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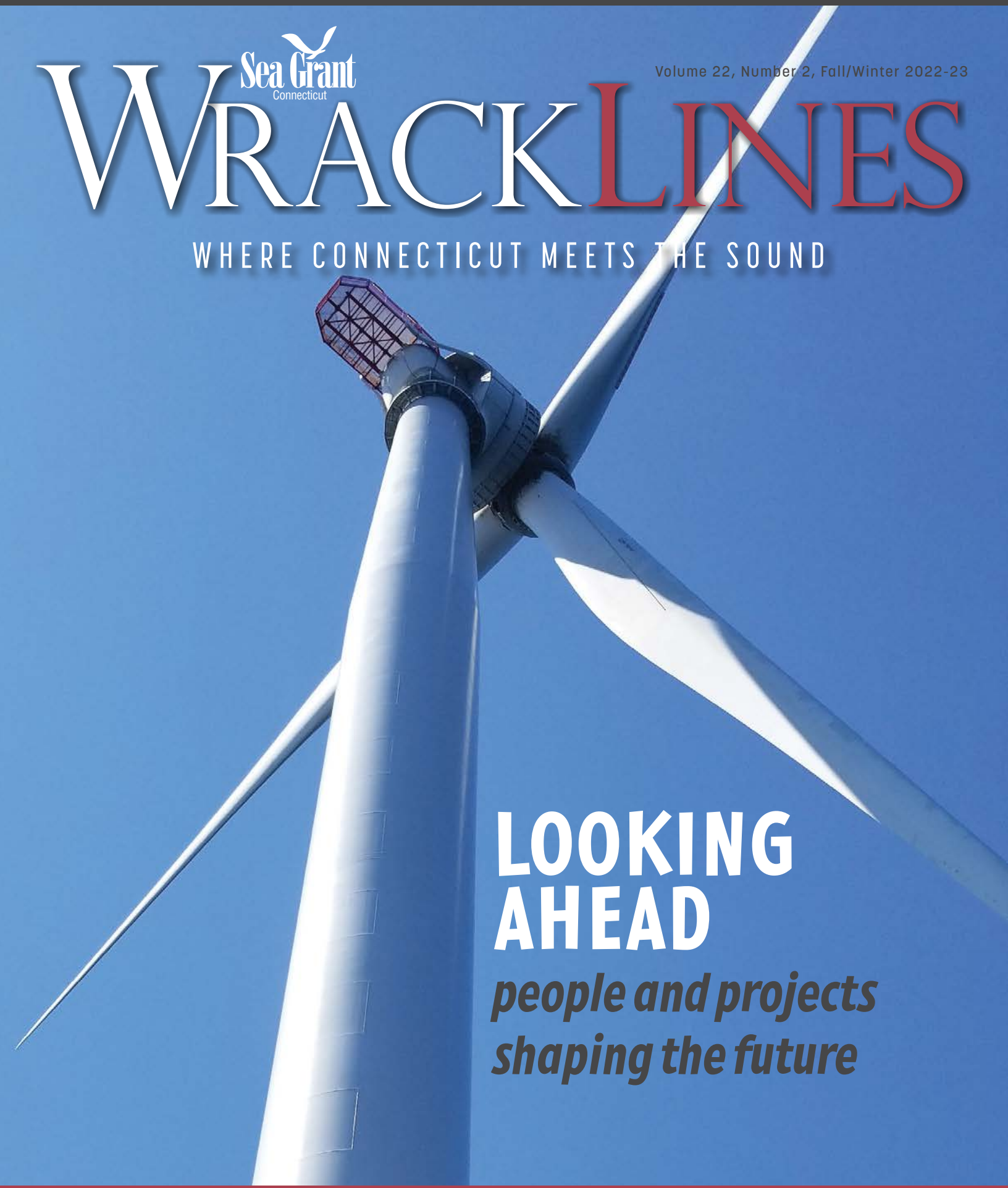
Sea Grant Connecticut

WRACKLINES

Volume 22, Number 2, Fall/Winter 2022-23

WHERE CONNECTICUT MEETS THE SOUND



LOOKING AHEAD

people and projects shaping the future

ARTIST STO LEN • FOREST REBIRTH • TOM VISEL'S LEGACY • STANCHING THE CHEMICAL SOUP

Sea Grant
Connecticut

Volume 22, No. 2 Fall/Winter 2022-23

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From the EDITOR

As if pulled by an invisible lure, bicyclists, parents with children and elderly couples came to the seaside overlook that warm September day to stare out at five wind turbines spinning three miles off the southeast coast of Block Island.

Just behind them on the grassy hillside, I and about 20 of my colleagues from East Coast Sea Grant programs sat listening to a social scientist and an island resident recently retired from the National Oceanic and Atmospheric Administration describe what they've learned since the turbines began generating electricity. This fall marked the fifth anniversary of the Block Island Wind Farm, the first offshore turbine installation in this country.

Visitors to Block Island view two of the turbines as the ferry approaches the dock in September. Photo: Judy Benson

But neither the rapt onlookers nor the Sea Grant group were interested so much in celebrating this milestone as in understanding what it means for the future. These five turbines are the forerunners of veritable cities of power-producing wire and steel towers on track to rise in the ocean waters off the East Coast over the next decade or so.

As federal and state regulators, commercial fishermen and coastal communities prepare for what's coming and air their hopes and concerns, the realities of the present can't be ignored. Just like prophets of old, scientists and environmentalists are calling attention to the damage already being done to us and the natural world by climate change, and the urgent need to reduce carbon emissions from fossil fuels to prevent catastrophe. They aren't so much predicting the future as they are making us aware of our need to change in the present.

What's needed is a new kind of relationship between humans and the Earth we depend on, one that accounts for the limitations of both. The British author Adam Nicholson, in his recent book *Life Between the Tides*, suggests that rethinking our primal attraction to the shore can open us to a healthy shift towards realizing ourselves as part of nature, rather than above or apart from it.

