsula. Our pollution is killing our ponds, lakes, rivers, and bays and impacting our aquifer. PFAS, known as the forever chemical, is just one example of a pollutant in our waters that is just starting to be understood and acknowledged as harmful.

Our estuaries, the nurseries for our critical fish and shellfish populations, are gradually turning eutrophic and slowly dying. With climate change, warmer temperatures accelerate the growth of algae and other native and invasive species.

The Rolling Stones sang "Time is On My Side", but that is not the case for all of us!

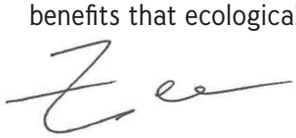
Our contaminated groundwater will continue to move through our ponds and aquifer and gradually toward our coasts for decades until we turn off the spigot of wastewater and other contaminants.

We must attack the source of the problem. This is why we all should support the efforts of our towns to expand municipal wastewater treatment and adopt new and alternative approaches to wastewater treatment and control.

In this issue, we will focus on our polluted groundwater and surface water and how to treat the existing conditions we will live with for decades. You will learn more about the work we are doing at the headwaters of the Marstons Mills River and in the cranberry bog system that surrounds the river to address these concerns.

Our plan is to harness nature as part of the clean-up by allowing wetlands and plants to return and flourish on the nitrogen "fertilizer" we generate from our own wastewater. The most polluted estuaries on the Cape are fed by rivers that collect groundwater rushing towards the sea. Virtually all these rivers are surrounded by working or abandoned cranberry bogs. By restoring these areas back to their natural wetlands state, we can intercept the water and start to clean it up as plants grow and biological activity progresses.

Please read on to learn more about this work and the benefits that ecological restorations can bring to Cape Cod.



Time To Travel: Seven Hours to Several Days

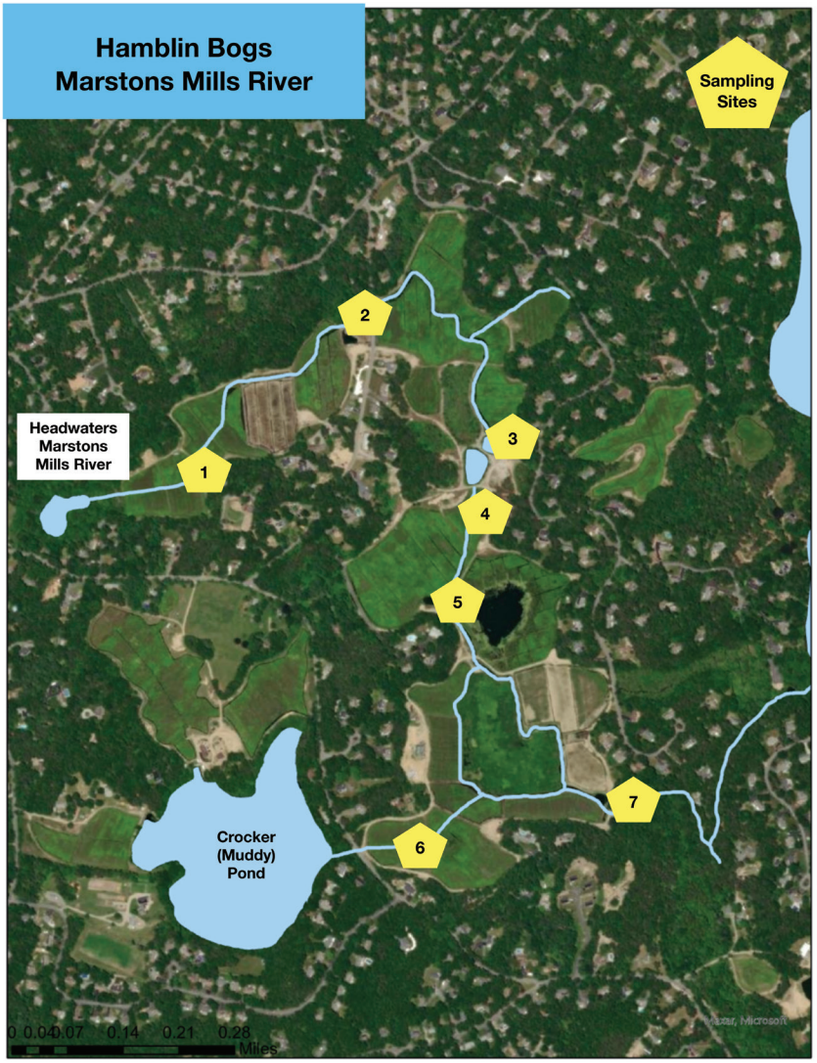
Over the past six years, BCWC has worked with environmental scientists and researchers from academic institutions and federal, state, and local agencies to study and report on nutrient pollution flowing into the Three Bays estuary. Most of this research and experimental work is being conducted at the headwaters of the Marstons Mills River (MMR) and through a cranberry bog system called the Hamblin Bogs. The MMR is one of the main collection and transportation points for freshwater and nitrogen discharging from the MMR sub-watershed into the upper reaches of the Three Bays estuary.

