SNEP Watershed Implementation Grants Final Report:

Windswept Bog Wetland Restoration

NANTUCKET, MA

SNEP Southeast New England Program

RESTORE AMERICA'S ESTUARIES

EPA

U.S. FISH & WILDLIFE SERVICE

SUMCO ECO-CONTRACTING

NANTUCKET CONSERVATION FOUNDATION

FUSS & O'NEILL

RICHARD KING MELLON FOUNDATION

Massachusetts Department of Fish and Game

Division of Ecological Restoration

Invested in Nature and Community

Project Site & Problem Addressed

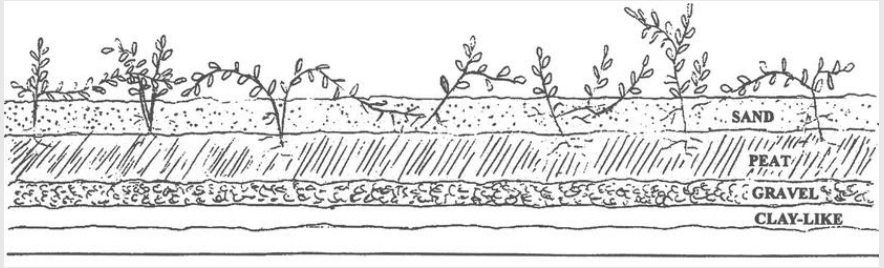
Windswept Bog is a former cranberry farm privately owned and managed by Nantucket Conservation Foundation (NCF), a non-profit dedicated to the conservation and stewardship of Nantucket's open lands. Located on the northeast end of Nantucket Island, Windswept Bog includes 40 acres of human-made former cranberry production bogs that are central to a larger assemblage of 231 acres of open space. Prior to restoration, the site was divided into 14 discrete bog cells ranging from 0.7 to 8.4 acres. Each cell was separated by a 2- to 6-foot-high berm with irrigation/drainage ditches and water control structures to manage water levels and direct flows for cranberry production.

The site is typical of retired cranberry bogs and shares many of the stressors common to these former agricultural landscapes. Historic wetlands were converted to farming and legacy impacts include: a sand fill layer placed over native wetland soils; alteration of hydrology via ditching/berms and water control structures; loss of diversity; pesticide/herbicide residues; and nutrient pollution from past fertilizer use. Cumulatively, this results in dry soils in the upper bog platform and a trajectory toward more upland plant species over time. Massachusetts Division of Ecological Restoration (DER) has repeatedly observed that without proactive restoration, abandoned cranberry farms in Massachusetts react to these legacy stressors by moving toward an alternative ecological path: more simplified and less valuable upland plant communities. This indicates a loss of functioning wetlands and the ecosystem services they provide to the coastal watershed.

In terms of its broader landscape context, the site lies within a 19.9 square mile watershed to Nantucket Harbor on the northeast end of the island bordering the Middle Moors–the largest expanse of undeveloped, protected land on-island. Currently, the bogs lie just outside of tidal influence as constricting structures limit tidal influence into the lowest reach of Millbrook Creek; however, even moderate forecasts of sea level rise through the year 2100 predict increasing tidal influence at Polpis Road and into the northwest quadrant of Windswept Bog.

Drainage to Windswept Bog includes ~1,000 acres which flows northwest through the bogs to Polpis and Nantucket Harbors. Surrounding land uses include light residential development and 3,220 acres of protected open space. The site lies upgradient of Millbrook Creek and all surface water flows through the site, ultimately discharging via a culvert under Polpis Road into Millbrook Creek about ¼ mile upstream of Polpis and Nantucket Harbors. The harbor and its surrounds are simultaneously threatened by nutrient and bacteria impairments due to inland activities, namely nutrient loading from runoff from impervious areas and septic systems. TMDL-driven water quality monitoring of Polpis Harbor identified Millbrook Creek, just downstream of the project, as the source of 60-70% of stream discharge N-load to Polpis Harbor. Agriculture has already ceased at the site and use of fertilizers at the bog are not now a concern. Decreased flow velocities post-restoration will allow sediment to settle out and wetlands to perform filtration of nutrients and other pollutants, directly benefiting these receiving waters.

