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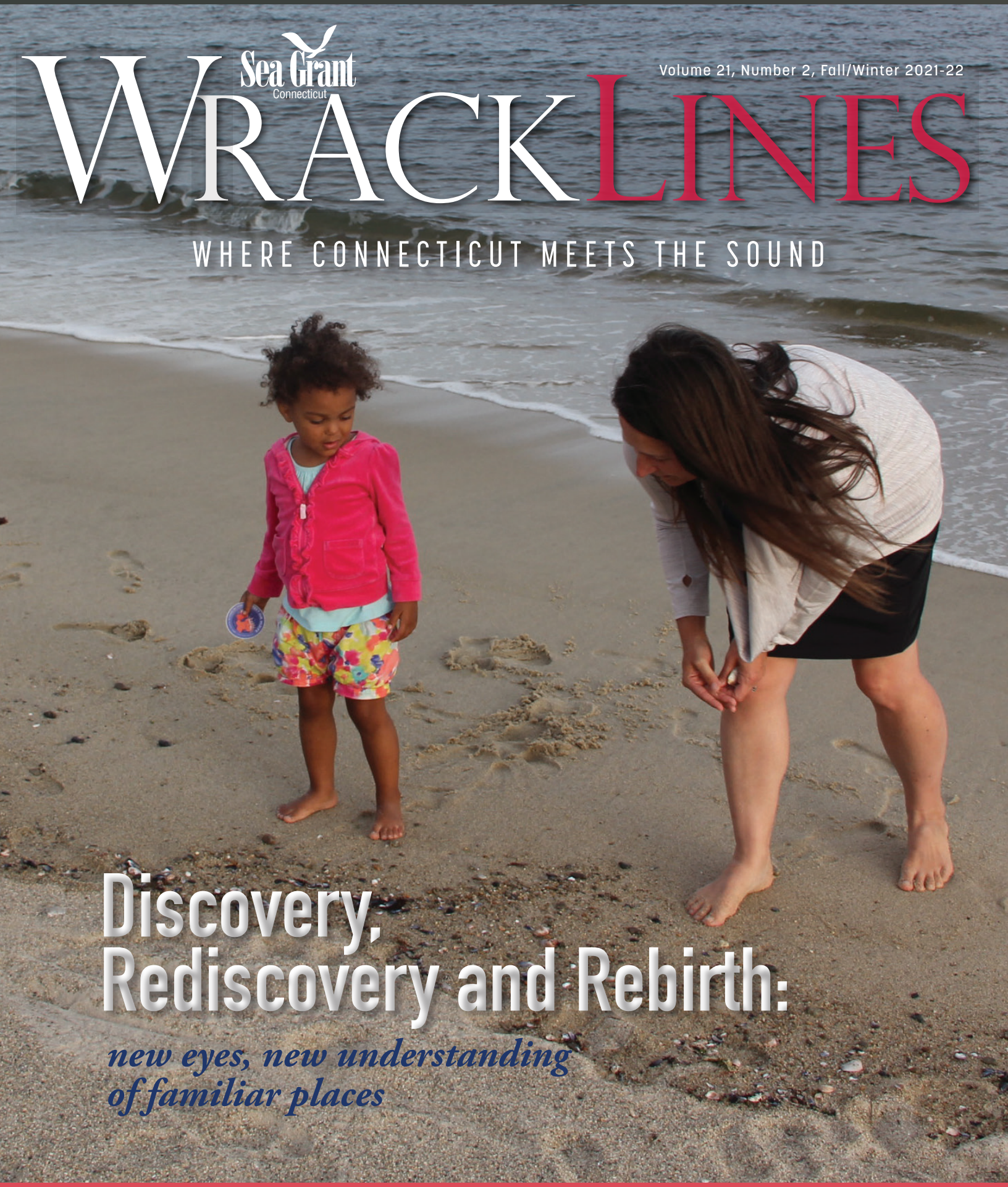
WRACK LINES

Sea Grant Connecticut

Volume 21, Number 2, Fall/Winter 2021-22

WHERE CONNECTICUT MEETS THE SOUND



Discovery, Rediscovery and Rebirth:

new eyes, new understanding of familiar places

CT NERR NEARS DESIGNATION • UNTANGLING BAY'S SEAWEED BATTLE • PEABODY MUSEUM TRANSFORMING

Sea Grant
Connecticut

Volume 21, No. 2 Fall/Winter 2021-22

EDITOR
JUDY BENSON

GRAPHIC DESIGN
MAXINE A. MARCY

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From the EDITOR

Egrets and gulls commanded their watery kingdom from atop a large log as our boat meandered through Lord Cove. The electric motor purred, and the waves lapped gently. No one spoke.

My husband guided his boat, Solar Breeze, for Judy Preston and me one June afternoon as we explored this warren of channels and islands in the lower Connecticut River and took photos. Moments like this of beauty and wonder came along the way, the kinds that form attachments between people and places.

Soon, if all goes according to plan, Lord Cove and nearby marshes will have a new identity as one of the signature pieces of the Connecticut National Estuarine Research Reserve (CT NERR). With it will come more appreciation, more resources for stewardship, research, monitoring and education and perhaps more experiences that will deepen the connections between Connecticut's natural and human spheres. Through discovery, rediscovery and exploration, we can better realize ourselves as part of the environment outside our walls, not separate from it.

Robin Wall Kimmerer, a native American writer, academic and member of the Citizen Potawatomi Nation, stated this idea eloquently in her best-selling book, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teaching of Plants*:

"It was through her actions of reciprocity, the give and take with the land, that the original immigrant became indigenous. For all of us, becoming indigenous to a place means living as if your children's future mattered, to take care of the land as if our lives, both material and spiritual, depended on it."

With apologies to Kimmerer, I'd suggest a slight revision to her quote to expand its meaning. I don't think she'd mind:

"It was through her actions of reciprocity, the give and take with the *water and* land…." Then, "to take care of the *water and* land as if…."

With the addition of "water" to the quote, it could be a statement of aspiration for the CT NERR —that the NERR framework for this assemblage of tidal waters and nearby lands is a means for us all to become indigenous, or at least more so. The different parts—Haley Farm, Bluff Point, the lower Thames River, the lower Connecticut River—are familiar to some and undiscovered by others, but through the new lens of the NERR can be seen and experienced anew by all with the mind, heart and senses.

Those opportunities for discovery and rediscovery are being found, too, by the researchers collecting and analyzing the waters of the Pawcatuck River and the sources of nitrogen it may be carrying into Little Narragansett Bay, fueling excessive algal growth. And within the imposing stone walls of the Peabody Museum in New Haven, teams are reimagining ways to tell the stories of the Earth through more inviting voices and perspectives.

Together, the stories about the CT NERR, Little Narragansett Bay research and the Peabody invite readers of this issue to take a fresh look at some of Connecticut's finest assets—its coastal treasures, storied institutions and the people who care about them, and perhaps become more like them.

Judy Benson

Judy Benson, editor
judy.benson@uconn.edu

Three great egrets share a log with gulls in Lord Cove on the Connecticut River, designated to be part of the Connecticut National Estuarine Research Reserve. Photo: Judy Benson

Cover photo: Debbie Pickering and her daughter Mia, 3, visiting southeastern Connecticut from their home in Massachusetts, explore a beach at the mouth of the Thames River, one of the areas that will be part of the proposed CT NERR. Photo: Judy Benson

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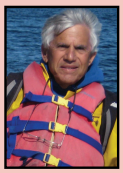
CT NERR

About our contributors

JUDY PRESTON
Judy Preston conducts public engagement and education programs for the Long Island Sound Study at Connecticut Sea Grant. In partnership with the UConn Master Gardener program, she runs the Coastal Certificate program that teaches sustainable gardening practices. She lives, plays and volunteers in conservation efforts at the mouth of the Connecticut River. She has an undergraduate degree in geology from Skidmore College, a Master of Science in botany from the University of Vermont and Master of Environmental Management from Yale University.



HOWARD "MICKEY" WEISS
Howard "Mickey" Weiss founded Project Oceanology in 1972, served as director until 2002, and is currently senior marine scientist. Dr. Weiss has led workshops for civic leaders in NY and CT and taught courses for science teachers in New England, Alaska and Mexico. He conducted research on blue crabs, American lobsters, spiny lobsters and the Thames River, and published several books including *Marine Animals of Southern New England and New York* and *Investigating the Marine Environment*. He is a member of the Citizens Advisory Committee to the EPA's Long Island Sound Study and was its first co-chair in the 1980s.

SYMA EBBIN
Syma Ebbin serves as both a professor at the University of Connecticut's Avery Point campus and the research coordinator for Connecticut Sea Grant, teaching courses in environmental and marine science and policy. She engages in social science research focused on fisheries and other marine and coastal issues. She developed and administers CTSG's Art Support Awards Program, which awards competitive grants to local artists working on coastal and marine themes. She obtained doctorate and masters' degrees from Yale University, a Master of Science from the University of Alaska, Juneau, and a bachelor's degree from Williams College.