"We still go to the seaside for consolation and simplicity. Demands and anxieties seem to drop away there; things still are as they were when we were 10. The rock pools still beckon, the blennies and gobies [types of fish] still shimmer beneath us. But there are ironies in choosing the shore as a theater for reassurance. Even if its changes are dependable and rhythmic, it is thick with variability. A tidal coast is filled with that paradoxical quality: reliable unreliability, both closed and open-ended, both familiar and strange. Regularity toys with uncertainty there. Nothing is more predictable than the coming and going of the tide and yet nothing about it can be relied on: daily revelation and daily erasure, daily loss and daily acquisition."

In this issue, the stories look at different ways people and projects are responding to present challenges and looking to create a better future. Offshore wind projects promise to provide clean energy. Land conservation advocates are helping a dying forest to be reborn and setting an example for others to follow. Educator Tim Visel saw a need for marine trades and aquaculture programs in Connecticut schools and helped ensure new generations of coastal stewards are nurtured. The artist sTo Len turns trash and polluted water into art that sends gentle but persuasive messages about the need to care for the world around us. And the scientists leading the project on the proliferation of dangerous chemicals in the environment hope to make a dent in a big, complicated problem threating our well-being.
These are examples of the kinds of actions we can all emulate to bring about positive change.

As the Jewish philosopher Martin Buber said, *"The future stands in need of you in order to be born."*

Judy Benson

Cover photo: One of the five turbines situated offshore from Block Island is seen from a vessel traveling close to the wind farm. Photo: Syma Ebbin

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About OUR CONTRIBUTORS

NANCY BALCOM

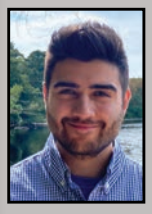
Nancy Balcom is the associate director and extension program leader for Connecticut Sea Grant and a senior extension educator with UConn Extension. Her extension interests range from safe seafood handling and safety at sea to disaster risk communication and community resilience. She has been part of the Sea Grant family for more than 37 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.

STO LEN

sTo Len is a genre-fluid artist in printmaking, installation, sound, video and performance. His printmaking updates traditional techniques such as Suminagashi (floating ink) and Gyotaku (fish impression) into a collaboration with nature and a site of discourse on environmentalism and art activism. Len has co-created with waterways, transformed public spaces into art studios, recycled waste into art materials and hosted performances at Superfund sites. He is a member of Works on Water, an artists and activists group working with and about water amid climate change and environmental justice concerns.

JULIANA BARRETT

Juliana Barrett is an extension educator emerita with the CT Sea Grant College Program and the UConn Department of Extension. Her work focuses on climate change adaptation and coastal habitat management in collaboration with multiple partners. Prior to coming to Sea Grant in 2006 she worked with CT DEEP on management plans for state natural areas and for The Nature Conservancy as the director of the Connecticut River Tidelands Last Great Places Program. She has a doctorate in plant ecology from UConn and is co-author of *The Vegetation of Connecticut*.



BEN CRNIC

Ben Crnic is a journalist living in Tolland County who is currently a newspaper reporter for the *Journal Inquirer* of Manchester, where he covers local and breaking news. He has also contributed to the Connecticut Mirror. He recently graduated from the University of Connecticut, where he earned a bachelor's degree in both journalism and geoscience. He enjoys writing about the environment, and when he is not writing, he is usually exploring the state's hiking trails. On his bucket list: spending more time by Connecticut's shoreline.

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 book created in collaboration with artist Roxanne Steed: *Earth and Sky: Nature Meditations in Word and Watercolor,* published in 2021 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.

Winds of change: Connecticut starts to see signs of offshore turbine development

THE FIRST IN A SERIES OF ARTICLES ABOUT VARIOUS FACETS OF OFFSHORE WIND DEVELOPMENT IMPACTING CONNECTICUT

By Nancy Balcom

Today, just seven turbines harness the power of North Atlantic winds along the East Coast—five 328-foot towers offshore from Block Island, R.I., and two twice that height in waters off Virginia.

Over the next several years, thousands of even larger electricity-producing machines are expected to rise from the sea floor from Maine to Florida, mimicking scenes already common in Europe. Evolving rapidly, the offshore wind industry represents a new area of engagement for Connecticut Sea Grant and Sea Grant programs nationwide. As such, I have begun working my way up a new learning curve to understand this energy source and explore how Sea Grant should share knowledge and assess related needs, concerns and opportunities.

Recognizing this emerging need, National Sea Grant established an offshore wind extension liaison, Jen McCann, director of R.I. Sea Grant extension. The National Oceanic and Atmospheric Administration provided $350,000 to jumpstart Sea Grant's capacity to serve its constituents as offshore renewable energy is incorporated into our marine ecology, economy and communities. The seven Northeast Sea Grant programs in partnership with NOAA's Northeast Fisheries Science Center and the U.S. Department of Energy's Wind Energy Technologies Office and Water Power Technologies Office jointly funded six social science projects, currently underway, to better understand the effects of ocean renewable energy on community resilience and economies.

As these broader efforts advance, Connecticut Sea Grant staff are delving into the specifics of our state's involvement with offshore wind. Although no wind farms are planned for Long Island Sound, projects in nearby ocean waters will affect Connecticut. Like other Sea Grant programs, we are looking to define our place in this complicated and dynamic field involving federal and state regulators, business, commercial fishermen and environmental groups. Even as my self-education continues, I want to share what I've learned thus far. This first of several articles is not a comprehensive explanation of the pros, cons and tradeoffs associated with offshore wind, but an overview of relevant state government actions and the three offshore wind projects impacting Connecticut: Revolution Wind, Beacon Wind and Park City Wind.