The area around Polpis and Nantucket Harbors on Nantucket Island, MA contains significant salt marshes and eelgrass beds that are and will be vital to the island's climate resilience potential. As sea level rises, these areas are threatened. Loss of these habitats has been identified as one of the main coastal resilience challenges facing this area of the island, and inland salt marsh migration will need to be accommodated to preserve the ecosystem services provided by coastal wetlands (Nantucket Coastal Resilience Plan, 2021).



The overall restoration project will restore 40 acres of former cranberry bog to self-sustaining natural wetlands and integrate the restored wetlands into the broader landscape and watershed. The project has been recognized by the Massachusetts Division of Ecological Restoration (DER) as a DER Priority Project; partners have been coordinating since 2019 to develop and permit the restoration design. SWIG23 funding contributed to implementation of Phase 1 of the restoration, which restored ~14 acres to diverse wetland habitats.

Key Objectives

There are three high-level goals for the restoration of Windswept Bog: (1) successful ecological restoration, (2) long-term conservation, and (3) continued passive recreational access. To achieve these goals, the project design focuses on restoring hydrology to support self-sustaining wetlands within the site, eliminating barriers to fish and wildlife movement, addressing farm-related physical simplification to dramatically enhance habitat and expand resident (and transient) biota, and providing opportunities for scientific research, public education, and passive recreation.

The project's process-based restoration approach will ultimately repair the natural movement and storage of water as a driver for wetland recovery and re-establishment of self-sustaining wetlands. Work across all phases of the project will remove 3,500ft+ of berms and 28 water control structures to restore wetland hydrology and connectivity and establish a self-sustaining wetland system. Roughening 14 bog cells (6 cells in Phase 2 plus 8 completed in Phase 1) will break up mats of cranberry and underlying sand, expose native peat and seed bank, and create microtopography for diverse wetland habitat. Excavation to lower ground surface elevations will establish a range of habitats (semi-permanently to seasonally flooded wetlands). Collectively, 40 acres of retired cranberry bogs will be restored to wetland habitats, providing flood dampening and improved water quality immediately upstream of Polpis and Nantucket Harbors (which are both impaired for nitrogen and bacteria). The project will preserve refugia for inland species and eventual marsh migration, in turn, reducing exposure to sea level rise and storm damage.

The project will also demonstrate and refine design and construction approaches that can be applied to other retired bogs and resilience projects across the region focused on nature-based strategies for flood protection and adaptation in coastal systems. NCF's ongoing research program at the site will track both short-term and long-term restoration success and facilitate transfer of lessons learned from the project to the broader region.