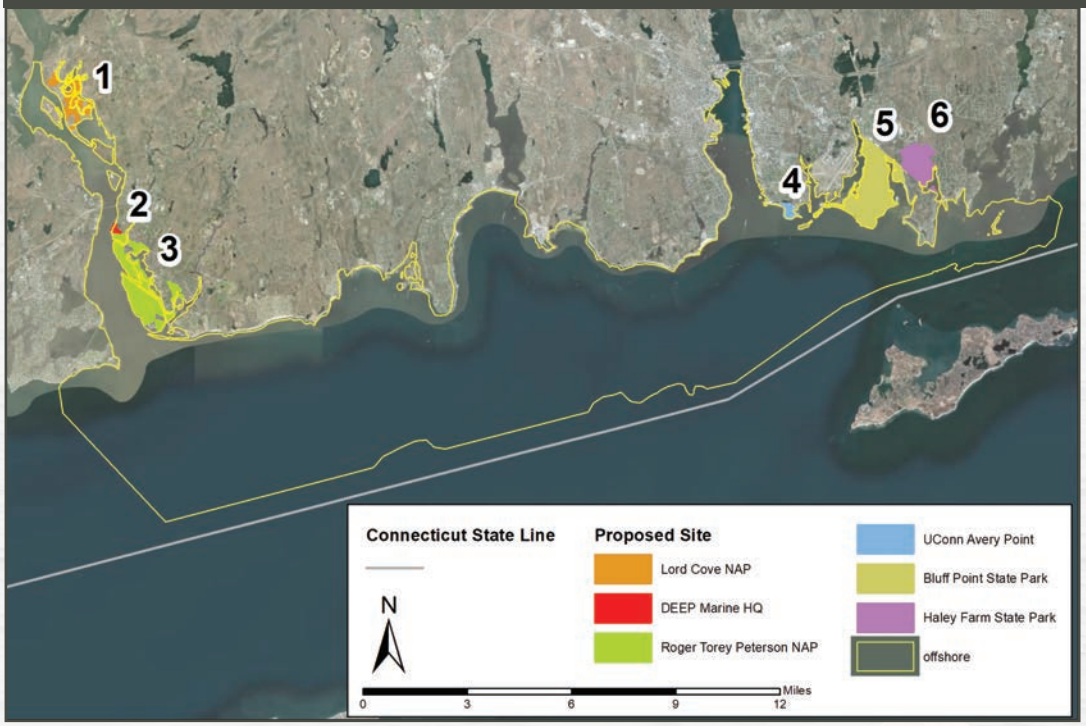
NANCY BALCOM
Nancy Balcom is the associate director and extension program leader for Connecticut Sea Grant and a senior extension educator with UConn Extension. Her extension interests range from safe seafood handling and safety at sea to disaster risk communication and community resilience. She has been part of the Sea Grant family for more than 34 years, starting in 1985 as a graduate student. She earned her undergraduate degree from UConn and her masters in marine fisheries from the Virginia Institute of Marine Science, College of William & Mary.

KIRA GOLDENBERG
Kira Goldenberg is a freelance writer and communications professional, and a Connecticut native. She writes regularly for university publications, including Barnard College and Wesleyan University's alumni magazines. Her work has also appeared in *The Connecticut Mirror, The Day,* the *Hartford Courant* and *The Guardian*, among other publications. She is working on her master's degree in social work at Hunter College.

JUDY BENSON
Judy Benson has been communications coordinator at Connecticut Sea Grant and editor of *Wrack Lines* since 2017. Before that, she was a newspaper reporter and editor, concluding her journalism career at *The Day* of New London covering health and the environment. She is the author of a forthcoming book created in collaboration with artist Roxanne Steed: *Earth and Sky: Nature Meditations in Word and Watercolor*, being published by New London Librarium (nllibrarium.com). She earned both a bachelor's degree in journalism and a Master of Science in natural resources from UConn.

Spanning 2 rivers, urban and rural zones and many habitats,

CT NERR nears official designation



By Judy Benson

Kayaks, waders and seine nets will be the equipment of choice for experiences in what is set to become the nation's 30th federally designated estuarine research reserve. Estuaries are the rich zones where rivers meet the sea.

Hiking boots, snowshoes and bicycles will have their place there, too. But the area marked for the 50,000-acre CT NERR—Connecticut National Estuarine Research Reserve—is a mostly watery world.

"The majority of our reserve is aquatic," said Jamie Vaudrey, assistant research professor of marine science at UConn and one of the leaders of the CT NERR project. "The land components of the reserve are all connected to each other by the waters of Long Island Sound and Fishers Island Sound."

A collection of state lands and surrounding submerged areas of the lower Thames and Connecticut rivers will comprise the CT NERR. These two rivers supply most of the fresh water that mixes with the salty Atlantic Ocean in Long Island Sound. Now, after a years-long process, the groups leading the CT NERR project with the National Oceanic and Atmospheric Administration are approaching the finish line. An announcement that the CT NERR will join the national network of NERRs could come early in 2022.

"We're much closer to the end than we are to the beginning," said Kevin O'Brien, supervising environmental analyst leading the project for DEEP. "It's been a long time coming, and it's something that other states have received a lot of benefit from."

The CT NERR footprint extends from Bluff Point and Haley Farm state parks in the east, to the Lord Cove and Roger Tory Peterson Natural Area Preserves (previously known as Great Island) in the Connecticut River some 23 miles to the west, with the lower Thames River in between. The variety of habitats throughout the reserve includes salt marshes, brackish coves, eelgrass and shellfish beds, two river mouths, sandy beaches, coastal forest, upland woods, fields and rocky islands.

There are also sharp contrasts. The Connecticut River portions are sparsely populated areas favored by fishermen and waterfowl hunters, with limited access by boat. The lower Thames is heavily developed and busy with commercial and recreational boat traffic. Bluff Point and Haley Farm are visited by thousands of hikers, bikers, recreational clammers and birders annually. But none of the uses currently enjoyed by the public in these places will change with the NERR designation. Like all NERRs nationwide, the CT NERR will follow existing state rules and regulations for management of the lands, waters and how they are used.

"There is lots of habitat diversity, and that provides a lot of different opportunities for outdoor education, research and monitoring," O'Brien said.

CT DEEP, UConn Marine Sciences, Connecticut Sea Grant and the Connecticut Audubon Society led the CT NERR designation, and UConn's Avery Point campus in Groton is slated to house its headquarters. Once established, the CT NERR will receive federal dollars and matching state resources to support staff, research, conservation, monitoring, education and volunteer opportunities, and connect with the other NERRs to share data and resources.

"This will be a very interesting place for people of all ages, including scientists and lay persons, to come and learn in a beautiful outdoor setting," said Sylvain De Guise, director for Connecticut Sea Grant.

MORE INFORMATION:
www.ct.gov/deep/NERR

Above: Map showing the proposed CT NERR sites courtesy of the state Department of Energy and Environmental Protection.

Right, Project Oceanology staff use a seine net to collect samples of marine life as part of an activity at Bluff Point. Photo: Callie Scheetz

Great Island: a place of wonderment, especially in August

By Judy Preston

Editor's Note: Though renamed the Roger Tory Peterson Natural Area Preserve in 2000, the original name Great Island is still the one preferred by many who've come to know and love it, including the author of this article. To her ears, it better connotes the straightforward declaration of uniqueness that this landscape deserves.

Great Island is a "sea of grass" not unlike the great American prairie, with the important addition of tides. Photo: Judy Preston

Great Island is located at the mouth of the Connecticut River. It's a gateway to New England's longest and largest river system.

It is also the river's largest salt marsh, hugging the eastern shoreline in the town of Old Lyme and divided by the Back River into an upper island, with Great Island making up the largest landmass to the south. Three tributaries help define the eastern boundary of this island complex: the Lieutenant River to the north, the Duck and the Blackhall at the south.

Collectively all these rivers and associated marshes make up a strikingly intact natural system that has helped give rise to nine (soon to be 10) local, national and even international environmental designations. They underscore the remarkable fact that in the 21st century and in the one of the most densely populated coasts in the country, a large tidal river estuary has managed to flourish.

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The 10th designation, expected in early 2022, will define Great Island and the brackish tidal marsh complex and islands just to the north, including Lord Cove, as a National Estuarine Research Reserve by the National Oceanic and Atmospheric Administration (NOAA).

An August midweek afternoon is an optimal time to explore the edges and winding creeks within Great Island in a small human-powered boat. The tide will orchestrate the experience: at high tide you will glide as if on the land surface itself, past late-season flowering sea lavender and salt marsh fleabane along the banks. Stretching beyond are the dominant plants with names such as saltmarsh hay, smooth cordgrass, black needle rush and spike grass.

At low tide you will experience the magic of the very foundation of Great Island: peat. Year after year, season by season, the dense vegetation at the marsh surface incorporates into this spongy organic basement, punctuated in places by fast-moving fiddler crabs that disappear into their excavated holes upon your approach.

To describe Great Island, imagine a grassland—low-lying, interspersed with areas of taller grasses and a few hardy shrubs. As far as the eye can see it is green—electric green by mid-August as it emerges into its full splendor, and wind-swept, just like the prairie. That is part of the appeal of Great Island: big views, with a few bedrock islands emerging above the marsh, mostly along the Connecticut River side, where tough oaks and native shrubs persist.

Diverging from the prairie image, Great Island is surrounded by water, and under the influence of the moon is monthly flooded such that even its higher "fields" of grass are submerged in salt water. Setting this place apart from the marshes, islands and coves just up the river, is the stalwart capacity of the plants and animals that call this place home to survive the vagaries of the coast: wind, salt, flooding, searing heat in the summer and brutal cold in the winter with little shelter, particularly as persistent tides variously expose and then submerge the landscape.

Stepping onto the island surface, it is possible to experience one of the features that makes the salt marsh so essential to the nearshore landscape, especially to coastal human residents: water capacity. Peat holds many times its own weight in water; if you jump you will feel the marsh below quake, absorbing your motion. Great Island and others like it along the coast can absorb and mitigate key impacts from storms.