Recent studies have shown that it takes 5-8 hours for the nitrogen load transiting the Hamblin Bogs to reach the estuary. Restored cranberry bogs may naturally attenuate (reduce) 30-40% of the nitrogen load passing through them, making them an important ecological tool. This is a primary reason why BCWC and its partners are working hard to restore this bog system to its original wetlands state with the goal of increasing the "time to travel" to a week.

In 2018, BCWC contracted Dr. Brian Howes from the University of Massachusetts Dartmouth's School for Marine Science and Technology (SMAST) to assess and analyze the nitrogen load transiting through the Hamblin Bogs.

From 2018 to 2021, Dr. Howes, his SMAST team and BCWC staff collected water samples at seven different sites along the river. These samples allowed them to quantify and determine the inputs of the highest loads of nitrogen and phosphorus in the bogs.

BCWC received Dr. Howes' final report in 2022 based on the water quality analysis collected at each site. Data points and findings for each one of the seven sampling sites were noted, with the following being the major highlights and conclusions.



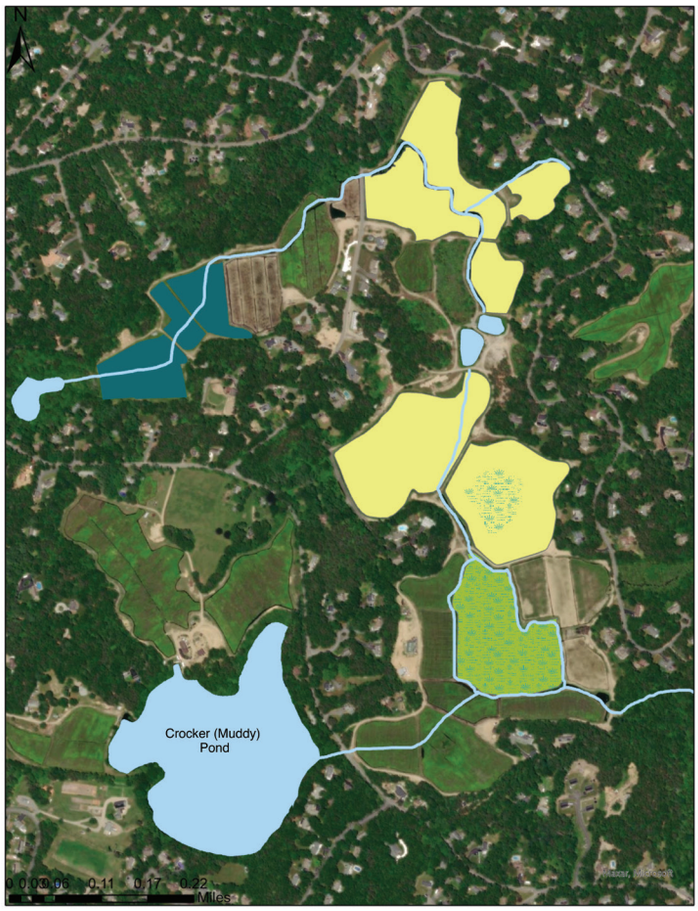
- The bog system tends to attenuate nitrogen entering from the streams, groundwater, and precipitation.
- There were variations in nitrogen attenuation occurring at different times of the year, during the cranberry harvest periods, and in areas that had natural conditions versus manmade.