PROCESS-BASED RESTORATION

MICROTOPOGRAPHY

UN-STRAIGHTENING DITCHES

REMOVING BERMS/ RECONNECTING BVW

EMBRACING MESSINESS

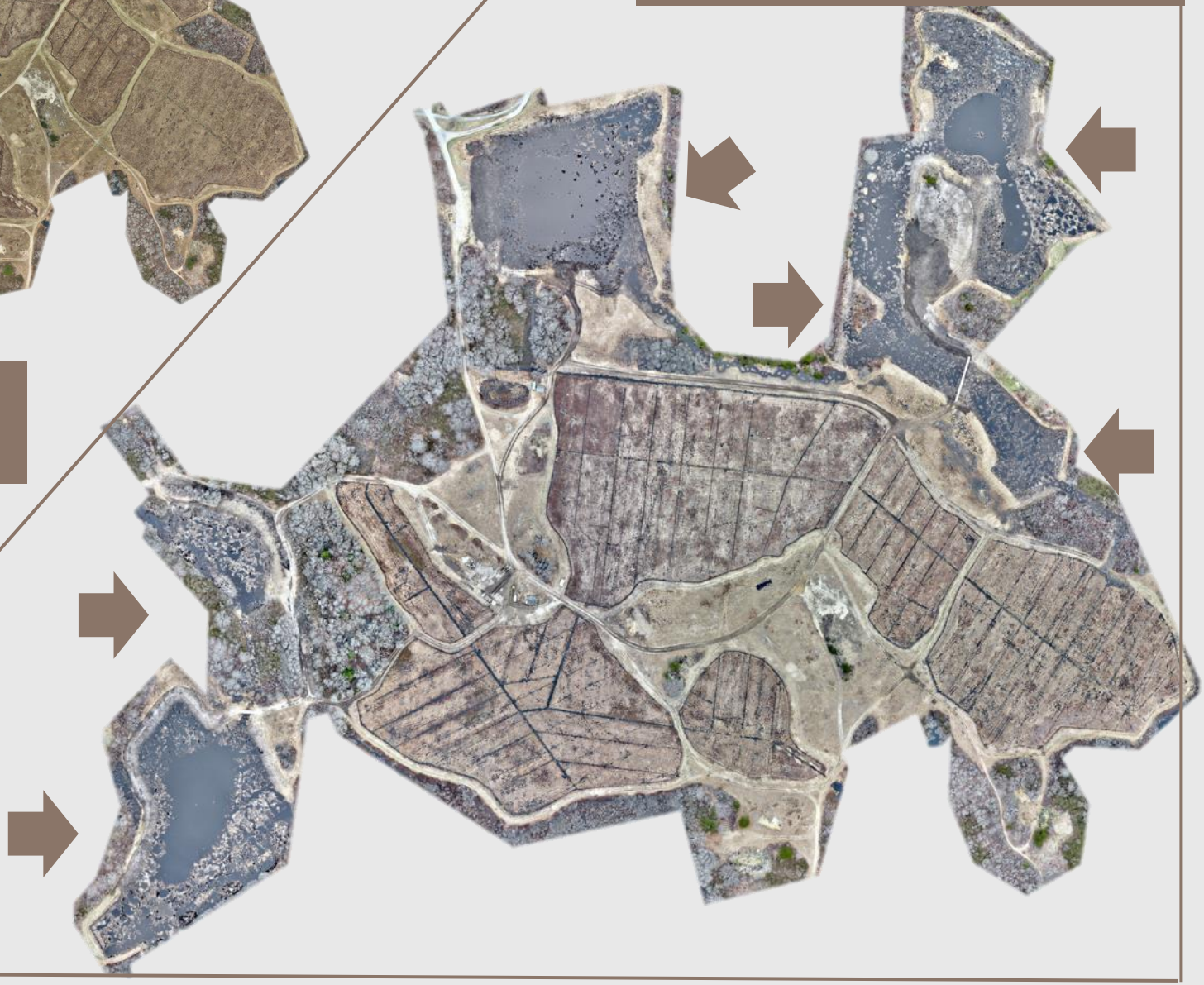
Phase 1 Results

The project was fully designed and permitted by the end of 2023, with bidding and contractor selection completed between October and December 2023. Phase 1 Restoration was completed in January to March 2024 with funding from DER, a grant from the Richard King Mellon Foundation, and this SNEP SWIG award. The initial phase of the project restored 8 bog cells (~14 acres) at the periphery of the site. The project used what is known as a "process-based restoration approach" – which focuses on repairing the natural movement and storage of water as a driver for wetland recovery and ultimate reestablishment of a self-sustaining wetland system. Berms and water control structures—remnants of past agricultural infrastructure—were removed to restore natural wetland hydrology, allowing water to spread out and move more slowly across the site, rather than being channelized into agricultural ditches. Roughening (essentially 'messing up' the surface with an excavator) throughout the bog cells was used to break up mats of cranberry plants and artificially sanded surfaces to expose and engage native peat deposits and seed bed that have been buried for decades and create microtopography for habitat. Deeper excavation in select areas was used to lower ground surfaces and establish pockets of diverse habitats including semi-permanently and seasonally flooded wetlands.

