Issue 15, Spring 2021

Barnstable Clean Water Coalition

COALITION Quarterly

Can These Bogs Save the Three Bays Estuary?

BCleanWater.org

A Note from The Helm

Cranberry farming on Cape Cod began its modern era around 1830. Before that, Native Americans used wild cranberries for many purposes, including for food, dyes, and medicinal purposes. By the middle to late 19th century, cranberries had become an important economic engine on Cape Cod. The industry was so important that by the turn of the century, children would be dismissed from school to help with the annual fall harvest.

Today, the cranberry business is in decline after decades of challenges. Massachusetts, where the Ocean Spray Cooperative was founded, is no longer the leading cranberry producer. Industrial farms in Wisconsin and elsewhere produce crops at far lower costs. Like so many other types of farming, the traditional and generational "hand off" rarely occurs now. Today's youth have other priorities.

Fortunately, one of the main concerns for youth today is environmental health and justice, and the protection of our planet and its valuable resources. Though rarely characterized as such today, "Mother Earth" can provide for us all when we choose to live within the systems that are naturally occurring.

One of the most important sustainers of our life here on this planet is nitrogen. Approximately 78% of our atmosphere is nitrogen and, as a gas, it is both vital and essentially harmless. Nitrogen in its many forms provides natural "fertilizer" to most terrestrial life. But sometimes there can be too much of a good thing, and too much liquid nitrogen can be a problem.

On Cape Cod, human wastewater (principally urine) is largely untreated before it enters the groundwater. Urine is chemically transformed from ammonia into various types of nitrogen. With treatment and control, nitrogen can resume its natural cycle of being converted to a harmless gas; or when "consumed" by plants and animals, used as a fuel for growth.

BCWC is leading the effort here on the Cape to reduce excess nitrogen using natural processes that bring our ecosystems back into harmony. One effort is focused on installing alternative septic systems that use wood chips to turn liquid nitrogen into a gas. Another is to restore natural habitats that will use excess nitrogen before it reaches fragile ecosystems.

It is no coincidence that the most polluted estuaries on Cape Cod are connected to our freshwater streams and rivers. The Three Bays estuary receives about 40% of its excess nitrogen load from the Marstons Mills River system. At its headwaters is a network of farmed cranberry bogs, which were historically wetlands. This area acts as a collection system for wastewater from the thousands of homes that surround the bogs, directing it downstream. Harmful algal blooms are the evidence of this "overload" we are seeking to address.

This spring newsletter will focus on our efforts to restore these bogs by creating wetlands that will be specifically designed to maximize nitrogen removal. We have several nature-based pilot projects underway. This exciting approach will turn abandoned cranberry bogs back into functioning wetlands, where they will work to remove nitrogen naturally.

Could cranberry bogs once again be used to restore the economic engine of Cape Cod by ensuring clean water? That is BCWC's goal!! And your support will make our combined efforts successful. As you peruse this newsletter, please take a moment and donate today to support these projects that will provide clean water for tomorrow.

Restoring Cranberry Bogs for Clean Water

The Marstons Mills cranberry bog system is home to a significant amount of groundwater upwelling, where water is constantly being transported to the surface. The headwaters of the Marstons Mills River are formed from the continual upwelling of groundwater in these bogs. Groundwater flowing to the bog's surface is loaded with nutrients from the septic systems of hundreds of homes surrounding the bogs.

This water is so nutrient laden with nitrogen that the cranberry farmer has not needed to use fertilizer on the bogs for over a decade. The subwatershed at the top of the bog system also contributes nitrogen from inefficient residential and commercial septic systems. Once water enters the bogs, it flows into the Marstons Mills River. The river acts like a highway carrying nitrogen-rich water into the Three Bays estuary in about 5 hours. Nutrients traveling through the bogs make up approximately 40% of the excess nitrogen load flowing into the Three Bays estuary.