Hundreds of menhaden—a fish that fuels many food webs in the estuary and neighboring Long Island Sound—riffle the water as they move down the Back River in August. Photo: Judy Preston

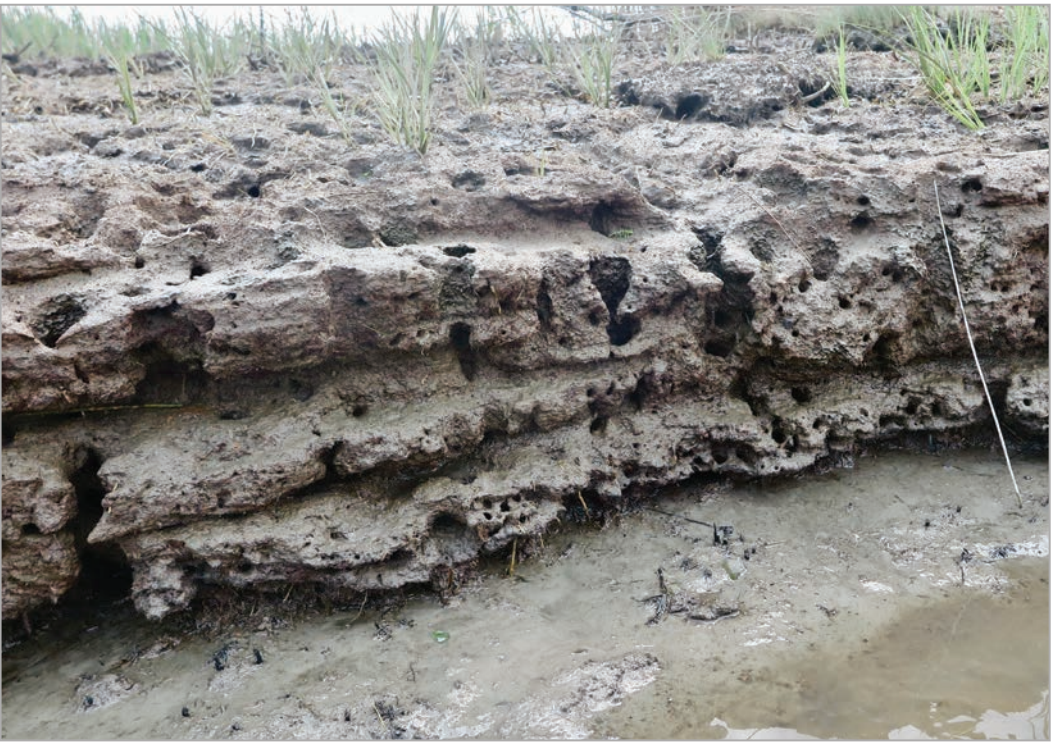
Especially in August, you may find yourself, as I did while paddling down the Back River, thinking that a breeze ahead is riffling the water. But as you draw nearer the crescent reveals hundreds of bunker fish—menhaden. There is a faint clicking as their dorsal fins break the surface. Occasionally one will depart the water entirely, returning after its airborne moment with a slap. As my boat skims above them I can see below their orderly, seamless progression—gills and mouths open. And there are so many more. Now I recognize their approach, group after group. Who would not delight in such abundance? Certainly the osprey has taken note.

I'm told that the number of artificial platforms constructed for nesting osprey on Great Island are at capacity, and indeed the landscape looks rather like the equivalent of an osprey city. This is not to suggest that they are unwanted but rather that their abundance cannot be taken for granted.

As a child, I remember adults pointing out the occasional osprey and the hushed significance that their explanations took on. Years later I would read, and study in textbooks, the significance of the use of the pesticide DDT and its unintended impact to the state's osprey population. Great Island was one of the first places where this problem was recognized by local luminaries Roger Tory Peterson and Paul Spitzer, doubtless alerted by Rachel Carson's seminal book, *Silent Spring*. Around Great Island, what had been one of the state's highest concentrations of nesting birds was reduced to one remaining nest in the lower Connecticut River, and statewide only nine active nests remained in the 1970s.

Today's osprey success rests on the backs of many who collectively observed and acted, including those who also advocated for limits to the amount of menhaden taken, ensuring a healthy food web.

Humans have been interacting with this landscape for a long time. Local archaeologist John Pfeiffer uncovered the ceremonial artifacts and indications of



Great Island's organic peat makes this place an essential buffer to coastal storms and notably, hurricanes. Photo: Judy Preston

a shelter and burial pit that place First Nation Peoples in the area around Great Island, dating back more than 4,700 years. The arrival of Europeans in the early 1600s initiated a marked departure from the seasonal visits of those before them to access local food resources. Europeans made a permanent presence, bringing with them grazing livestock—unknown to the landscape or native peoples. Early on, salt hay harvested by colonists from Great Island became an essential commodity.

That Great Island and the estuary it helps define was not engineered into a coastal city—like all its peers in the state and many across the nation, is due in part to its glacial past. Shifting sand bars at the juncture with Long Island Sound early on made ship passage problematic. To this day flat-bottomed barges are the largest ships making passage up river. Historically shipbuilding upriver as far as Middletown (which included the manufacture of clipper ships in its heyday) fueled local economies. Imagine the things seen from Great Island's shores, from Dutch explorer Adrian Block's modest ship, the *Onrust*, more than 300 years ago, to fleets of trade and fishing boats, then the era of steam, to today's recreational boats emerging from riverside marinas.

On the rocks that elevate the largest bedrock hummock on Great Island, faintly incised signatures of men who visited this place in the 1800s are still visible at low tide. What did they see and think, looking out onto the river and estuary marshes? As I sat listening to wind and river, I was reminded of John Stilgoe's phrase: "outside lies magic." The glint of a train moves across the landscape to the north, part of the busy Northeast corridor that embodies the technology and pace of a world that those early visitors could scarcely have imagined. Despite the ubiquitous sounds of planes, boats and distant sirens, that is the most amazing part of experiencing Great Island: it is still possible.

MORE INFORMATION:

Map of Great Island: https://portal.ct.gov/DEEP/Boating/Boat-Launches/Great-Island-Boat-Launch

Great Island State Boat Launch: https://portal.ct.gov/DEEP/Boating/Boat-Launches/Great-Island-Boat-Launch

A common tern flies over the Connecticut River near Great Island in July. Photo: Judy Benson

Above, Judy Preston paddles through the Great Island marshes in August. Below, smooth cordgrass is anchored in layers of peat exposed at low tide at Great Island. Bottom, two egrets hunt for food on the edges of the marsh. Photos: Judy Benson

Lower Thames River: corridor for commerce, defense, recreation and education

By Howard "Mickey" Weiss

I invite you to accompany me on an imaginary voyage around the lower Thames River onboard the Enviro-Lab, Project Oceanology's research vessel and floating classroom.

Leaving the docks at UConn's Avery Point campus behind us, we enter the mouth of the river with New London Ledge Light to our port. We keep a careful watch for the frequent ferries to Long Island, Block Island and Fishers Island, nuclear submarines from the Navy base just upriver, and a multitude of other boats. The barque Eagle, a 295-foot long tall ship used by the U.S. Coast Guard Academy to train cadets, might cross our path, or a commercial fishing boat, water taxi, cargo ship, recreational power boat or sailboat.

This busy harbor, flanked by Groton on the east and New London on the west, is the easternmost deep-water port in Long Island Sound, and offers numerous opportunities to study and teach about how we depend on and care for our marine resources.

The Thames River estuary is a major educational resource for Project Oceanology, a marine science and environmental education center located at Avery Point. Every year since it was founded in 1973, Project Oceanology has brought more than 20,000 students from elementary grades to college onto the Thames onboard Enviro-Lab. The students collect marine life, sample bottom sediments, measure water quality parameters and learn about the importance of preserving and protecting coastal water and the ocean.

Students in one of the Project Oceanology summer camps board the vessel at the docks at UConn Avery Point in July. Photo: Judy Benson

As the founder and director of Project "O," I have traveled up and down the Thames dozens of times annually to conduct marine science courses for teachers, coastal management workshops for community leaders and research. I have experienced some delightful surprises on the Thames such as sighting a seal resting on a Styrofoam float half-way up the river and a harbor porpoise cavorting in Norwich Harbor. There have also been some unpleasant moments, including pulling up a very heavy old rusty motorcycle and a toilet in our badly ripped-up trawl net at the river mouth. Though I'm now retired, my interest, appreciation and concern for the Thames has not diminished.

With the anticipated establishment of the Connecticut National Estuarine Research Reserve (CT NERR), the lower portion of the Thames will take on added significance as one of the primary regions included in the reserve. The many different human uses of the Thames offer unique opportunities for the CT NERR to carry out its programs and objectives. These include research and monitoring, education, stewardship, resource management, public access and partnerships involving diverse audiences carried out under principles of environmental justice.

More so than any of the other regions of the CT NERR, the lower Thames embodies an area where many diverse and sometimes conflicting human activities occur along its heavily trafficked waters and developed shores. One example is the dredging needed to maintain the navigation channel for military, commercial and recreational vessels. Because of concerns about the ecological impact of the removal and disposal of potentially contaminated bottom sediments, regulators undertake an extensive analysis before permits are granted.

The CT NERR has the potential to generate many new scientific discoveries about the complex and dynamic Thames River ecosystem and to help implement best management practices for the ever-changing human society living and working in its watershed. Among the most urgent future challenges facing this region is the need to respond to coastal flooding due to rising sea level, by conserving and protecting critical habitats such as tidal wetlands. We also need to understand the health and environmental impacts of contaminants of emerging concern, such as

microplastics and hormones discharged into the water. These remnants of medications and other substances flushed down sinks and toilets are not removed during the wastewater treatment process.

Continuing our trip up the river, on the west we pass the New London Harbor Light, the fourth oldest operating lighthouse in the country, perched on the rocks of the city's shoreline. On the eastern shore in Groton we pass the Avery Point campus, where the CT NERR headquarters will be located. Many homes, marinas and restaurants can be seen on both sides of the river, along with fishing docks. Small beaches such as Shennecossett and Eastern Point in Groton, and Ocean Beach and Green Harbor in New London provide important recreational opportunities and access to the water for the diverse populations living in New London, Groton and beyond.