Windswept by Drone
January 6, 2024

Project Motto:
"Wetter is Better"

Windswept by Drone
March 9, 2024



SPREAD AND SLOW FLOWS… & REMOVE INFRASTRUCTURE…

TO GENERATE RESTORED WETLAND HABITAT

Next Steps

Phase 1 restoration areas were selected because they were representative of different site conditions and provided a good variety of restoration activities to observe post-restoration to gain additional information which has now been incorporated into the design for Phase 2. The Phase 1 pilot was used to confirm restoration response in diverse portions of the site before restoring the remaining bog cells. Phase 2 will then incorporate adaptive management and methodology based on the outcomes of Phase 1 to complete implementation across the entire site.

Construction of Phase 2 is required to complete restoration of the remaining 6 bog cells, creating a continuous, dispersed flow path through the site and connecting the already-restored cells to the natural adjoining wetlands. Phase 2 is also necessary to achieve restoration of the full extent of proposed restoration—the second phase encompasses roughly 2/3 of the total wetland acreage to be restored on the site.

With Phase 1 restoration and post-restoration monitoring now complete, the project is ready for Phase 2. Construction is slated to begin again on November 1, 2024 and continue through March 15, 2025. Phase 2 implementation will restore the remaining 6 bog cells (~26 acres) in the central portion of the site, for a total of approximately 40 acres of restored wetlands across phases. Along with the wetland restoration, upland areas between the bog cells will also be restored and enhanced to facilitate expansion of sandplain grassland habitats and other community types. Phase 2 construction will mirror the work performed in Phase 1, including microtopography, excavation, and construction of boardwalks for public access, resulting in completion of the entirety of the planned restoration project.

Completion of Phase 2 will complete the full extent of the restoration design to achieve the desired ecological and community benefits of the project and set the entirety of the site on a trajectory toward redevelopment of self-sustaining natural wetlands. NCF's Ecological Research, Stewardship and Restoration Department will take over from there, engaging in ongoing monitoring and research after the site is restored to track how vegetation, turtles and other wildlife, and water quality respond to the restoration work over the long-term.

In keeping with MassDER's restoration philosophy, the Windswept Bog Restoration project is built around the concept of process-based restoration. The design intent is to restore natural ecosystem processes and functions so that the system is set on a trajectory to self-sustaining natural recovery, without further ongoing human intervention. Windswept will continue to evolve and adapt over time and has been designed to allow for this adaptation to incorporate future marsh migration under sea level rise. The site is permanently preserved. NCF's Ecological Research, Stewardship and Restoration Department will have a long-term presence on the site conducting monitoring of the restoration and NCF's Land Management staff will maintain the trail network and access amenities that invite the public to explore the site and learn about the restoration project and its benefits.

Engagement & Outreach

Along the way, NCF conducted extensive outreach using both in-house staff and through hosting a partners' tour and media interviews to provide information on the project to a wider audience. The team was fortunate to have the project featured on the front page of the Boston Globe in March, 2024.

NCF conducts many types of educational programming for the community to increase environmental awareness about Nantucket's natural resources, including ecologist-led field trips, lectures, classes, and workshops. NCF's focused several of these in-person public field trips on the Windswept project site, starting before restoration to promote project plans and help the public understand what restoration would entail. These firsthand property and project tours have provided attendees with a chance to learn and ask questions from staff prior to the restoration, and after completion of Phase 1 restoration. These programs will continue through the duration of Phase 2 construction and post-restoration phases for this project to ensure that the public is aware of and engaged with the site and the many benefits arising from restoration.

WINDSWEPT MAKES HEADLINES*!

The Boston Globe

Serving our community since 1872

THURSDAY, MARCH 14, 2024

FOR MIGRANTS IN MASS., THE STRUGGLE GOES ON

Haitians who've left so much behind try to find their bearings in Mattapan

By Danny McDonald
GLOBE STAFF

Every day the cramped offices of the Immigrant Family Services Institute in Mattapan Square are a whirlwind of activity, with newly arrived migrants coached in navigating the bewildering bureaucracy of their new world while ready to recount the terrors that forced them to flee their homeland.