The report's findings and recommendations are an important data source and reference for BCWC as we finalize the design for our cranberry bog restoration project.

Marstons Mills Cranberry Bog Restoration Plan: Proposed Design for Nitrogen Attenuation

Removing Nitrogen from the System

About 7,600 kg of nitrogen flows through these cranberry bogs in Marstons Mills each year, which is about 1/3 of the excess nitrogen load in the Three Bays estuary. Natural wetlands can remove up to 90% of nitrogen that enters a system. Our proposed ecological restoration of cranberry bogs into a natural wetlands system has the potential to make a major impact. The goal is to design the system so the water flows uniformly and slowly to maximize contact with anoxic soils. This allows for denitrification to take place — where nitrates are removed from the system or consumed by plants. If we can slow down the flow of water as it transits these bogs, we can increase the capability for nitrogen removal, resulting in a decrease in the amount of nitrogen flowing into the estuary.



Map of Marstons Mills cranberry bogs proposed for restoration.

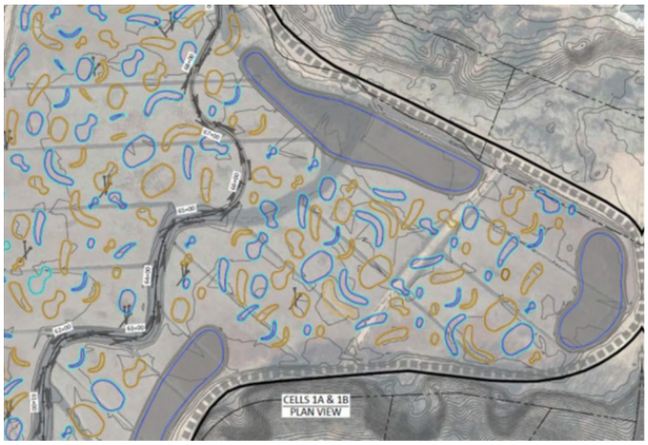
Micro and Macro Topography

Micro and macro topography will be created on the surface of the restoration area by digging pits (micro) and building mounds (macro). This process helps expose the buried peat material and seed bank located underneath the cranberry bogs. This exposure will encourage the growth of vegetation. Additionally, the existing channels in the bogs will be filled and sand will be removed, allowing water to come into direct contact with the variable surface topography.

These photos show examples of macro (above) and micro (below) topography used in the Eel River restoration project in Plymouth.

Streams and Ponds

As mentioned, water currently flows through the cranberry bogs, down the river, and reaches the estuary in a matter of hours. Our restoration plan will incorporate ways to increase this travel time by adding more bends and curves to the river causing the flow of water to slow down. We also want some areas of this restoration to be flooded, keeping the soil wet. Shallow ponds will also be added. Increasing the area that the water travels through will allow more nitrogen attenuation to occur before the water reaches the river. Along certain points of the river, large pieces of wood will be placed that will narrow the channel, which will improve natural habitat.



This topography design for the Marstons Mills cranberry bog restoration shows proposed placement of micro topography depressions (in blue) and macro topography mounds (in brown)

Marstons Mills River (pre-restoration), which transports nitrogen and other nutrients to the Three Bays estuary in just under 8 hours.

Layers of sand and peat are dug up during construction of cranberry bog restorations, encouraging the growth of vegetation.

Adding more curves and natural debris to the river will slow down the transport of nutrients to the estuary.

Young Atlantic White Cedar, a species that will likely grow once the BCWC restoration project is completed.

If You Restore it, They Will Grow!

An important component of our bog restoration involves the removal of part of the top layer of sand, which cranberry farmers have added to over many years, and exposing the peat below. This peat comes from the historic wetlands that predated the cranberry bogs along the Marstons Mills River. Low oxygen levels in these saturated and flooded wetland soils can reduce deterioration and increase longevity in seeds, making them still viable over 100 years later. Like weeds popping up after tilling your garden, these seeds will germinate and begin to grow when exposed to the right conditions like increased sunlight and oxygen. The wetlands will revegetate all on their own without needing to be planted. Although we don't know exactly what was growing in these wetlands before they were farmed, we have an idea of what could be in this historic seed bank based on present day wetland communities. What will sprout when we remove the sand and expose the peat containing the seeds is unknown, but will probably include some of these species:


Sphagnum moss


Woolgrass


Common Rush

We may even see rare carnivorous plants such as the Thread-leaved sundew (pictured below).