Close to these residential, commercial and recreational sites are the outfalls to three municipal wastewater treatment plants as well as Electric Boat (EB), a major heavy industrial site which constructs submarines and one of the largest employers in this region. The effluent from the wastewater treatment plants and from EB must be well treated and carefully monitored to be sure that they do not contain toxic substances or pathogenic microorganisms that could harm human health or damage the environment.

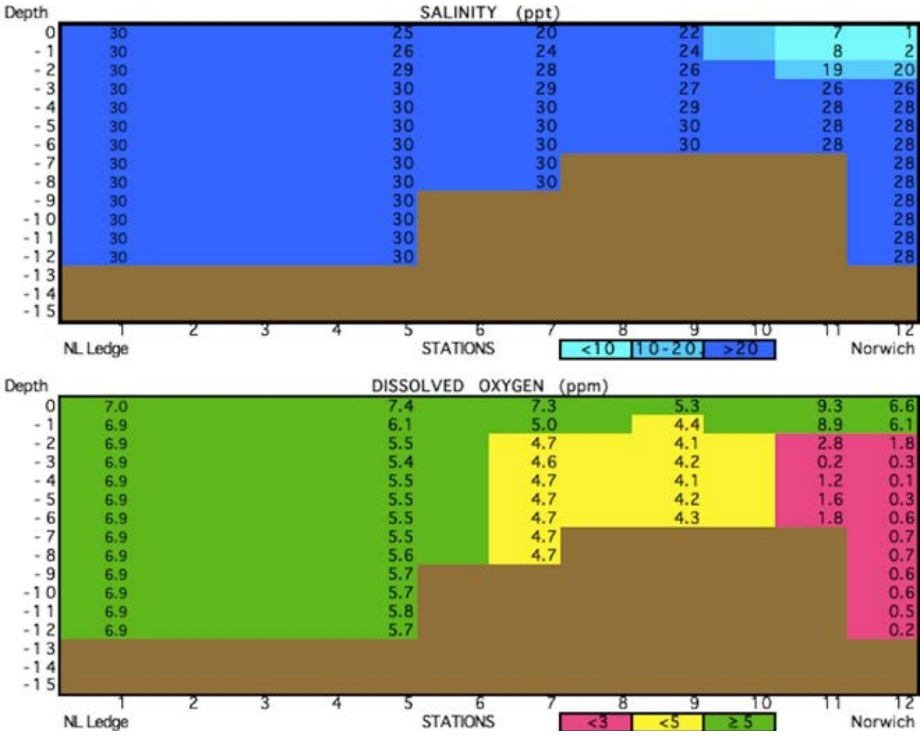
When we reach the Gold Star Memorial Bridge that carries Interstate 95 above the Thames, we are at the approximate northern boundary for the CT NERR.

A short distance to the north of the bridge we can see the U.S. Coast Guard Academy and the Naval Submarine Base New London. Further north, the shore of the river is much less developed. The Thames River is the southern end of the third largest watershed in Connecticut, originating at the Massachusetts border, and fed by many rivers such as the Shetucket, Yantic, Natchaug, Quinebaug and Willimantic. The Thames is the estuarine and tidal, portion of this system. It starts in Norwich and discharges into Long Island Sound at New London and Groton, about 15 miles downstream. This watershed contains many farms and small towns; runoff from the watershed carries nutrients and other contaminants that ultimately end up in the Thames and the Sound.

Except during extreme rainfall or flooding events, the salty tidal waters dominate the Thames. Seawater intrudes upriver as far north as the dams in Norwich and occupies all but the upper 3 to 6 feet of the water column. The normal salinity at the bottom of the Thames in Norwich is nearly the same as in Long Island Sound. A crab crawling on the bottom of the Thames or a fish swimming in all but its near-surface water might "think" it was still in the Sound based on the salinity. The freshwater supply to the river is controlled by dams in Norwich on the Shetucket and Yantic rivers and at many other locations further upstream in the watershed, such as the Mansfield Hollow Dam and at West Thompson Lake.

Research conducted by science teachers and high school students under the direction of Project O staff has determined that the bottom layer of salt water in the upper portion of the Thames is persistently hypoxic (nearly devoid of oxygen), especially during the warmer months. Further study indicated that this hypoxia is caused, at least in part, by the over-enrichment of the water by nitrogen wastes coming from upstream sources such as farms, wastewater effluent, and lawn fertilizer. Significant efforts are being made by Connecticut's Department of Energy and Environmental Protection and environmental organizations to reduce this nitrogen loading through treatment, education and best management practices. Upgrades to the Norwich Wastewater Treatment Plant now underway are one of those efforts.

We now turn the boat back downstream at the I-95 bridge and pass by State Pier on the New London shore. This large facility is the proposed site for the assembly of wind turbines which will be transported to create offshore wind farms in the North Atlantic to provide renewable energy to the populous Northeast.



The stratification of salinity and oxygen in the Thames River is shown in these graphs of the gradient of salinity (in parts per thousand) and dissolved oxygen (in parts per million) versus depth (in meters) in the Thames River from New London Ledge to Norwich. Graphic courtesy of Mickey Weiss

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We also see a busy urban scene on the downtown New London waterfront, with people boarding trains and ferries, fishing off City Pier, visiting historical sites such as Fort Trumbull State Park and The New London Custom House Museum, and enjoying restaurants and live music on the waterfront park and river walk.

Leaving the mouth of the Thames behind, we pass south into Fishers Island Sound (FIS), parts of which are also included in the CT NERR. We can observe commercial fishing boats trawling for bottom fish, hauling lobster traps and releasing clams for restocking shellfish beds. For nearly 50 years Project O has conducted frequent trawls in this area and kept records of the catch. A recently published analysis of this long-term data set (Snyder et al., 2019), shows that the species composition has shifted, with an increase of species such as spider crabs that prefer warmer water, and declines of cold water adapted species, such as lobster, rock crabs and winter flounder. This shift correlates very closely with the above-average rates of warming and acidification of the water that have been recorded over this same period, presumably due to climate change.

A study I conducted in FIS and adjoining estuaries of blue crabs showed that their abundance in the summer is highly variable from year to year and is strongly correlated with the water temperatures of the prior winter (Weiss & Downs, 2020). The blue crab is a warm water adapted species that is near the northern end of its range in FIS. The large fluctuations in its abundance are probably caused by varying overwinter survival rates. Additional research is needed to determine if the warming of the water due to climate change leads to an increase in the blue crab population over the long term.

On our boat tour we have seen many different environments and human activities within the CT NERR that will make excellent subjects for its future research, education, outreach, stewardship and other programs. I am pleased and excited that Project Oceanology will be one of the CT NERR partner organizations and will help the CT NERR achieve its objectives in the Thames, FIS, and other regions of the reserve.

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- Weiss, H.M. and Downs, J. 2020. Living near the edge: variability in abundance and life cycle of the blue crab Callinectes sapidus (Rathbun, 1896) in eastern Long Island Sound. Journal of Shellfish Research 39(2): 1–10: https://bioone.org/journals/journal-of-shellfish-research

Rediscovering Bluff Point State Park: a place of gathering

By Syma Ebbin

My 92-year-old mother, my husband, son and I launched our small boat from her house on Jupiter Point in Groton on an overcast Sunday morning, heading out of Pine Island Bay across Baker Cove and onto the Poquonnock River. Another son followed, paddling a kayak.

Sporadic rain and boat spray dampened us during the short trip to Bluff Point State Park, where my grandparents' summer house once stood. My mother, Mildred Raymond Newbury (now Ebbin) hadn't been back to the site of the house since 1938, when she was nine years old.

Despite her long absence, her enduring relationship with Bluff Point resonated through her recounted memories. Hers is one of many compelling stories that speak to the importance of this place. This beloved 806-acre peninsula—officially named Bluff Point State Park, Coastal Reserve and Natural Area Preserve—is seeing a new chapter added to its history. This magnificent site is now set to be part of Connecticut's anticipated designated National Estuarine Research Reserve (CT NERR). As in nature where each species has its own unique niche—its own place and role in the community—Bluff Point has its own special niche within the CT NERR. With its large size, historical significance, ecological diversity and long-time popularity, Bluff Point contributes to the CT NERR's mission of furthering science, recreation, conservation and education, welcoming the public to embark on explorations of their own design throughout the year.

As we pulled our boat onto the shore at Bluff Point that day, we checked a hand-drawn map for Lot 16. That was where my great-grandfather built a three-room cottage next to Mugg's Hole, a spot midway along the west side of the 1.8-mile-long peninsula. T.K. Raymond, my mom's grandfather, kept his large motorboat moored in deep water off the beach, transporting a dozen or more individuals out for frequent fishing trips where they caught porgies, flounder, striped bass, bluefish and other species. On Bluff Point, my grandparents boated, fished and clammed. My mother preferred hiking and exploring the coasts and uplands alone and with her summer friends, boating down to the Blue Shanty to get ice cream, and on rainy days working on her coin and stamp collections. They loved being near the water, swimming and soaking in the summer sun and playing cards and board games at night.