One is Vladimy Jean Pierre, who arrived from Haiti in November via a federal humanitarian parole program. To get his work authorization, he must be fingerprinted by US Citizen and Immigration Services. But thanks to a forecast of a nasty nor'easter, when he showed for his appointment at the relevant government office outside Boston in February, it was closed. He has not been able to reschedule. He hopes the staff here can help. He wants to work.

Back home, Jean Pierre worked in radio broadcasting and industry restricted his ability to move around freely; more and more places became too dangerous to visit. The justice sys-

Plan for new leadership in Haiti appears to crumble. A7.

MIGRANTS, Page A7

JESSICA RINALDI/GLOBE STAFF

Jacques Dostchy passed his one-month-old baby, Atalinda Nefertari, to his wife, Gigie Zaldo, at the Immigrant Family Services Institute.

CRAIG F. WALKER/GLOBE STAFF

Elias Perea of Northill Willston Security greeted a migrant family at the shelter at the Melnea A. Cass Recreational Complex.

"We change the climate of any environment we're in. People feel safe."

CHRIS WOMACK, part of a private security team employed by the Nubian Square Foundation, which staffs the shelter at the Melnea A. Cass Recreational Complex in Roxbury

In emotional time, security on alert at shelters

By Samantha J. Gross
GLOBE STAFF

Will Dunn and Chris Womack walked the perimeter of the indoor track at the Melnea A. Cass Recreational Complex in Roxbury, waving hello to homeless families perched atop blue cots and fist-bumping members of the security team they lead.

Passing for a moment, Dunn, a tall man with a white beard, puffed his cheeks out at a toddler, who responded with a giggle.

Dunn and Womack lead a 24-member private security team employed by their Roxbury nonprofit, the Nubian Square Foundation, which has been staffing the shelter since it opened last month. Under a subcontract with the provider running the shelter, the state pays them $20,000 a week to provide three shifts of around-the-clock security for the families inside, while working the perimeter to keep protesters or others at bay.

Emergency shelters across the state have always required some element of security. But the rapid expansion over the last year of the shelter system, which now houses migrant families in nearly 100 communities, and heightened public scrutiny of new arrivals fleeing violence, political unrest, and economic turmoil in their home countries has created a more urgent need.

Families living in the emergency shelter system — which hit a state-set cap of 7,500 families late last year — have fled turbulent conditions in countries such as Haiti and Venezuela in search of reliable employment and safety for their families. But here, they have also faced mistrust and hate, from residents in Dedham railing against "hand-outs" to immigrants, to neo-Nazis

BACKLASH, Page A7

House lines up behind a possible TikTok ban

Critics say it's too narrow; Mass. delegation divided

By Jim Puzzanghera
GLOBE STAFF

WASHINGTON — As TikTok users flooded Congress with calls opposing a bill that could ban the popular video app in the United States, Representative Jake Auchincloss said his office received one so disturbing that it convinced him the legislation was needed.

"We got a voicemail from a young individual threatening suicide if we banned TikTok. That is a case in point . . . of the deleterious impact that these apps are having on our youth," the Newton Democrat said, adding that another voicemail came from a person sobbing hysterically over a potential ban. "I mean, Congress needs to get a grip on this."

Auchincloss was part of an overwhelming bipartisan House majority on Wednesday that voted 352-65 to approve the Protecting Americans from Foreign Adversary Controlled Applications Act, which would ban TikTok in the United States unless Bytedance, its Chinese owner, sells to a non-Chinese company in six months. The mental health impact of TikTok on young people was only part of Auchincloss's motivation — he added that he also is concerned that the Chinese government

TIKTOK, Page A6

Despite need, primary care harder to find

Fed up with administrative tasks, doctors moving on

By Felice J. Freyer
GLOBE STAFF

When Justin Ritter first met his new primary care doctor two years ago, she asked him a simple question: How was he feeling? He replied, honestly, that he felt fine, no complaints.