We plan to have a variety of plant communities as part of the restoration. We also hope to include some areas which will contain plantings to supplement the natural seed bank. We are consulting with the Mashpee Wampanoag tribe to create an area of wetlands full of plants that have historic cultural significance to the tribe. With warming temperatures due to climate change, we are working with Dr. Chris Neill and the Woodwell Climate Research Center to plant an area with species more common in southern plant communities, including:

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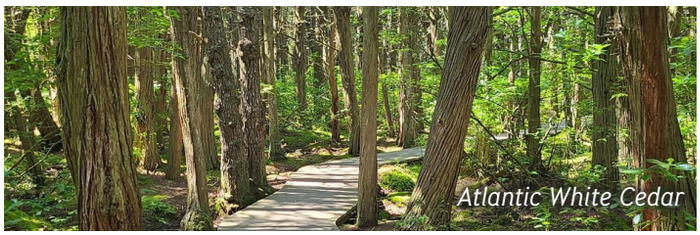
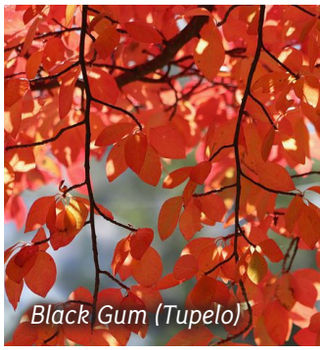

Atlantic White Cedar


Black Gum (Tupelo)


Leatherleaf

Dead Neck Sampson's Island Update

Scan QR Code for more DNSI Info

BCWC co-owns and co-manages Dead Neck Sampson's Island (DNSI) with Mass Audubon. From late spring through summer, DNSI is home to nesting shorebirds, including threatened and endangered species like piping plovers and least terns. During this time, it is important that birds and their nesting sites are not disturbed. People are asked to stay out of fenced areas, to leave their dogs at home or on their boats, and to abide by posted signs. By following these simple rules, the island can remain open for people – and birds - to enjoy.

Recent Mass Audubon Shorebird Report for DNSI

Tern Activity:

• Two Common Terns and a flock of 15 Least Terns were observed foraging on the east tip of the island.

Least tern adult with chick

Piping Plover Activity:

• There are currently 21 pairs of Piping Plover on the island. There are 13 active nests with eggs. 7 nests are in and around the eastern restoration area, 4 nests are in the western restoration area, and 2 nests are towards the middle of the island. One nest was discovered with 6 eggs.

Piping Plovers

American Oystercatcher Activity:

• Both pairs of American Oystercatchers have been observed incubating their nests.

Fencing Maintenance and Activity:

• A significant portion of the fencing on the eastern half of the island has been disturbed due to the recent storm. More signage continues to be added across the island.

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If we don't remove the added sand top layer as part of our restoration and let nature "take its course", the plant communities that grow will be much different. The area would eventually become an upland forest due to the sand layer staying above the water table. While not a "bad" thing, 37% of the land area on Cape Cod is already upland forest. Woody wetlands and emergent herbaceous wetlands only make up 4% and 8% respectively of the Cape's land area (APCC's "Hanging in the Balance"). On top of that, our restoration is focused on the essential functions that wetlands provide such as nutrient retention and transformation, carbon sequestration, surface water detention, and sediment retention. Plant species that might grow if we let nature take its course and in some of the drier areas of the restoration include:

Pitch Pine

Little Bluestem.

Barnstable Clean Water Coalition

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Mission Statement

Barnstable Clean Water Coalition works to restore and preserve clean water in Barnstable. BCWC utilizes science as its foundation to educate, monitor, mitigate and advocate for clean water.

7TH ANNUAL
BCWC Open House

WHEN: Thursday, June 29th
5:00 pm to 7:00 pm

WHERE: Wianno Club
107 Sea View Avenue
Osterville

Please join BCWC staff, board, and supporters at our annual open house to hear the latest, exciting updates on our Marstons Mills Cranberry Bog Restoration Project.

Light refreshments, beer and wine will be served.
Registration is FREE.

Scan QR Code
or visit BCleanWater.org to RSVP

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