More than eight decades later, my mom now climbed over the side of the boat onto the beach. After a few moments she got her bearings, at first confused by the dense coastal forest

Syma Ebbin, right, heads home with her son Eli Kane and mother Mildred Ebbin in a small boat after visiting Bluff Point on Aug. 8. Photo: Michael Kane

that now crowded the shore, the fringing salt marsh at the edge of the beach and the absence of the brown sand beach she remembered playing on as a child. The vacation home she remembered had been situated on open, treeless land, 100 feet or so back from the swimming beach. She particularly remembered how, at low tide, she had been able to walk across the neck of water on a raised path at the mouth of Mugg's Hole to get to her friend Betty Rogers' house, which sat on the narrow peninsula of land jutting into the river. Some of the rocks which had formed the path are still visible, but the mouth is now wider and deeper, perhaps because of erosion, rising seas or the removal of rocks and sediment to allow boats to enter more easily.

At the end of their summer stay at Bluff Point in 1938, her family moved back to their home on Morse Avenue, about 4 miles away. She and her brother started school. They returned one last time in late September in the wake of the 1938 hurricane that made landfall on the 21st.

"We returned to an empty lot to sift through the mud for my parents' silverware, while my friend Betty and her family searched for her brother," my mother recalled.

During a 50th Anniversary reunion in 1988, Betty (then Betty Wadsworth) remembered that her newly married sister Carlene and husband Roger Page had been honeymooning at Bluff Point when they rowed back to the house with Betty's brother Ellsworth to get a puppy. The tidal surge of the hurricane capsized their boat, drowning Roger and carrying Ellsworth up the Poquonnock River, where he was eventually found alive.

As described by ecologist C.S. Holling, what followed was a cycle of release and renewal. The category 3 Hurricane of '38 created a veritable "ecological blank slate," destroying most vestiges of human settlement on the Bluff Point peninsula. This ultimately facilitated events and conditions that led to the restoration and protection of the coastal forests and beaches that make up Bluff Point.

Glasswort, a marsh plant that turns from green to red in the fall, contrasts with saltmarsh hay in one of the marshes at Bluff Point. Photo: Judy Benson

Also known as Gardiner's Point or Mumford Point (according to an 1868 map), Bluff Point is a rocky headland that extends into Fishers Island Sound, bounded on the east by Mumford Cove and on the west by the Poquonnock River. "Split Rock" lies at the southernmost point; to the west, Bluff Point's rocky headland adjoins a mile-long sandspit, called "the Sand Bar." Prior to the Hurricane of '38, it was connected to Bushy Point, a rocky island to the west.

The area contains sandy beaches and dunes, salt marshes, mud flats and rocky intertidal habitats at its margin. These give way in the uplands to a coastal forest dominated by oak and hickory species, shrubs such as bayberry and huckleberry and more recently, a tangle of vines: invasive Asiatic bittersweet, Japanese honeysuckle and multiflora rose, and native poison ivy, blackberry and wild grape. The Atlantic flyway transects the point. More than 200 resident and migrant bird species have been identified, including several species of concern such as the piping plover, American oystercatcher and least tern which all nest in the area. Deer and other common New England mammal species also reside here. In the 1980s and 90s, the deer population exploded, negatively impacting the growth and regeneration of vegetation with their browsing.

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This led the Connecticut Department of Energy and Environmental Protection (CT DEEP) to institute a limited hunt to cull the population.

Estuarine waters around Bluff Point contain an assortment of fish and invertebrate species, many of them recreationally and commercially important. The shores and coastal margin contain abundant quahog clams, blue and ribbed mussels, oyster and various crab species. Offshore, eel grass beds provide habitat for bay scallops. Ancient-looking horseshoe crabs spawn on the calm and sandy beaches of the north side of the Sand Bar. CT DEEP and now, Sacred Heart University's Project Limulus have been monitoring and tagging horseshoe crabs on Bluff Point for over a decade. My children and I helped with this effort in the past, hiking out at dusk to make it to the spawning area in time for the influx of hundreds of horseshoe crabs, all in search of a mate.

A bucket of clams and a clam rake rest beside a driftwood log while Larry Richard of Ledyard (not shown) uses a different rake to harvest more clams.

Before colonial settlers came, the native Pequot tribes lived along the coast of what is now Southeastern Connecticut, including the lands comprising Bluff Point along the Poquonnock River. "Poquonnock" is the Algonkian word for "cleared land," and the area near this river was the summer planting area for the native peoples. They also took advantage of coastal resources. Large shell middens found along the shoreline confirm their reliance on coastal species of shellfish. The shells of the quahog clam and whelk were fashioned into purple and white Wampum beads, then sewn into belts and other ornamental items and used in rituals and as a medium of exchange.

In the 1640s, John Winthrop the Younger was given permission by the colonial government to create a plantation on the tribal lands. Winthrop, who ultimately became the first governor of Connecticut, selected lands for himself that included Bluff Point, Haley Farm and Groton Long Point. The Winthrop residence on Bluff Point remained occupied for several hundred years until it was destroyed by fire in 1962. Bluff Point eventually passed to Henry Gardiner. In 1907 he rented it to John Ackley, a farmer who raised livestock and grew potatoes. Around 1920 Ackley subleased parcels of the peninsula to campers and the area became known as a "camper's paradise." Over 100 small wooden cottages were built, including the one my mom and grandparents summered in.

As early as 1914, efforts to protect Bluff Point began. Finally in 1963, the state acquired 246.6 acres of the Point for $1 million. This was followed in 1974 by the acquisition of 530 acres paid with $1.7 million of federal funds matched with state dollars. In 1975, Bluff Point became a state "Coastal Reserve," in part due to the existence of a "cove forest," a rare habitat in southeastern Connecticut containing 100-year-old trees. It was designated through a special act of the Connecticut legislature, "for the purpose of preserving its native ecological associations, unique faunal and floral characteristics, geological features and scenic qualities in a condition of undisturbed integrity."

Bluff Point is one of the most productive shellfish habitats in the region, with clean freshwater from Groton's public drinking water reservoir to the north mixing with tidal waters. In 2012, more than 425,000 visitors were estimated to have visited Bluff Point and the adjoining Haley Farm Park.

Visitors today fish for the same species my great grandfather targeted from shore and by boat. Recreational shellfishers wade into the brackish waters at the mouth of the Poquonnock River at low tides, digging with rakes or with their feet for the abundant quahogs. These are seeded, along with oysters, through a collaborative relationship between Groton's Shellfish Commission and the Noank Aquaculture Cooperative which utilizes a town building for its hatchery operations. Blue mussels grow wild attached to the rocks.

Every day, hundreds hike and bike, run and ride horses along the warren of trails that crisscross the peninsula. Some use binoculars to view shorebirds and wildlife or set up tripods to take photographs. In winter, skiers and snowshoers frequent these same trails. Kayakers and stand-up paddle boarders explore the peninsula's mosquito channels, inlets and beaches.

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Clammers Stephen Meskiewicz, left, Henry Sistare, center, and Len Wineski, all of Norwich, dig for clams in the mouth of the Poquonnock River at Bluff Point on July 20. Photos: Judy Benson

Haley Farm inspires many with its beauty and history, from grazing cows to preservation battles

Story and photos by Judy Benson

Right, An osprey looks out from its nest over the Palmer Cove marsh at Bluff Point.

Ospreys nest near one of the main trails.

Miles of cut stone and natural rock walls course through the fields and forests.

Wildflowers bloom where hay and corn once grew, creating havens for goldfinches, monarchs and bumble bees. Trails meander through cedar groves, upland woods, past ponds and golden-green salt marshes.

"It's just beautiful here," said Sue Holbrook, as she hiked past Palmer Cove and the osprey family that makes its summer home at Haley Farm State Park.

A resident of Oklahoma, Holbrook was in the area visiting her aunt. Remembering Haley Farm from her last visit 20 years ago, she decided to return that July day.

Gordon Gruetzmacher is one of the Haley Farm regulars. He lives a short walk from the park and comes frequently to trek a four-mile loop.

"I like to check on the ospreys, and I like the solitude," he said.

While Haley Farm has many fans, perhaps there's none more ardent than Sidney Van Zandt of Noank. She's also the ideal guide for telling the park's story, from its days as a working farm in the late 19th through mid-20th centuries, to the landmark preservation battle that led to its designation as a state park in 1970. Now, a new chapter is being added to her narrative, as the 250-acre park is set to join a collection of nearby state-owned lands and waterways in the Connecticut National Estuarine Research Reserve.

"The whole place is a favorite spot," said Van Zandt, who's led dozens of hikes there since the mid-1960s and still moves at a pace that belies her 87 years. "I've been living this for so long."

Setting out on an August morning, she pointed out the foundations of barns from Caleb Haley's farm, then a pond that provided ice to keep milk cold, then the remains of a circular path where racehorses exercised. While she is well versed in that part of the land's history, Van Zandt's passion emerges in full force when she skips ahead to the

Many of the stone walls at Haley Farm are made of large boulders hauled by ox-drawn stone pullers.

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Haley Farm's former hay and corn fields are now wildflower meadows that attract many birds, bees and butterflies.

mid-1960s. It was then that a developer sought to buy the farm to build a complex of duplexes, and she and other locals came together to stop it. Their successful effort of fund-raising, lobbying and eventually enlisting state support landed her on the cover of Life magazine in 1970 beside one of the farm's stone walls, under the heading, "Battles Won."

"Haley Farm is my heart and soul," she said in the accompanying article.

The group that began as the Save Haley Farm Committee in 1965 soon evolved into the Groton Open Space Association, with Van Zandt as its first president. Today, she serves as GOSA's vice president. Many more preservation victories would follow that first one at Haley Farm that set the course.

"When we first started this," she said, "the town said no, we need this development. Then, there was no protection of marshes. You just filled them in to get more land."

As the trailed hugged the fenced-off tracks where Amtrak trains traverse, Van Zandt paused. The tracks were first laid in the late 1800s, when dairy cows grazed the fields.

"Here's the tunnel for the cows to get through to the other side," she said, motioning toward the dark passage.