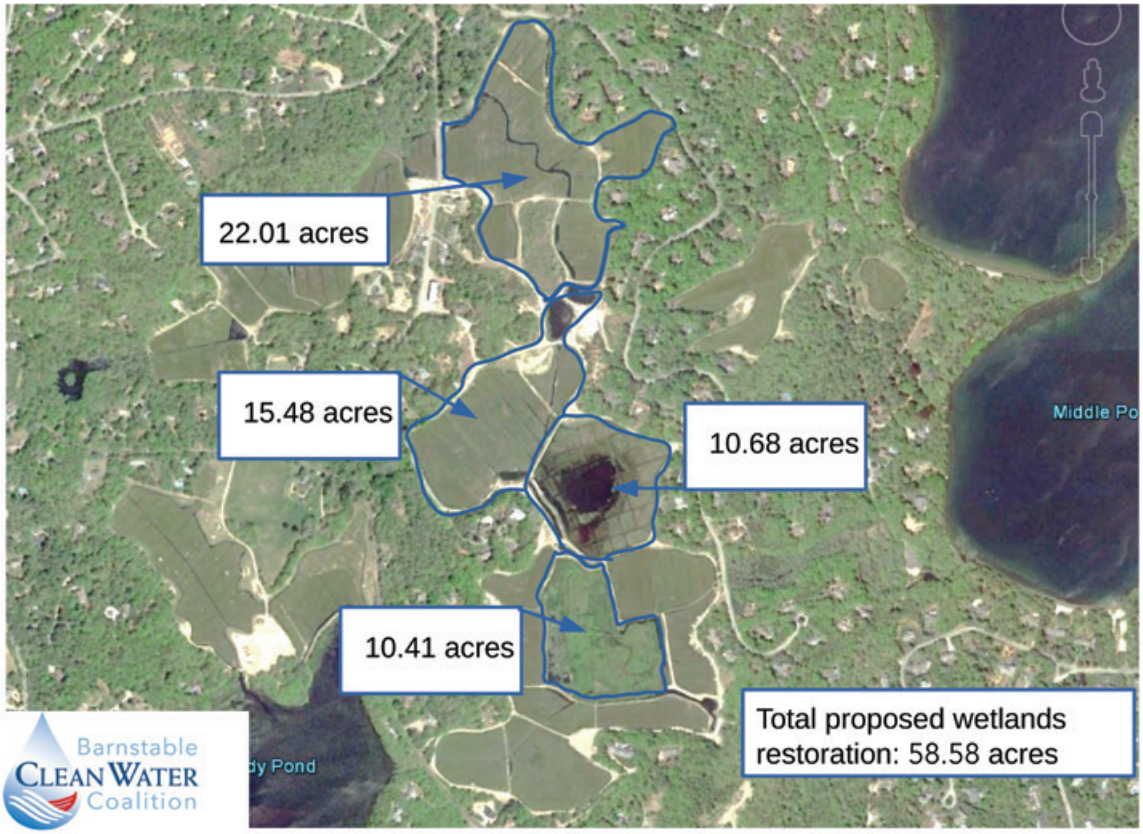
BCWC is working to restore 55 acres of cranberry bogs to natural freshwater wetlands. This restoration would entail filling drainage ditches, grading the bog surface, removing water control structures, reconstructing stream channels, removing sand, and moving sediment.

The goals of this restoration project include:

- Attenuate nitrogen
- Reduce the nitrogen flow downriver
- Improve water quality in the Three Bays estuary
- Habitat restoration
- Public recreation and education opportunities

Would you like to learn more? Sign up for our emails at BCleanWater.org to stay up to date on the latest details from our projects.

Map of Proposed Marstons Mills Cranberry Bog Restoration



Cranberry Bogs… A Fruitful History

Cranberry bogs have a rich history on Cape Cod that dates back to the end of an ice age. Thousands of years ago, receding glaciers formed craters, kettle ponds, and wetlands. Over time, cranberry vines would grow and thrive in these places throughout Plymouth County, Cape Cod and the Islands.