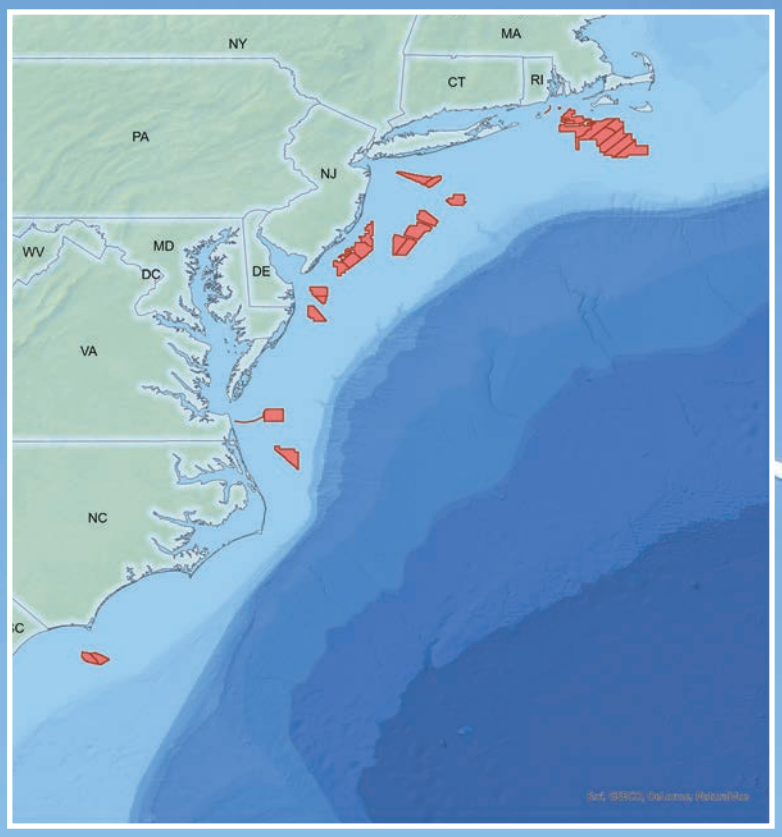
Public understanding is important because offshore wind energy may soon be powering our homes. Supplies of oil and natural gas, which we have traditionally relied upon to power our cars, heat our homes and light our way, are limited, finite and contribute to climate change. While nuclear energy provides power without carbon emissions, the waste it generates remains problematic. Renewable energy sources—wind, solar, geothermal and hydropower—are replenished continuously.

CONNECTICUT SETS THE STAGE

In recent years, Gov. Ned Lamont, the Connecticut General Assembly and the Connecticut Department of Energy and Environmental Protection (CT DEEP) have taken steps to reduce our reliance on fossil fuels by turning to carbon-free renewable energy sources such as solar and offshore wind power.

In May 2019, Lamont announced a public-private partnership between the Connecticut Port Authority, Gateway New London LLC and joint venture partners Ørsted and Eversource that included a plan to redevelop the New London State Pier into a world-class, state-of-the-art port facility. In June 2019, Governor Lamont signed House Bill 7156, *An Act Concerning the Procurement of Energy Derived from Offshore Wind*, authorizing the development of wind energy in Connecticut and the purchase of up to 2,000 megawatts (MW) of power, equivalent to powering one million homes. (A megawatt is the unit used to measure bulk electrical power, equivalent to one million watts or 1,000 kilowatts). In December 2019, CT DEEP contracted with Avangrid to provide 804 MW of power (about 14% of Connecticut's required electricity supply) through Park City Wind.

The governor signed Public Act 22-5, *An Act Concerning Climate Change Mitigation* last May, which codified into law the 2040 zero-carbon electric grid goal he had established though the executive order three years earlier. The goal is to power 100% of the state's electricity needs from sources other than natural gas and oil by 2040.



The red area in the top right, identified by the federal Bureau of Ocean Energy (BOEM) as "Commercial Leases Offshore Rhode Island/Massachusetts," is where the Avangrid, Equinor, and Eversource/Ørsted projects and several other wind projects are expected to be located. Red areas to the south are proposed locations of other wind farms. (Map courtesy of BOEM)

More information on the leases and project can be found on the BOEM website:
https://www.boem.gov/renewable-energy/state-activities
https://www.boem.gov/renewable-energy/state-activities/new-england-wind-formerly-vineyard-wind-south.

Photo page 4, top: State Pier in New London is busy with the activity of cranes and work crews renovating the site into a staging area for offshore wind assembly. Photo: Nancy Balcom

Right, the turbines located offshore from Block Island are 328 feet high, while those being planned for other sites on the East Coast are expected to be more than three times that height. Photo: Nat Trumbull

Some of the leaders of the State Pier construction project led a tour for CTSG's Syma Ebbin, second from left, and Nancy Balcom (not shown) last summer. Photo: Nancy Balcom

STATE PIER AND THE REVOLUTION WIND PROJECT

Last August, my colleague Syma Ebbin and I toured State Pier to see more than $250 million in renovation activities. Anyone routinely driving I-95 northbound on the Gold Star Bridge over the Thames River may catch glimpses of the changing pier area just south of the bridge. We were met by representatives of the Connecticut Port Authority, AECOM, Kiewit Infrastructure Co., Ørsted and Eversource. The two companies formed a partnership called Northeast Offshore that the pier renovations will serve.

"The old State Pier is being upgraded to a new, heavy-lift capable port," said Andrew Lavigne, manager of business development and special projects, "with two heavy-lift pads, each able to handle loads of 5,000 pounds per square foot.

"More than seven acres of water between the fingers of the old pier and the State Pier were filled in with 400,000 cubic yards of material to create the terminal platform," he added. Still-exposed areas of the deck under construction revealed arrays of steel piles driven 80-120 feet into the riverbed to bear the future weight of cranes and cargo. Once the renovations are completed, Eversource and Ørsted will enter into a 10-year lease agreement to use the pier for pre-assembly and staging for at least three of their currently awarded offshore wind projects (Revolution Wind, South Fork Wind, Sunrise Wind), supplying power to Connecticut, Rhode Island and New York.

"These renovations, as envisioned for decades by studies indicating the facility's underutilization, will also facilitate a five-fold increase in use from about one vessel per month to six by supporting a greater range of cargo," Lavigne said. Unlike other East Coast port facilities, State Pier has no overhead restrictions from bridges or hurricane barriers, making it ideal for supporting the movement of massive wind turbine components offshore.

Ørsted, a Danish company and world's leading offshore wind developer, partnered with Eversource in 2019. The companies have an agreement with Dominion Energy to charter its massive new vessel, *Charybdis,* being specially built in Texas for offshore wind turbine installation. Costing $500 million and named after a formidable Greek mythology sea monster,

Dominion Energy's *Charybdis*, currently under construction in Texas, will be the first Jones Act compliant offshore wind turbine installation vessel in the United States. The vessel's first use is slated to be at State Pier in New London. Image: GustoMSC

Because of its location in front of the Gold Star Bridge, State Pier is free of obstructions and uniquely suited to handle the large components needed for the offshore wind industry. Photo: Judy Benson

its first deployments will be from State Pier to support the construction of Revolution Wind and Sunrise Wind. According to Dominion Energy's website, the 472-foot-long vessel is equipped with sturdy "legs" that will stabilize it on the seafloor in water depths up to 213 feet as the ship self-elevates. The 58,000 square foot main deck supports a crane capable of lifting 2,200 tons.