Further ahead was a footbridge built over the tracks in 1999. On the other side is a trail leading to Bluff Point State Park, another of the CT NERR properties. Together with two other parcels owned by GOSA and the town, more than 1,000 acres of contiguous land is preserved for wildlife and watershed protection, a rarity on the highly developed Connecticut coast.

"They're all basically one place," said Van Zandt. "It's all connected."

Today, Haley Farm is well loved in all seasons, by cross-country skiers and snowshoers, birdwatchers, bicyclists, horseback riders, families with babies in backpacks and strollers and hikers young and old. The variety of paved, crush stone and dirt trails—none that would be rated higher than "moderate" in difficulty—make Haley Farm accessible to people at all levels of ability. Among recent visitors were Martha Reynolds of Ledyard and Erika Sproul of Canterbury, now retired from their jobs at nearby Fitch High School.

"We used to walk this all the time when we both worked at Fitch," Reynolds said as they paused at the sign near the park entrance with historic photos of the ox-drawn stone pullers used to create the massive walls.

For Van Zandt, the pending designation of the CT NERR with Haley Farm included is another significant milestone in its history. It will be better appreciated for its connections to the other NERR properties and its value for filtering the waters that flow into Long Island Sound. Research and monitoring that the NERR will bring will further enhance its profile as an environmental and educational resource. But she believes it will also be a vehicle for telling an important story for the CT NERR, one about the evolution of people's attitudes towards the environment.

"I think it's very helpful for people to know what the mentality of the people running the town was towards conservation," she said. "It was all about development. There was no effort to control stormwater, it would just go wherever, and wetlands were wastelands. To me, this place is about the history of protecting water."

MORE INFORMATION:

Connecticut DEEP Haley Farm State Park website: https://portal.ct.gov/DEEP/State-Parks/Parks/Haley-Farm-State-Park

Map of Haley Farm State Park: https://portal.ct.gov/-/media/DEEP/stateparks/SkysTheLimit/haleymappdf.pdf

Groton Open Space Association: https://www.gosaonline.org/

To win back the health of Little Narragansett Bay, researchers first help diagnose the problem

CHANGING WATER CHEMISTRY CAUSES EXPLOSION OF INVASIVE SEAWEED

By Nancy Balcom

Researcher Veronica Rollinson, right, heads out with UConn student Holly Westbrook to the first sampling trip in January 2018.

Below: *Cladophora* mats collect in one of the inlets at Elihu Island in Stonington. Photos courtesy of Veronica Rollinson

Stonington Harbor became famous for a battle with the British Navy in the War of 1812.

In recent decades, a very different kind of battle has been waged in the waters of the state's easternmost community. Unlike the earlier conflict, this adversary has made a gradual, stealthy and successful advance to domination. Stopping and ultimately reversing the damage required a different sort of foot soldier—one armed with water collection tubes and an understanding of the complex chemistry that happens when rivers carry too much of what flows off the land with them to the sea.

"I grew up around here and this was happening in my own backyard," said Veronica Rollinson, who earned her master's degree in marine science working on the research project. "I was intrigued as I've boated with my family on Little Narragansett Bay. We didn't notice this happening as we weren't digging up the bottom or spending time on the beaches, but it is something very near and dear to my heart."

The enemy in this case is the invasive filamentous green seaweed *Cladophora* that had taken over the bottom of Little Narragansett Bay. A scenic area popular with recreational boaters, the bay is shared by Stonington and Westerly, R.I., its neighbor across the Pawcatuck River that divides the two states. In the bay, fresh water flowing from the river mixes with salt water from Long Island Sound—typically the ideal conditions for a rich marine ecosystem.

That was the case until the early 1990s, when eelgrass beds and bay scallops were abundant there. Then different seaweeds began replacing the eelgrass—seen as an indicator of a healthy ecosystem because it thrives when nutrients from water flowing off the land are at optimal low levels. By 2010, *Cladophora* had won, turning the bay into a virtual monoculture.

Residents' complaints about the seaweed increased as gooey mats some three feet thick left boat propellers entangled and beaches covered in mounds of putrid decaying seaweed.

Oddly, according to Jane Sawyers, supervising environmental scientist with the R.I. Department of Environmental Management (RI DEM), *Cladophora* mats are not as apparent on the Rhode Island side of the bay, presenting another mystery about how the freshwater and estuarine parts of the watershed are functioning.

Excess levels of nutrients, particularly nitrogen, were super-fueling the growth

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of *Cladophora*. Decomposition was following explosive growth, reducing the amount of oxygen present in the water to levels that couldn't support animal life. Frequent nighttime low oxygen events in the shallow coves of Little Narragansett Bay have been linked to the abundant *Cladophora*. This process of eutrophication has long been a focus of water quality improvement programs.

Proper management of the amount of nitrogen entering the Pawcatuck River and ultimately Little Narragansett Bay requires an understanding of how much is being loaded and from which sources. That means parsing out the so-called "point sources"— those that originate from an identified outfall pipe, for example—from "nonpoint sources"— those that flow off land and pavement as individual trickles that accumulate.

Within the Pawcatuck River watershed and estuary, there are two wastewater treatment plants (WWTPs) in Westerly and Stonington, and an industrial facility in Kenyon, R.I., all potential point sources of nitrogen (and all currently meeting their discharge permit requirements).

Nonpoint sources include runoff from urban, residential or agricultural activities into surface waters or groundwater discharges. The majority of the Pawcatuck's watershed is in Rhode Island with a small section in eastern Connecticut. The sparsely populated upper watershed has forests, wetlands and numerous turf farms. The lower watershed, closer to the mouth of the river, is more densely populated.

With Connecticut Sea Grant support, University of Connecticut marine science faculty Julie Granger and Jamie Vaudrey led a two-year study to identify and quantify the sources of nitrogen entering the Pawcatuck River and Little Narragansett Bay, spurred on in part by the massive blooms of *Cladophora*.

The researchers instituted four sampling methods, undertaken over 12 months between 2018 and 2019. Weekly samples were collected near the Stillman Bridge at the mouth of the freshwater portion of the river and at the limit of seawater intrusion, near the Route 1 bridge connecting Pawcatuck to Westerly. Weekly effluent samples from the Westerly WWTP were analyzed. Three seasonal surveys of 15 locations along the river were conducted and rainwater collected at UConn-Avery Point.

"The sampling was intense overall," said Rollinson. "It was weekly sampling from two primary locations and then seasonally we added a third location. On top of that, there were the river transects themselves. It was a behemoth effort to organize the sampling alone, and then the processing of the samples…I believe there were 375 sampling grabs and over 7,500 unique data points in the end."

As a quick refresher of long-forgotten chemistry lessons, nitrogen is an important component of proteins, essential to plant and animal growth. In its gaseous state, nitrogen comprises more than 70% of the atmosphere but is not available for protein building. "Reactive nitrogen" refers to interrelated nitrogen compounds, such as ammonia, nitrate and nitrite, that can support protein building and therefore growth. These compounds change constantly in the environment, and while essential, too much reactive nitrogen can lead to serious environmental consequences such as eutrophication and acid rain.

UConn Marine Sciences faculty Jamie Vaudrey, left, and Julie Granger, center, worked with graduate student Veronica Rollinson on the project. Photo: Judy Benson

The research team monitored the concentration of reactive nitrogen species delivered from the Pawcatuck River into Little Narragansett Bay. They measured naturally occurring stable isotope ratios of nitrate to trace nitrogen sources and cycling, enabling them to determine the dominant sources of nitrogen entering the watershed, including industrial fertilizers, livestock farms, septic systems and natural sources. Similar analyses were conducted on the effluent samples from the WWTP. The samples collected during the seasonal river surveys were used to identify distinct nitrogen sources from the watershed.

"We brought oceanography to land," said Granger, associate professor of marine sciences, who led the research team. "We used an interpretational scheme for the nitrogen isotope ratios of nitrate that was more oceanographic than what has traditionally been done with river studies, an empirical framework {meaning verifiable through observation} that hadn't been tested in rivers before, whereas in the ocean it has been more rigorously tested.

"We were very ambitious and ended up sampling and measuring far more than we could include in her thesis," Granger added. "We focused on the river exclusively for this project but Veronica collected a ton of samples from the estuary too. Overall a heroic number of samples… unprecedented for a master's degree, I'd say."

The sampling days often started by sunrise and ended by dusk. Sometimes Rollinson had help from undergraduate volunteers and other days she completed the sampling by herself. Off the water and back in the lab, she then preserved and organized samples before ending exhausting 12-to-16-hour days. Figuring out the best way to manage such a large volume of samples proved to be an education in and of itself and Rollinson learned that

Students from a marine science class kayak into the upper Pawcatuck River to collect water samples for a class project in the fall of 2019. Photo courtesy of Veronica Rollinson

sometimes the best laid sampling plans on paper must be scrapped when put to the test in the field.

"When sampling the upper river, we first tried to kayak with two groups and while we had this whole huge plan, logistically it didn't work out," she said. Undergraduate students enrolled in the course titled, "Measurement and Analysis in Coastal Ecosystems" applied their new knowledge in the field by helping to collect and analyze some of the samples.

What did this astronomical amount of data tell the research team about how nitrogen cycles through the Pawcatuck River? The two WWTPs contributed very little nitrogen to the overall loading amount during the winter months, when the discharge of nitrogen from the Pawcatuck River was at a seasonal high.
During the warmer, drier months, the decrease in the nitrogen discharge from the river elevated the significance of the WWTPs' and the industrial plant's nitrogen contributions to the total estuary loading. The larger fraction of riverine nitrogen in the Pawcatuck during drier months otherwise originated from deeper groundwater in the agricultural areas of the upper watershed and in urbanized portions of the lower watershed, the researchers found. During wetter, colder months, reactive nitrogen in the river originated disproportionately from shallower groundwater and surface waters.