But as Dr. Vicki Noble questioned Ritter, 46, about his life, his work as a nursing supervisor on the night shift, and his recent weight gain and fatigue, she sensed something was amiss. Ritter recalled. She ordered some tests and diagnosed a thyroid condition that required medication, he said.

Ritter benefited from a primary care doctor whose expert listening spared him potentially serious health consequences. But then the Belchertown resident suffered the consequences of a system that often doesn't support that kind of care: Noble quit private practice within a year, unwilling to rush through the 18 patients a day her group required.

Noble joined an exodus of primary care physicians weary of administrative tasks mandated by insurance companies and the seemingly endless data entry required by electronic medical records, all while receiving low- or salaries compared with physicians in other specialties. To

PRIMARY CARE, Page A10

Primary care doctor $294,000 a year

Pediatrician $242,000 a year

Cardiologist $544,000 a year

Orthopedic surgeon $624,000 a year

National averages SOURCE: Doximity Physician Compensation Report

Doomed cranberry bogs get new life in climate fight

By Erin Douglas
GLOBE STAFF

NANTUCKET — Sinking their boots deeper into the thick, black muck, scientists oohed and aahed among themselves. The object of their affection: a field of upturned mud.

"This is so beautiful," said Beth Lambert, director of the Massachusetts Division of Ecological Restoration.

The mess at the century-old Windswept Cranberry Bog on Nantucket could be beautiful come summer when plants return. But right now?

"It kind of looks like a bomb has gone off," said Jennifer Karberg, director of research and partnerships for the Nantucket Conservation Foundation, which owns the bog.

The bog is in the thick of a transformation that will undo more than a century of farming and restore the land to its native wetland ecosystem. Wetlands reduce the impacts of sea level rise and coastal erosion by acting as a sponge that can absorb flood waters. They can also mitigate climate change by storing carbon dioxide, a greenhouse gas. Both make them a key strategy for the state's battle to adapt to and fight climate change.

The soil at what was once a 231-acre organic cranberry bog is being upturned, removed, and jumbled as part of the wetland restoration project supported by a $1 million grant from the US Fish and Wildlife Service. The total cost of the project will likely be more than $3 million.

Cranberries, which are native to New England, have a deep history in

CRANBERRIES, Page A10

Jeremy Sanders worked on a walkway over an excavated bog in Nantucket that is becoming wetlands again.

DAVID L. RYAN/GLOBE STAFF

In a surprise, a judge in Atlanta quashed six charges against Donald Trump and his allies in the Georgia

Spring trainer

Thursday: Some sun, nice. High 51-56. Low 40-45.

Friday: A few showers. High 48-53. Low 38-43.

D5-6, 78

$2.50

of marijuana possession convictions in the state. B1.

11413

Jeremy Sanders worked on a walkway over an excavated bog in Nantucket that is becoming wetlands again.

DAVID L. RYAN/GLOBE STAFF

Doomed cranberry bogs get new life in climate fight

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THE BOSTON GLOBE

A10 The Region

THURSDAY, MARCH 14, 2024

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▶ CRANBERRIES
Continued from Page A1

commercially grown since the 1800s. A quarter of the nation's cranberries are still produced here, mostly on Cape Cod and in Plymouth County. But as the climate warmed and competitors farther north — namely, Wisconsin and Canada — began to dominate the market, cranberry dynasties across Massachusetts fell.

Rather than let the land from out-of-production bogs go fallow, several farmers across the state have agreed to massive excavation projects to uncover the native wetland ecosystems that often lie below 1 to 3 feet of artificially placed sand. Sand is used as a sort of fertilizer that encourages the cranberry vines to grow stronger and produce more fruit.

So far, the state has completed six cranberry bog restoration projects totaling more than 350 acres. But another 18 restoration projects are already planned or under construction, according to the Division of Ecological Restoration. That would total more than 800 acres.