The Revolution Wind lease area is projected to produce 704 megawatts (MW) of power, supplying electricity to 350,000 Connecticut and Rhode Island homes. The turbines will be located 20 miles east of Block Island and 12 miles southwest of Martha's Vineyard. Landfall will be at the Quonset Business Park in Narragansett Bay, R.I. with the onshore substation in North Kingstown, R.I.

EQUINOR'S BEACON WIND PROJECT AND ITS LONG ISLAND SOUND CABLE ROUTE

Equinor is a 50-year-old international company that has been building offshore wind farms for over a decade. The company is developing two lease areas for the Empire Wind and Beacon Wind projects, expected to supply 3.3 gigawatts (GW) of power—enough for approximately two million New York homes, explained EJ Marohn, marine affairs manager for Equinor, during a meeting last July with Connecticut Sea Grant.

Kristin Kelleher, community engagement manager, was among the Equinor staff answering questions at a community meeting hosted by Mystic Aquarium in October.

"The Empire Wind lease area is located in the New York Bight south of Long Island while the Beacon Wind lease area is 20 miles south of Nantucket and 60 miles east of Montauk," she explained. "There will be approximately 80 turbines in the Beacon Wind 1 project area to produce 1,230 MW of power, installed in a 1 x 1 nautical mile grid layout...developed with input from relevant officials and fishermen."

Equinor staff indicated Beacon Wind turbines will be up to 1,083 feet tall, only a few hundred feet shorter than the Empire State Building. One rotation of one turbine can power a home for about 1.5 days, according to the information provided. Construction will begin in 2025; first power is expected to be generated in the late 2020s.

Alternating current (AC) power generated by the turbines will be converted to direct current (DC) at an offshore substation facility. From there, it will travel approximately 202 nautical miles via high-voltage underwater cables to the New York City power grid. The path of the cables will traverse the length of Long Island Sound in New York waters, installed to a target depth of three to six feet.

Tom Cunningham, public affairs manager for Equinor, said this is the longest cable route planned thus far for their wind projects.

"It will weave through the East River to the Astoria power complex in Queens, where it will be brought ashore on previously-developed industrial land," he said. "This routing will allow for minimal onshore disruption. We are applying lessons learned from past cable installations in Long Island Sound and we wish to minimize any impacts."

He added that the company expects its transmission cables will cross over a dozen existing pipeline and cable assets along the route. Michelle Fogarty, environmental surveys manager, explained that Equinor is using the Long Island Sound Blue Plan, a marine spatial plan developed in Connecticut, to inform decisions related to the cable route.

"Not only are technical needs and costs considered, but we are also incorporating information on the most sensitive areas along the proposed route," she said.

Elizabeth Marchetti, fisheries liaison officer for Equinor, added: "Based on information from fishermen, we also shifted the cable route further west."

Equinor planners will also be mindful of the Rhode Island Special Area Management Plan (SAMP) as well as the newly designated National Estuarine Research Reserve (NERR) in Connecticut.

Equinor is in the process of conducting environmental impact assessments to support permits, including current bird, bat, fish and marine mammal populations. Additional funds to support regional wildlife conservation and fisheries research is under development as part of an agreement with the New York State Energy Research and Development Authority, Fogarty noted.

A site on Bridgeport harbor was being remediated last summer in preparation for the Avangrid-Park City Wind project, which is expected to complete a lease agreement for the property in the coming months.

AVANGRID AND PARK CITY WIND

Avangrid Renewables LLC will be building Park City Wind, recalling the nickname for Bridgeport, the city where its staging area will be located. Avangrid was awarded the lease in 2019 in the same federal waters as Revolution Wind, Beacon Wind and other projects. The clustered leases take advantage of the strongest winds on the East Coast. Transmission cables from Park City Wind will come ashore in Barnstable, Mass., to a newly constructed substation, according to Avangrid's website. Scheduled to be completed in 2026, Park City Wind is expected to power 400,000 Connecticut homes annually.

Barnum Landing, a 15-acre parcel in Bridgeport, is anticipated to be the base of operations during the construction phase. Once construction is completed, three acres will be used for an operations and maintenance hub.

At a September conference of Environmental Business Council of New England, Sarah Lewis, Connecticut bids commitment manager for Avangrid, talked about the significant job creation expected over the life of this project and an anticipated $890 million in direct economic benefits. The company will help develop a skilled offshore wind workforce in partnership with vocational schools and universities, and through labor and pre-apprenticeship programs, she said.

Gary Yerman, right, owner of New London Seafood Distributors, talks with a representative of Equinor, developers of the Beacon Wind project, at a public meeting at Mystic Aquarium on Oct. 3. Photos: Judy Benson

Power generation through renewable energy is critical to reducing both our dependence on fossil fuels and greenhouse gas emissions. Yet, it is no small matter that the U.S. Department of the Interior, Bureau of Ocean Energy Management (BOEM)'s proposed lease areas along the Atlantic coast may eventually support thousands of wind turbines. Potential impacts to living resources, communities and the environment must be investigated and monitored by individual companies for each lease area, but how will any associated cumulative impacts be measured or determined? These and other questions will be explored in future installments.

In the next article, commercial and recreational fishing impacts, concerns and opportunities will be considered.