Comparison of their data to historical measurements revealed that nitrogen discharge from the Pawcatuck River has increased in the last 20 years, an environmental change that could help explain the disappearance of eelgrass beds and persistence of *Cladophora*.

Their findings stress the importance of considering seasonality of riverine nitrogen sources and loading to mitigate eutrophication in receiving estuaries, perhaps paving the way for the return of eelgrass beds in the future. According to Vaudrey, assistant research professor of marine sciences and co-leader of the research project, 80% of the nitrogen would have to be removed from the system to spur the return of eelgrass, based on their nitrogen loading model.

Amanda Dostie, UConn Marine Sciences student and IDEA grant recipient, scoops *Cladophora* from the waters of Little Narragansett Bay in summer of 2014. Photo: Jamie Vaudrey

"The management of nutrients focuses on the summertime period," said Vaudrey, "and that seems short-sighted to me as we're getting warmer winters. Winter reductions are more important than people think.

"*Cladophora* is bright and green in winter," she added. "It is not dormant but growing slowly, although not at the levels of summer when it rapidly cycles nutrients for growth."

Watershed management for the Pawcatuck River watershed and estuary is the focus of an ongoing collaboration between the Connecticut Department of Energy and Environmental Protection (CT DEEP) and RI DEM, backed by the public's interest in nutrients and the health of coastal embayments. With funding from the U.S. EPA and Restore America's Estuaries, the two agencies are collaborating on a watershed grant to evaluate nutrient loadings to the Pawcatuck River estuary and Little Narragansett Bay. The goal is to develop a new watershed-focused approach to analyzing and managing nutrient impacts on coastal estuaries.

"This collaborative project with Rhode Island involves pairing two models, one describing water quality in the freshwater upland portion and the other, water quality in the estuarine waters," said Traci Iott, a supervising environmental analyst with CT DEEP. "We chose the Pawcatuck River watershed for this pilot effort after reviewing Dr. Vaudrey's previous modeling work that ranked Long Island Sound embayments based on nutrient levels and hope to apply the process to other embayments."

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Granger and Rollinson said that their data have been shared with both CT DEEP and RI DEM, in the hopes that their research can contribute to both the ongoing paired modeling effort and ultimately, the restoration plan for this watershed.

"We are collecting data for this watershed from wherever we can find it—including EPA, USGS (U.S. Geological Survey) CUSH (Clean Up Sound & Harbors), Rhode Island and the Unified Water Study," said Iott. "The data from this {Sea Grant-supported} study will be evaluated for inclusion in the model looking at water quality in the estuary."

Once both models are calibrated, validated and linked, they will be used to set water quality targets for the embayment, most likely focused on clarity and dissolved oxygen. Identifying the nutrient levels in the estuary is necessary to support these water quality goals.

"From there, we determine what nutrient load reductions need to occur in the upland part of the watershed to achieve these targets," Iott said. "It will be a fully public process as we go."

What three steps would the UConn research team take first if they were managing this watershed?

"I always tell managers, don't put your outfall in a river, move it to the ocean where it's diluted," said Vaudrey. "I know it's expensive but it's worked for Boston Harbor and other places. Next, go after the nonpoint sources of nitrogen that are concentrated, like getting the turf farms to pay attention to the amount of fertilizer they require."

Noted Granger: "Fertilizer is so cheap, the incentives are not there to monitor how much you use."

Vaudrey agreed.

"It's a hard angle to go after without some kind of legislation requiring it," she said.

Industrial plants like the one situated in the upper watershed "could be directing their outfall into a created wetland," Vaudrey said. "Forests have been created to remove nitrogen, toxins and help sequester carbon. There are just so many other options than just dumping it in the {nearest} river."

Through these complementary efforts to understand nitrogen loading and establish targets to reduce nitrogen inputs from different sources, this coastal embayment has a strong chance to return to a healthier state, and the lost bottom retaken from *Cladophora*.

MORE INFORMATION

CT DEEP – RI DEM Pawcatuck River Watershed Nutrient Project https://portal.ct.gov/DEEP/Water/TMDL/Pawcatuck-Watershed-Nutrient-Project

USGS – U.S. Geological Survey; CUSH – Clean Up Sound and Harbors www.cushinc.org

A historic mural depicting a prehistoric landscape is seen through steel beams erected as part of the Peabody Museum renovation project.

Above, Kailen Rogers, associate director for exhibitions at the Peabody, shows renderings of the new museum to article author Kira Goldenberg, center, and Arnelle Larose, exhibitions intern at the museum, in August. Below, a workman uses a jackhammer to break up old flooring in the museum. All photos: Judy Benson

Yale's iconic natural history museum being transformed physically and culturally

ALREADY A PREMIER EXHIBIT AND EDUCATIONAL INSTITUTION, PEABODY BEING REMADE FOR A NEW ERA

By Kira Goldenberg

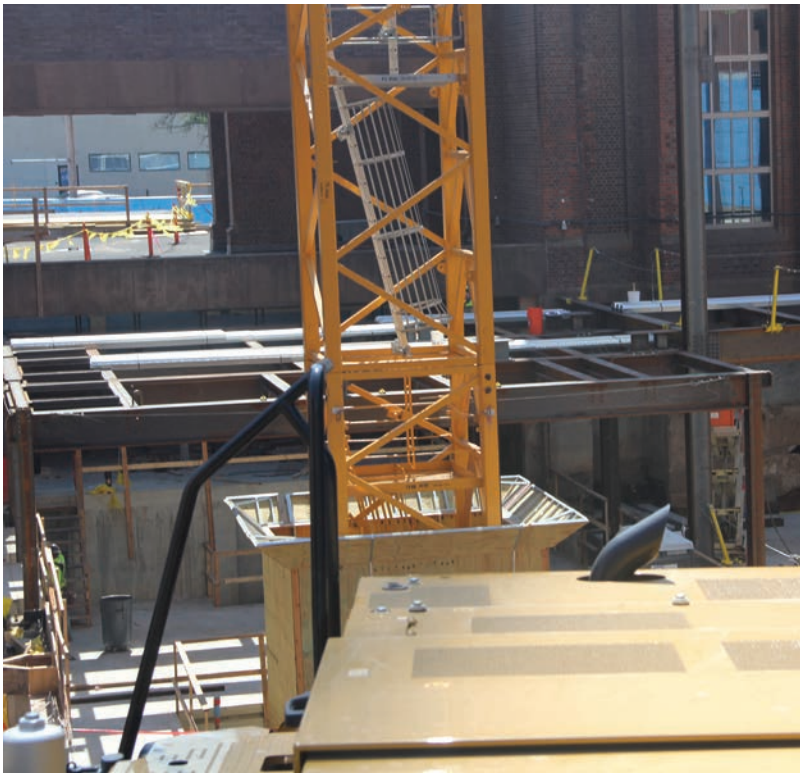
A shiver ran through me as Tim White, the director of collections and research at the Yale Peabody Museum of Natural History, opened a padlocked plywood door and then parted one of the air-tight metal doors within it.

There, without the glass that normally shields them from interlopers, were three American bison, standing placidly amid rolling Western plains. They have been dead for 150 years: legend has it that the bison were shot by Wild Bill in the 1870s. But they looked uncannily alive, quite capable of pulling some *Night at the Museum*-style capers if left unattended.

The bison and their taxidermied neighbors in the museum's North American Diorama Hall have been wowing visitors since the exhibit—many of its murals painted by the same artist who did the dioramas in the American Museum of Natural History—first debuted in the 1940s. They are one of just two parts of the Peabody, which opened in 1876 and has been in its current building since 1924, that will remain unchanged when the museum finishes its first major renovation in more than 90 years.

By late last summer, the 1920s building had been pared back to its studs. Special protective walls were built around the dioramas and two historic murals—the Age of Reptiles and the Age of Mammals—that will connect the Peabody's past as a groundbreaking physical science museum to its future as an institution with more classrooms, more light and more display space.

An American bison appears to graze beside its calf in the short grass plains of the West, one of the historic dioramas at the Peabody Museum. Photo: Judy Benson



As the Peabody is being rebuilt from the inside out, former exhibit halls are filled with scaffolding, beams and construction equipment. Photo: Judy Benson

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PEABODY RENOVATION WILL ENHANCE EXPERIENCE FOR KEY AUDIENCE: SCHOOLCHILDREN

The Peabody Museum renovation brings a great asset to Connecticut students: updated educational resources and facilities.

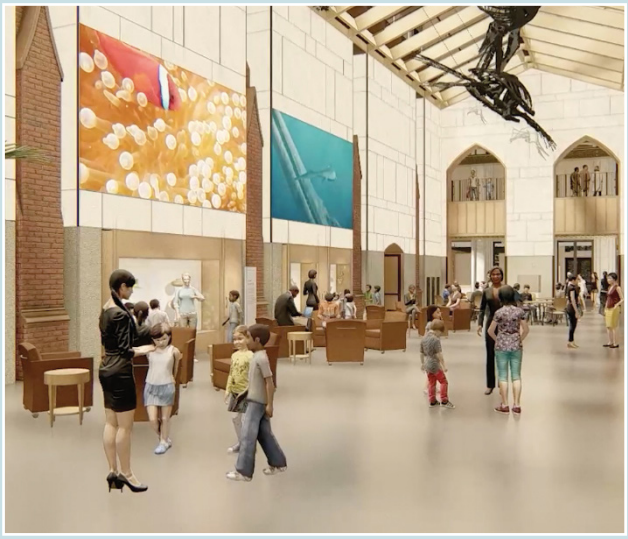
The museum has been an educational asset for generations of schoolchildren throughout the state, and the reimagined museum will bolster this offering, starting with an entrance dedicated to school groups with the capacity to handle up to three buses at once.