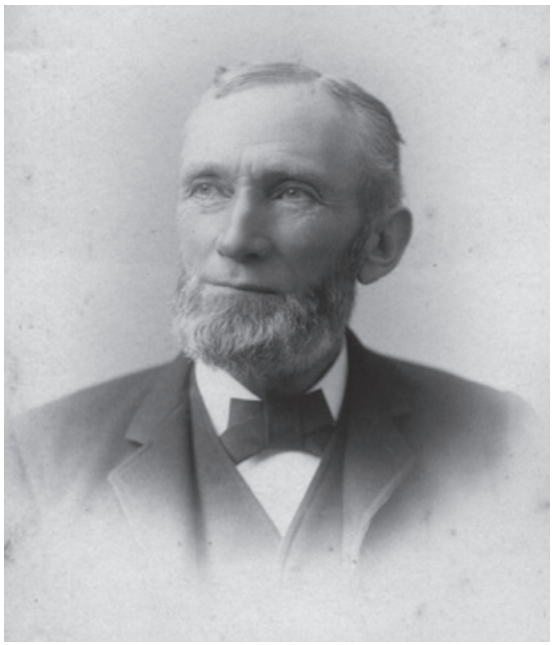
Along with other native fruits, cranberries were at the first Thanksgiving, when the Wampanoags and Pilgrims feasted together in 1621. The Wampanoags ate wild cranberries fresh or dried to make pemmican, a mix of berries, dried meat and animal fat that could last for months. Indigenous peoples derived natural dyes for clothing from the juice, and medicine men used them for healing rituals. Once the colonists became familiar with the berries, they sent barrels to King George as a gift.

In the United States, commercialization of the fruit started in 1816 when Captain Henry Hall, a Revolutionary War veteran from Dennis, began cultivating and selling cranberries. Other Cape Cod landowners joined in and converted their swamps, wetlands, and wet meadows into cranberry bogs. This new agricultural industry flourished. By 1885, Plymouth County had more than 1,300 acres under cultivation and Barnstable County had more than 2,400.

BCWC and its partners have started nitrogen reduction pilot projects in the cranberry bogs located in Marstons Mills. The bioreactors installed in 2020 and spring 2021 are located in bogs owned by the Hamblin family. The Hamblins have been in the cranberry-growing business since 1858, when Luther Hamblin purchased their first 3.5 acres, which has grown to over 60 acres today.

The Hamblins are just one of several Barnstable families that made their livelihood on the Marstons Mills bogs. The first was Russell Hinckley, who established Gifford Farm in 1849. Others include Isaac Sprague Jones and his nephew Thomas, who farmed bogs near Muddy Pond; and Thomas' cousin Jedidiah who had nine acres just north of the pond.

In 1874, Abel D. Makepeace from Hyannis bought 87.5 acres from Thomas Jones, the first in a series of purchases in Barnstable and Plymouth counties that was to make him the largest producer of cranberries in the world. Titled the "Cranberry King," Makepeace transformed the industry from small-scale, individual bogs of a few acres to large-scale production. The A.D. Makepeace Company dominated cranberry production from right here in Marstons Mills for over a hundred years, from the 1870's until 1980.



A.D. Makepeace (1832 - 1916): "Cranberry King"

Jedidiah Jones' cranberry bogs located north of Muddy Pond, Marstons Mills.

A screening machine separated spoiled cranberries from good ones through a bouncing process. Skilled workers were still required to handpick cranberries before being shipped.

Circa 1960 - Motor-driven picking machines were introduced after World War II to help with wet harvesting of cranberries.

Photos: Marstons Mills Historical Society

By the turn of the 20th century, cranberries were a vital part of the economy, covering more than 11,000 acres across the South Shore and Cape Cod. During this time, Marcus L. Urann, a lawyer from Plymouth County, bought a cranberry bog and had the novel idea to can cranberries. Urann developed a recipe for cranberry sauce in 1912. By the early 1930s, Marcus was working with John Makepeace (A.D.'s son) and Elizabeth Lee to form Ocean Spray and place this canned treat in pantries across the nation. By 1940, millions of Americans were enjoying cranberries in the form of a jiggly jelly log at their Thanksgiving table.

Like the cranberry when eaten fresh, the Cape Cod cranberry industry eventually soured in the latter part of the 1900s. The Makepeace investment in cranberry bogs ended in 1980 when the company sold off its Cape Cod bogs. Production costs continue to rise and manufacturing efficiencies in competing states, like Wisconsin, are crowding out Massachusetts growers. As Christopher Makepeace, grandson of John notes, "cranberry growing is dying on the vines". Many of the bogs in Marstons Mills were taken over and operated by John Hamblin — a full circle back to one of the original Marstons Mills' farming families.

BCWC is excited about our partnership with the Hamblins and our numerous projects on the bogs, from bioreactors that filter out nutrients and impurities before they reach great waterways, to restoring these bogs back to natural wetlands.