The seeds of grasses and shrubs that are necessary to restore the lost wetlands are already here, lying dormant underground for more than 100 years.

"Once you bring them to the surface and bring back the right conditions, like water and sunlight, they explode back into healthy wetlands," said Jessica Cohn, ecological restoration specialist at the Division of Ecological Restoration, which is part of the state's Fish and Game agency.

Cranberry farming requires cold temperatures and ice, and both are in short supply as winters rapidly warm across New England.

Bogs are soaked and frozen for the winter to hold the plants at a consistent temperature, rather than leaving their limbs and buds exposed to variable below-freezing temperatures. Many bogs are briefly flooded again in the fall to help with the harvest. (The cranberries float to the surface, making them easier to collect)

The plants need enough chilling hours each year to spark the right physiological processes for fruit production and the layer of ice to protect their buds.

With those optimal conditions becoming harder to achieve in New England, wetland restoration is an opportunity for struggling cranberry farms to do something positive with properties that have been hit hard by climate change, said Nick Larrabee, a third-generation cranberry farmer on Nantucket.

"A lot of growers haven't been able to make ends meet," Larrabee said. "It's just declined, year by year."

Last year, Massachusetts announced more than $1.7 million in grant awards to acquire retired cranberry bogs for restoration to functional wetlands. The state has promoted the program as a "green exit strategy" for struggling farmers.

The cranberry bog on Nantucket has been owned by the Nantucket Conservation Foundation since 1980; the group harvested cranberries there as recently as 2017, but in 2018 decided to cease cultivation.

The conservation foundation and the Division of Ecological Restoration, which partnered on the restoration project, broke ground this past January.

After the first few months of digging up the bog, the skeleton of an ancient wetlands ecosystem is beginning to emerge: The sandy dirt is gone. So are the human-made ditches that used to corral and drain water from the bog.

What Lambert called the "beautiful" peat is soaking wet and contains the treasured seeds.

"Without reseeding it, we suspect that a lot of it is just going to come up on its own," said Travis Sumner, cofounder and principal at SumCo, an ecological construction company contracted for the project.

By his estimate, the firm has naturalized hundreds of acres of former cranberry bogs across New England. It's a growing part of their business; when the firm started in 2006, cranberry bog naturalization didn't yet exist.

After this bog on Nantucket transforms back into a wetland, scientists hope it will also set the stage for a nearby salt marsh to migrate inland as the ocean rises. The ocean waters off the coast of New England are among the fastest warming on the planet, and Massachusetts' coastline is experiencing among the fastest rates of sea level rise in the world.

Construction in the Windswept Cranberry Bog is expected to be complete by early next year. Even before then, researchers think the lush carpet of vegetation may begin to emerge.

"You see the mud now," Lambert said. "But that's the building block of the wetland. . . . We have the opportunity to actually see nature heal in real time."

Erin Douglas can be reached at erin.douglas@globe.com. Follow her @erinmdouglas23.

PHOTOS BY DAVID L. RYAN/GLOBE STAFF

The goal of the massive excavation projects is to uncover the native wetland ecosystems that often lie below 1 to 3 feet of artificially placed sand once used as a sort of fertilizer for cranberry bogs.

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* front page

BY THE NUMBERS: WINDSWEPT BOGS

14 Acres of Wetland Restored (Phase 1)

Phase 1 Implementation Cost: **$821,535**

Value of NCF Staff Time contributed to the project: **$116,438**

Projected Total Implementation Cost (all phases): **$2.9million**

WATERSHED HEALTH OUTCOMES/BENEFITS

Process-Based Restoration Approach puts ~40 acres of restored wetlands on a self-sustaining trajectory to recovery

Flows across site slowed and dispersed; reversal of channelization caused by agricultural ditches

Decreased sediment transport and nutrient pollution

Improved filtration of sediment and nutrients

Improved habitat for rare species protection; refugia for long-term inland marsh migration

Improved resilience and storm surge protection under future climate conditions

Decreased N and P load exiting site and improved water quality in Nantucket and Polpis Harbors