MORE INFORMATION:

Federal Bureau of Ocean Energy Management: https://www.boem.gov/renewable-energy
Northeast Sea Grant Consortium Ocean Renewable Energy Initiative: https://www.northeastseagrant.com/initiatives/ocean-renewable-energy
National Sea Grant Offshore Wind Energy Liaison: https://www.seagrantenergy.org/
Interactive map of proposed projects: https://www.seagrantenergy.org/where-is-owe-being-developed
National Renewable Energy Laboratory: https://www.nrel.gov/
Ocean energy research projects funded by Northeast Sea Grant Consortium, NOAA and DOE: https://seagrant.mit.edu/2022/05/19/six-ocean-energy-projects-announced/
Connecticut Sea Grant offshore wind web page: https://seagrant.uconn.edu/offshore-wind-connecticut/

s To Len reflects on the journey that led him to the CT Sea Grant art project

Above, sTo Len makes a sound recording of a stream at Sandy Point in West Haven. Left, a section of one of sTo Len's works titled, "Waste Wave." Photos courtesy of sTo Len

Editor's Note: New York City artist sTo Len has been chosen for a 2023 Connecticut Sea Grant Arts Support Award, a program that has been funding environmentally themed art aligned with CTSG's mission since 2009. Learn about the Connecticut-based project he has begun for this award and about his background and development as an artist in these 12 questions he answered for Wrack Lines Editor Judy Benson in August.

WHAT ARE SOME OF YOUR ONGOING AND RECENT PROJECTS?

Currently I am the resident artist at the Department of Sanitation in New York City, a 1½-year position that will conclude in December. In that role I am deeply researching and making work about sanitation. Over the past several years, I have been in residence at other places such as a wastewater treatment facility, a desert town in New Mexico and a radio station sound art retreat in upstate New York. I really enjoy working in this place-based way and through these experiences have been able to pursue my interests in water, sound, printmaking and installation in diverse ways.

WHAT WERE SOME MILESTONES ON YOUR PATH TO BECOMING AN ARTIST?

I moved to New York City in 2000 after undergraduate art school and I consider living here another type of school that truly formed me as a person and an artist. In 2004, I started a gallery space called Cinders with another artist, Kelie Bowman, which was an amazing learning experience and one that created so many relationships and opportunities over the years. I began working outdoors with water and ecological subjects around 2014 which has sent me on the trajectory that I am on today.

IN A RECENT PHONE CONVERSATION, YOU SPOKE ABOUT YOUR TRAVELS TO YOUR MOTHER'S HOME COUNTRY OF VIETNAM AS A TURNING POINT. HOW DID THOSE EXPERIENCES SHAPE WHO YOU ARE TODAY?

I had always wanted to go to Vietnam but didn't get a chance to until 2015. I think I was so hungry to discover my roots by that time that I had these inflated, romanticized notions of what it was going to be like. Soon after I arrived, I took a week-long boat trip around Saigon and down to the Mekong Delta. Water is a huge part of life in Vietnam and even the word for water, nước is also the word for country. What I saw on that trip was soberingly tragic; heavily polluted waterways full of single-use plastics beyond anything that I had ever seen up to that point. Despite this, there is still a lot of life out in the water. People's lives depend on it with an immense local fishing trade, busy boaters and floating markets. It was beautiful to witness the lively culture on the water but that made the pollution that much worse to see. I couldn't unsee it and I couldn't get it out of my mind. The trip was still amazing as I was able to visit the places where my mom grew up and really live life as a local for a few months. My parents even met me there for Tet, the Vietnamese New Year celebration, which marked the first time my mom had been back in more than 40 years. I also met many artists on that trip and began an artistic relationship with the country, having exhibitions and doing performances there every year until the pandemic hit. Seeing the heavily polluted water really hit me hard though, and I came back from that initial trip inspired to create work about these issues and to do something positive about it.

"...seeing the heavily polluted water really hit me hard though, and I came back from that initial trip inspired..."

WHERE ARE YOU BASED AND WHAT ARE SOME OF YOUR MOST SIGNIFICANT EXHIBITS OR PROJECTS BOTH CURRENTLY AND IN THE PAST?

I live in Queens, N.Y. All the exhibitions I have been in were significant in that I almost always learn from each one and they tend to inform each other in meaningful ways. In June I was in a group exhibition called "Steeped in Spilled Milk Part 2" at Elizabeth Fine Arts in Manhattan that was in response to the physical violence waged on the Asian community brought on by COVID-19. This elegant and powerful show featured some incredible Asian American and Pacific Islander artists who I did not previously know so meeting them was great. In April, I exhibited at Peel Gallery in Chapel Hill, N.C., where I was able to work with a local river cleanup group on artwork and do a residency at Level Retreat, a center for multidisciplinary artists in that community. In January I exhibited at a wonderful gallery called ArtYard in Frenchtown, N.J., and was able to work with a local historian on a research-based publication. I am currently working on a multimedia exhibition about my sanitation residency.

WHAT IS YOUR PERSONAL AND EDUCATIONAL BACKGROUND RELEVANT TO YOU AS AN ARTIST?

I have always drawn, painted and wrote in journals as far back as I can remember. Art for me has always been about creating my own world, a place where I could be myself and explore my ideas, a space where I could be free. I went to art school at Virginia Commonwealth University in Richmond, Va., as soon as I graduated high school. I could not wait to go to school for art and devote myself to learning about it and doing it. After moving to New York City, I became deeply involved in the local art scene and began putting on art shows, starting an art collective and eventually a gallery, all of which was very informative to my development. In 2018, I decided to pursue a master's degree with a unique program called Nomad MFA at the University of Hartford. This is a traveling interdisciplinary art program that took me to Mexico,

Minneapolis, Miami, New Mexico and of course Connecticut. It opened me up to new ways of being and broke me out of a bubble that I found myself in after 18 years of being an artist in NYC. Many of the professors and places were extremely impactful for me and continue to inform my work.

WHAT MOTIVATES YOU AS AN ARTIST AND IS THERE AN OVERARCHING MESSAGE OR THEME THAT CONNECTS ALL YOUR WORKS?

I am interested in creating new perspectives in the world. I believe that artists see the world differently and that we can be extremely adept at responding to situations through a type of creative problem solving that is at once fantastical, wild, beautiful and meaningful. I am interested in advocating for the artist in society and working to dispel the myth that art is unnecessary. The defunding of art programs in schools and the lack of grants in this country is a travesty. I see an urgent call to action in America right now and I am interested in creating art that can speak to the current issues of our times with facts as well as grace and humor.

WHAT ARE YOUR VIEWS ON THE ROLE OF ART IN BRIDGING SCIENCE, ENVIRONMENTAL CHALLENGES AND PUBLIC AWARENESS, AND IN MOTIVATING ACTION?