Before the renovation, the Peabody lacked a separate entrance for school groups, leading to overcrowding, noise and chaos in the shared public lobby. School groups will also have access to new classrooms, storage, programming and a lunchroom, Manager of School and Teacher Engagement Tom Parlapiano said.

"Everyone in the Education Department is excited to have a modern teaching facility where we can guide students as they explore science using the exceptional resources of the Peabody Museum," he said.

Even before these improvements, the Peabody was a big draw for schools. In 2019, pre-pandemic, 444 youth or school groups visited the museum. With new resources devoted to serving students, those numbers can grow without compromising the general public's visitor experience.

Kira Goldenberg



Two renderings show what the new Peabody museum will look like. Images provided by Reigh & Petch Design International / Centerbrook Architects and Planners

When the Peabody reopens in 2024, the dioramas will remain but the ways available for visitors to interact with them will be vastly different and larger.

Construction work is taking place on the exterior as well as the interior of the museum. Photo: Judy Benson

The renovation was announced in 2019, made possible thanks to a $160 million donation from Edward P. Bass, Yale class of 1968, a longtime donor to science and conservation-related causes. It will allow the museum to completely modernize, integrating contemporary best practices and technology into a structure that wasn't previously built to include it.

Slated for completion in 2024, the project excites staff because of the increased number of objects that will be on display, with 50% more exhibition space. An entire section on ancient oceans, for example, will be installed for the first time, along with integrated classroom spaces that will allow for more real-life immersion in the eras and objects under scrutiny.

"If someone wants to teach a class using a mastodon skull, that's not ridiculous. We can do that," said Museum Director Dave Skelly.

But the project is, crucially, just as much a narrative overhaul as it is a physical one: Peabody staff is working to change the tenor of the museum. Instead of being a place where scientists are experts doling out knowledge to the public, it is becoming one where what we know is constantly changing, both based on new discoveries and on including historically marginalized voices.

"The idea that we needed to be able to allow more different people to tell stories and do it more often —that was fundamental to the whole project," Skelly said. "It's been very clear for a while that museums need to adopt a more inclusive posture. The expert behind the curtain telling you what it is—that's not a way to think about this."

That means making concerted efforts to bring more voices, both within and outside of the science world, into the mix.

"What we're increasingly thinking about is the authority by which we hold materials and the authority with which we interpret them for audiences," said Chris Norris, the museum's director of public programs.

The dioramas are case-in-point: the murals, painted in the 1940s, depict a landscape untouched by human intervention even as the animals that stand beside them had to be pursued, killed and preserved to create the tableau. They are, essentially, a history of human storytelling—which in the West has been overwhelmingly white and male—as much as they are scenes that convey scientific information.

When the Peabody reopens in 2024, the dioramas will remain but the ways available for visitors to interact with them will be vastly different and larger. That's because three college-aged alumni of Sci.CORPS, the museum's high school career readiness program, teamed up to craft shortened explanatory text focused on sensory description, select poetry by people indigenous to the landscapes depicted, write guided questions, and even create games for future visitors to use while engaging with the exhibit.

NATASHA GHAZI

"What we're really doing is figuring out which stories we want to tell and how we want to tell them," said Natasha Ghazali, one of the Sci.CORPS alums. The Yale College senior spent the latter half of high school as a Sci.CORPS member, helping guests in the Peabody's two diorama halls interpret what they were seeing.

"It flips the script for who is an expert in museum spaces," Ghazali said. "We wanted the exhibit and the writing in the exhibit to be more accessible and less about rich white professional science men. This has to be a space for more people to come as they are and learn however much or however little they want to."

NEETI JAIN

The Sci.CORPS alumni are working under the guidance of Neeti Jain, a National Science Foundation graduate fellow and a master's student at the Yale School of Environment.

"They're bringing voices into the curation process that I think the museum doesn't always get," Jain said. The objective is to turn what was formerly a dry process of reading facts and figures into a more immersive experience with touchpoints that appeal to a broader array of visitors.

That's the goal for serving future visitors museum-wide. Beyond the dioramas, collection displays are being completely reimagined, both philosophically and physically.

"I was at eye level with these carved skulls from New

continued on page 22

Photos courtesy of Natasha Ghazi and Neeti Jain

Guinea that were in one of our anthro halls," Skelly recalled, reminiscing about a childhood visit. "They were still there just a couple years ago. That's a long time to have one exhibit up."

The museum's iconic brontosaurus skeleton—the first-discovered of the species, named by Yale paleontology professor O.C. Marsh in 1879—is getting a refresh. (It was Marsh who convinced his uncle, George Peabody, to donate funds to create his namesake museum.) Updated scientific knowledge has revealed that the way the fossilized structure long stood as installed, with its head high and tail brushing the ground, was an inaccurate representation of how brontosauri moved across the Earth. They actually walked with head and tail off the ground, in more of a horizontal line parallel to the ground. When the skeleton is re-installed, it will reflect this update, with the neck and tail floating above visitors' heads.

This, though, puts it at odds with the brontosaurus depicted in the Age of Reptiles mural. It was painted in the 1940s by Rudolph F. Zallinger, who started the project while he was still a fine arts bachelor's student. He created innovatively realistic plant and animal ecosystems reflecting the knowledge of his era.

"That is something that we will be calling attention to, this artistic artifact that commemorates the science of 1942," said Kailen Rogers, associate director of exhibitions. "The answer is not just, 'let's repaint the mural.' We're always adapting as we learn new information."

That new information is now something the Peabody is seeking as it rebuilds its exhibits. Conservator and paleontologist Mariana Di Giacomo, who is from Uruguay, is writing about South American fossils in both English and Spanish. Museum officials are discussing the return of significant artifacts to the descendants of their Indigenous creators. For objects that remain, they are working to make tribal voices an integral part of exhibiting them. Rogers is even part of a team partnering with Sanctuary Kitchen, the New Haven-based food organization run by area immigrants and refugees. The Peabody team is planning a storytelling workshop for the chefs there this fall with hopes that some of those stories will eventually inform related exhibits.

"Our goal," Rogers said, "is to make more people feel that the Peabody is a place for them."

MORE INFORMATION:
https://peabodyevolved.yale.edu/

Right, Tim White, left, director of collections and research at the Peabody, and Christopher Renton, associate director for marketing and communications, open doors protecting the Amazon jungle diorama. Below, workmen prepare one of the rooms for creation of new exhibit space. Photos: Judy Benson

Photo courtesy of Veronica Rollinson

TALK TO US

Send comments and questions about this issue to: judy.benson@uconn.edu

We'll share as many as possible, along with our responses, at: seagrant.uconn.edu

Bluff Point, *continued from page 12*

Jackie Steele, left, and Zekiah Wright, both of Los Angeles, head for a walk at Bluff Point on July 20 while visiting the area. Steele is originally from New Haven and lived in New London before moving to LA. Photo: Judy Benson

Staff and students of Project Oceanology land their small boat at Bluff Point as part of an educational activity. Photo: Callie Scheetz

Educators bring students to learn about the geology and biology of coastal ecosystems, sample the waters for nutrients and dissolved oxygen, and to experience hands-on learning. Volunteers survey shorebird nests, tag horseshoe crabs, cut invasive species and pick up trash along the beaches.

Bluff Point is well-loved by Connecticut residents near and far. Its ecosystems have real value to the biota of the region, to humans and even to our local economy. These anthropocentric values have only become more important since the Covid-19 pandemic has arrived and lingered.

Throughout days of quarantine and confinement, Bluff Point's parking lot was crowded most days. Its trails filled with folks walking and biking through the coastal forest, along the sandy beaches and salt marshes, simply rejoicing in being outside in nature. How provident that this fine piece of land should be saved for us to enjoy.

MORE INFORMATION:
https://portal.ct.gov/DEEP/State-Parks/Parks/Bluff-Point-State-Park

What's in our names?

The wrack line at high tide on the barrier spit at Bluff Point in September is de-

What are wrack lines? The word wrack is a term for various kinds of seaweed, and wrack lines are the collections of organic matter (sea grass, shells, feathers, seaweed and other debris) that are deposited on shore by high tides. More generally, wrack lines are where the sea meets the land.

With our magazine *Wrack Lines*, we tell stories about the intersection of the land, sea and Connecticut Sea Grant. So what is Connecticut Sea Grant? One of 34 Sea Grant programs across the country, it helps residents make the most of our coastal resources and inland waterways.

It addresses the challenges that come with living by the water or within the Long Island Sound watershed, in a state with 332 miles of shoreline and three major tidal rivers. This NOAA-state partnership based at UConn's Avery Point campus works with aquaculture farmers, fishermen and seafood purveyors to help their businesses prosper.

It funds research essential to understanding and managing our changing coastal and inland environments. It provides communities and local leaders with the information they need to make better land and shoreline decisions that result in more resilient communities and healthier watersheds. It educates students as well as teachers and adults of all ages about the marine environment.

Connected to experts and residents who live, work and recreate in the Sound and its watershed, it brings diverse interests together around a common purpose of working for mutually beneficial solutions to problems.

Small in staff but big in impact, Connecticut Sea Grant is like a pilot boat that navigates the way for large vessels toward safe harbors. Since 1988, Connecticut Sea Grant has supported "Science Serving the Connecticut Coast."

DON'T MISS AN ISSUE!

Wrack Lines is available online at: **https://seagrant.uconn.edu/publications/wrack-lines/**

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University of Connecticut
Connecticut Sea Grant
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Judy Preston, left, and Judy Benson paddle into Great Island this summer. Photo: Thomas Clark

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