The Marstons Mills bogs today.

Restoring Wetlands One Bog at A Time - MA Department of Ecological Restoration

BCWC is partnering with Alex Hackman of the Massachusetts Department of Ecological Restoration (MA DER) on the restoration of the Marstons Mills cranberry bog system. Over the last ten years, MA DER has worked with cranberry farmers throughout the state as they consider what to do with their bogs when they retire or no longer want to farm the bogs.

The first cranberry bog restoration project that MA DER assisted with was the Eel River Headwaters Project in Plymouth, MA. The Town of Plymouth worked with MA DER and other partners to restore 60-acres of a former cranberry farm into freshwater wetlands and public open space. Dams were removed, stream channels were reconstructed, trees were planted, and a tremendous amount of earth was moved to complete this project.

To date, MA DER has provided valuable insight and guidance that helped us get started on the feasibility study process. If designated as a Priority Project this summer, MA DER will be able to take on a larger role by providing technical assistance, contracting support, and financial support as we move into the conceptual design stage of the project.

Photos of the cranberry bogs in 2008 prior to the start of construction on the Eel River Headwaters Project.

The site graded after sand was removed, ditches were filled, and sediment was moved (2010).

Four months after construction began, plant growth can be seen along a reconstructed stream channel. (2010)

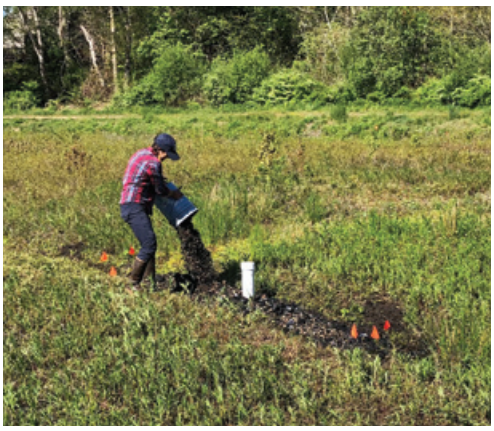
Photos: Alex Hackman/MA DER

New Biochar/Woodchip Bioreactors Installed in Bogs

BCWC is working with a team of researchers from Mount Holyoke College to study the effectiveness of an innovative, low-tech method for reducing nitrogen pollution to coastal waters from cranberry farms. A three-year grant from the Southeast New England Program is funding this innovative project that builds upon the denitrifying wood chip bioreactor technology BCWC first put in the Marstons Mills cranberry bogs in 2020. The main goal of this project is to determine how effective these bioreactors are in the removal of nitrogen.

Three 40 ft. long bioreactors were installed in the bog ditches in May using a mix of two carbon sources: woodchips and biochar. The biochar is locally made and a food source for microbes, which are good at removing nitrates from water and converting it into harmless nitrogen gas. When submerged underwater, the wood chips and biochar intercept nitrogen and stimulate microbial nitrogen removal.

Each of the bioreactors varies in depth and output, as well as having variable flow rates of water. They are a simple and affordable technology that helps rebuild organic matter in the soil and improve water quality. The bioreactors will be monitored for 14 months to measure the amounts of nitrogen and to account for variations in water levels and flow. This will allow us to compare data and results from the woodchip only bioreactor installed in 2020 with the three biochar/woodchip bioreactors.



(Left to Right) Special Projects Manager Casey D. Chatelain prepares bog ditches in advance of the biochar bioreactor installation. BCWC Volunteer Tess Prete and Field Operations Manager Meg Materne fill wheelbarrows with the biochar/woodchip mix. Rachel Rubin, post-doctoral researcher from Mount Holyoke College, pours the biochar/woodchip mix into the bioreactor. BCWC volunteers Tess Prete and John Thomas work with Rachel Rubin constructing one of the three new bioreactors. After a long day's work, the first bioreactor is complete and already filtering water flowing through the bogs.

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.

Photo by Alex Hackman/MA DER

Each project we start in the bogs, from installing a bioreactor to restoring the habitat to its natural state, is vital to restoring and preserving our local waters.

Please donate today to ensure clean water now and for future generations.

Cranberry Bog Bioreactor Nitrogen Reduction Project – Part 2

To continue these projects, we need your support!

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