I think art can be a beautiful bridge to the public that can communicate and motivate in alternative ways that are quite unique. Artists should work with scientists, activists, educators and organizers when they can. These collaborations can lead to unpredictable possibilities and help inform everyone involved. Art has this ability to inspire that charts and graphs just don't have and I think it is exciting when a cross-pollination occurs.

WHEN DID YOU BEGIN YOUR POSITION AS THE ARTIST IN RESIDENCE FOR THE N.Y. DEPT. OF SANITATION, AND WHAT DOES IT INVOLVE?

I started in September 2021. The PAIR (Public Artist in Residence) program was developed by the Department of Cultural Affairs in 2015 and embeds an artist within a city agency. It's been an incredible experience as I have been able to do everything from riding along with collection trucks to visiting sanitation garages, waste transfer stations, landfills and incinerators as well as meeting many employees of the 10,000-person workforce. Through the records unit of the sanitation department, I have had the opportunity to do research using the archive of photos, books, videos and artifacts collected there. I have resurrected a defunct print shop and began creating prints using the old equipment and materials. I also have been using the old TV Studio, discovering video and film dating to 1903. I'm currently helping digitize hundreds of these tapes and have been creating my own videos in the process, which show on flatscreen TVs in all of the sanitation buildings and garages. I call it SAN TV (Sanitation Art Network TV) and it really is like my own TV channel for the employees. I also have an online waste study project called the Privy Pit, which relies on the public to submit to prompts that I created about our waste habits. You can see it here: https://www.officeofinvisibility.com/privypit. My overall project is called the "Office of In Visibility." The underlying idea is that I am bearing witness to the unseen labor of sanitation through my art and discoveries. I will have several exhibitions next year with the work I am creating.

sTo Len gestures toward some of the approximately 50 volunteers who participated in a cleanup of the Long Wharf area of New Haven. Trash collected by the volunteers was used in several of his art projects. Photo: Judy Benson

An exhibit at the Seton Gallery at the University of New Haven Oct. 26-Dec. 9 showcased some of the works created by sTo Len from the trash collected in a cleanup of the Long Wharf section of New Haven. Top left is a collage of impressions of various trash objects; center is a display of some of the items collected; below, UNH students view more of his work. Photos: Judy Benson

WHAT ARE SOME OF THE MOST INTERESTING EXPERIENCES YOU'VE HAD IN THIS POSITION?

It has been amazing to talk to sanitation workers, all of whom have been incredibly hospitable and candid about their work. I think the length of this residency has allowed me to transcend being an outsider and be seen as part of the crew. I have been able to prove myself by showing up every day and being genuinely interested in what they're doing. I did a ride-along with the sanitation workers that pick up my actual garbage and that was amazing. We rode all through my neighborhood and now I know them personally. Now when I put my trash out, I think about two of the workers, Frank and Eagan. I practically gift wrap my trash because I want them to be safe and I want my trash bags to be easy to pick up. I've gone to a few retirement parties and sanitation barbeques this summer. I have seen so many sides of the job and the people who do it. The department really is like a family and being able to experience that has been great.

DESCRIBE SOME OF THE RESPONSES TO YOUR PROJECTS AND HOW THESE HAVE VALIDATED OR INFLUENCED YOUR APPROACH TO YOUR CREATIONS.

When people show up to my exhibitions and say, "Thank you, I feel seen," or when people tell me they never think about their trash the same way again since seeing my work—that is very rewarding. Or when people are enticed by the beauty of a print I made and then discover it was made with pollution in their neighborhood waterway and then get involved in the local cleanup group—that is the best thing to hear. I created an "adoption service" for trash objects that we pulled out of a river. Seeing people respond by taking these objects home and donating to the local river keeper group was very gratifying. This type of engagement and reaction certainly fuels my fire.

WHAT ARE YOU DOING FOR THE CONNECTICUT SEA GRANT ARTS AWARD AND HOW DID IT COME ABOUT?

I am creating an exhibition for the Seton Gallery at the University of New Haven that opened on Oct. 26 and was scheduled to close on Dec. 9. For this project, I am researching Connecticut waterways and making trips to New Haven to explore them. I have been observing and documenting the public's interaction with their local waters with photos, video, prints and recordings of the sound of the water with hydrophones. The show is called "To Dissolve into the Hydrocommons….one Drop at a Time" and it is about how we are all part of our water, from our habits to our stories to how we live. What memories are embedded in our water? How do we define our watery relations? Much of my work is geared towards a re-thinking of our attitudes towards water through artwork made on, with and about bodies of water and issues of waste in contemporary life. There will be a public water trash cleanup walk on October 1, talks and some other events associated with the show.

The show came about when Jacquelyn Gleisner, a University of New Haven professor and curator of the gallery, invited me to give a solo exhibition. I began researching and thinking up ideas for a show. Since I had gone to graduate school at the University of Hartford, I was familiar with Connecticut but because the program was based around traveling to other locations, I was never in the state long enough to collaborate with the water and this place, so I was excited about this opportunity.

WHAT DO YOU HOPE WILL COME OUT OF THIS PROJECT, BOTH SHORT- AND LONG-TERM?

I hope people who see the show are moved to spend more time with their local waterways and think about their own relationships to the water. What stories do they have connected to water? What places do they want to protect? What waterways do they want to become more familiar with? If these types of questions occur, if my work simply creates an excitement or a new way of looking at water, then I am very pleased. Personally, I hope to become more familiar with this area and truly connect with its waterways and stewards, while also cleaning up along my journey.

Hoffman Evergreen Preserve: a forest for now and the future

"The best time to plant a tree is 20 years ago. The second best time is now."
—Chinese proverb

By Juliana Barrett

Hickory, dogwood, oak and loblolly pine saplings now grow where hemlock and ash trees once stood.

Shadbush, hazelnut and viburnum have begun to fill the understory, offering berries and nuts for Eastern towhees, brown thrashers and other birds that favor shrub habitats.

These are some of the hallmarks of the transformation of Hoffman Evergreen Preserve, owned by Avalonia Land Conservancy and coursed with popular hiking trails. This nearly 200-acre forest in Stonington is close enough to Long Island Sound to be influenced by salt spray from storms and ocean and air temperatures increasing with climate change.

Rather than let those and the other new realities of the changing climate dramatically alter the forest habitat unchecked, Avalonia Land Conservancy and Connecticut Sea Gant created a bold and unique plan to intervene using the principles of assisted adaptation. Assisted adaptation requires stewards to look to models that project a future affected by climate change, and to select trees and shrubs that are likely to survive and prosper now, and in 30 to 50 years. This fosters a healthy plant and wildlife community long into the future.

In the process of carrying out this plan with the help of volunteers, I witnessed a real-life manifestation of the inspiring words of Aldo Leopold, one of the nation's most influential environmentalists and foresters:

"*Acts of creation are ordinarily reserved for gods and poets, but humbler folk may circumvent this restriction if they know how. To plant a pine, for example, one need be neither god nor poet; one need only own a shovel.*"

The story of Hoffman Preserve is one of both response to the immediate problem of an unhealthy forest, and of preemptive actions designed to accommodate projected climate conditions, some of which we are already experiencing. Many of us are dealing with hotter summer temperatures and heat waves, drought, road flooding during high tides and extreme weather events such as rain deluges and tornado watches.

We often look first at the impacts these changes are having on our lives and infrastructure—the homes we live in, the roads we travel on and our activities. But the biodiversity and natural environments around us are also impacted.

Local forests like the Hoffman Preserve are a critical resource as

In an area cleared of dead and dying trees, an Avalonia volunteer prepares a spot for a sapling during a May 2021 community planting event. Photo: Judy Benson

wildlife habitat and provide many benefits. These include carbon sequestration, water conservation and prevention of soil erosion, reduction of air pollution and as places for recreation, education, mindfulness, birding and hiking. But how is climate change impacting our forests? The U.S. Forest Service has conducted detailed climate vulnerability assessments for regions within the United States to answer this question and is partnering on forest climate adaptation projects.

But Avalonia wasn't initially considering the future of Hoffman Evergreen Preserve, which was created by Robert D. Hoffman, a mining engineer who prospected for gold in Canada during the 1920's. Five decades ago, Hoffman planted thousands of conifer seedlings across his many acres. Hoffman died in 1975, and the 142-acre property consisting of a hemlock, pine, tamarack and spruce intermixed with hardwood species, was acquired by Avalonia in 1976. Several other tracts were added in 1997 and 2013, bringing the total to nearly 200 acres.

Beth Sullivan is Avalonia's Stonington Town Chairperson and lead steward on this project. She notes that a 1984 environmental review of the preserve indicated that the conifers were mature and generally healthy, intermixed with hardwoods such as beech, oak and birch. Even then, the report included recommendations for active management, to preserve forest diversity. Undertaking and implementing the recommendations was costly, and at the time, Avalonia did not have the resources to fully execute an appropriate plan.

Then came a series of blizzards, nor'easters, hurricanes and storms including Irene and Sandy, disease, insect pests, drought and deer overbrowsing that took a toll on both the conifers and deciduous trees. This left many dead and dying trees, forest structure with little to no understory, over-mature conifers and fire and safety hazards. Invasive pests including the hemlock woolly adelgid, hemlock scale, spongy moth (formerly called

An Avalonia Land Conservancy volunteer digs a hole in preparation for planting an oak tree at the Hoffman Evergreen Preserve in May 2021. Photo: Judy Benson

gypsy moth) and emerald ash borer caused widespread damage to many hemlocks, oaks and ash throughout the preserve. In a 2014 review by the Connecticut Department of Energy and Environmental Protection, Audubon Connecticut and Avalonia stewards concluded that the preserve needed attention soon. Habitat quality had significantly declined, and there were mounting safety concerns.

Sullivan has monitored the Hoffman Preserve for several decades and participated in more recent studies and surveys which spelled out the decline in forest health. The deterioration and death in the old forest was obvious. Diversity was needed: in species, age classes and habitats. Letting sunlight into new areas would promote new growth, encourage new species, create the layered habitat required for wildlife species diversity, and begin forest restoration for better health and productivity. While moving forward was a difficult step to take, a forestry plan would provide a resource and road map for future forestry projects that would become even more important as climate change stresses forest ecosystems.

In November 2018, Avalonia's Board of Directors approved a forestry plan that included significant tree cutting and thinning by an accredited forester, paid for through the sale of harvested trees. Put into effect in 2019, the plan included clearing approximately 6.2 of the 200 acres in a series of five patch cuts. About 54 additional acres were thinned to open areas of dense growth or impacted by skid trails created to move equipment and downed trees.

As the timber harvest was taking shape, members of Avalonia's Stonington Town Committee explored next steps. They asked: do we plant? Do we seed? What evergreens could be planted? Do we let nature take its course and see what comes up from the seedbank, or be proactive by planting desirable, climate appropriate species in the new openings? Sullivan obtained and planted several loblolly pines in the thinned areas as an experiment.

A poet's view:

Connecticut State Poet Laureate Margaret Gibson, a member of Avalonia Land Conservancy, wrote and recorded a reading of her poem about Hoffman Preserve.

"Listening to the Forest"

https://youtu.be/ECWwLWU9a_k

I had worked with Sullivan and Avalonia on a resilience project at the land trust's Dodge Paddock Beal Preserve, a coastal site in Stonington. Now, the opportunity to create a healthy coastal forest in the context of resilience, climate change impacts, and forest management presented itself. As the coastal habitat specialist for Connecticut Sea Grant, I eagerly partnered with Avalonia to tackle the unique challenge of developing a future-focused plan for Hoffman. Avalonia is a land conservancy with the capacity to mobilize a seasoned group of knowledgeable and dependable volunteers.

The Hoffman Evergreen Preserve, in red, is located in the northwest corner of Stonington. Map: Avalonia Land Conservancy

"Making the decision to do this project was painful, but not as painful as watching the forest lose its life and knowing we had the ability to do something," Sullivan said. "The common-sense answer was the same as the scientific one: let in the light and create diversity. Aim for resilience. I will not be here in 30 years to see the matured results, but the Scouts, parents and other children will be, and can take ownership and pride in the forest for decades in the future."

In early winter of 2020, Sullivan, Sharon Lynch, a retired professor of science education from George Washington University and member of the Avalonia Stonington Town Committee, and I met. We discussed how we might implement a new project focused on appropriate plantings for Hoffman based on climate change projections. We located research-based lists of species that were more adapted to warmer climates, and of southern species that might ultimately expand their ranges over time into Connecticut. Lynch contacted national forestry experts and researchers involved with similar adaptation projects for input on a Hoffman Preserve plan.

A crucial consideration was the preserve's location in southeastern Connecticut, a region identified by the National Oceanic and Atmospheric Administration as an air temperature hotspot in the northeast that has already exceeded 2.9°F of average temperature change (temperature anomaly) between 1895 and 2018. The frost-free and growing seasons are expected to be longer, while precipitation patterns are less certain. Seasonal drought risk is projected to increase in the summer and fall, as is the frequency of previously rare extreme weather events. These climatic changes may impact vegetation directly through air temperature and precipitation patterns or through pests and disease. Therefore, we had to ascertain which species might grow well under these projected conditions to develop and manage a resilient forest.

Two undergraduates from the University of Connecticut Climate Corps, a class I teach that gives students the chance to work on real-world climate

adaptation projects, were added to our team. As part of their Climate Corps work, Chris Arrotti and Griffin Licari spent the Spring 2020 semester researching climate projections for southeastern Connecticut, the physical conditions of the Hoffman Preserve areas impacted by the patch cuts, U.S. Forest Service Vulnerability Assessments for the Northeast and Mid-Atlantic, and other forest-vegetation related resources.

We wanted to plant two categories of species to develop a resilient forest: 1) trees and shrubs native to Connecticut which would do well under both current and future climate conditions but may not be available in the existing seed bank for regeneration; and 2) southern natives, trees and shrubs many of which already occur in the Long Island Sound Study region. Most of these "southern natives" are already present in Connecticut, sold in nurseries statewide and planted in yards, parks and urban downtowns. Native to southeastern New York and New Jersey, they are likely to become established in coastal Connecticut as temperatures continue to warm. These species include sweet gum, persimmon and red bud. Forest experts and state ecologists provided input on the final plant list.

Some of the trees and shrubs that were planted:
Red oak, white oak, black oak
Sweet gum
Tulip
Redbud
Persimmon
Loblolly pine
Long leaf pine
Gray dogwood
Pignut hickory
Black gum
Common serviceberry (shadbush)
Smooth sumac

Birds that are appearing in the newly opened and thinned areas *(including forest birds that use the openings to catch insects):*
Bluebird
Chipping Sparrow
Blue winged warbler
Prairie warbler
Eastern towhee
Goldfinch
Many types of flycatchers (phoebe, Eastern wood peewee, great crested flycatcher)

With a good idea of what we wanted to plant and where to get the plants, we needed to share our plans with the public. When the 60 acres of tree cutting was completed in late 2019, many visitors to this well-used preserve questioned it, voicing a wide range of concerns about the management actions.

Lynch led our outreach efforts which included contacting forestry experts to speak at a four-part webinar series and a workshop for resource managers working on similar forest resilience issues. The recorded webinar series, "Finding the Right Trees for the Right Time," can be found at *https://clear.uconn.edu/2021/03/10/finding-the-right-trees-for-the-right-time/* Participants for the webinar series, while mainly from New England states, came from across the country with questions indicating that this concept of healthy, resilient forests is critical everywhere.

For Lynch, the project itself and the webinar component matched her interests as an educator in both formal and informal community learning.

"This project taught its lessons through its webinars, as well as through the activities of the many people who helped to plant the trees and shrubs at Hoffman," she said. "The conservation specialists and Avalonia stewards, as well as hikers, birders, and wanderers, have witnessed climate change effects in a stressed local forest. But they also can see what humans might do to alter its impact. Networked learning and action are likely crucial, not only to help our natural areas flourish, but also to help us retain the environmental health of our populated areas. We will need such smart collaborations to survive and thrive."

Another important aspect of resilience at this preserve focuses on the wildlife of the Long Island Sound Study region. Over the last several decades, wildlife abundance and diversity have diminished at Hoffman.

Robert Askins, professor emeritus of ornithology at Connecticut College, noted that bird species that depend on dense shrub layers in the forest interior or on forest openings have declined, and should be a priority for conservation and management efforts. By providing some southern native plant species at Hoffman, we help ensure that a food source will be available even as more northerly species potentially decline. Establishment of high-, low-, and ground-level shrub layers will create habitat for insects and other invertebrates as well as small mammals, and provide missing links in the food web. Many new bird species have been recorded and documented at the preserve since the cutting.

A critical component to implementing our plan was finding volunteers to plant saplings. Stalwart volunteers repeatedly answered Sullivan's recruitment calls. This was truly one of the most exciting parts of the project. Dozens of volunteers, from Cub Scouts to octogenarians, gathered outdoors during the COVID-19 lockdown to plant trees and shrubs, working together and looking toward the future. Over the 2021 and 2022 planting seasons, they planted more than 1,000 bare-root or small potted trees and shrubs in designated areas within the preserve, digging holes in rocky soils, hiking and lugging water to new plantings in the far reaches of the preserve. As part of the long term monitoring, GPS locations of each planting were taken.

This avid and enthusiastic volunteerism was what made this one of the most interesting and satisfying projects of my career, as the volunteers helped blaze a trail others can look to as they care for the wild places in their communities for generations to come.

Now it will be up to future generations to monitor these plantings—not just whether they survive, but whether they reproduce and truly become part of a resilient forest.

This project was funded by a LIS Futures Fund Grant.

Tim Visel worked to bring aquaculture to the forefront in CT education

By Ben Crnic

If you asked longtime educator Tim Visel about his extensive career, he'd likely humbly describe himself as a simple skiff fisherman.

Clearly, though, without Visel's tireless efforts across nearly 40 years, aquaculture education in Connecticut would not be at nearly the same level it is today.

Visel was a major force in starting two regional state schools that are dedicated to teaching aquaculture, or the cultivation of aquatic plants and animals, to high school-level students. The Bridgeport Regional Vocational Aquaculture School opened in 1993, and The Sound School in New Haven, which opened an aquaculture center in 1994, are cornerstones of his expansive legacy.

The two schools are complemented by other high school-level vocational aquaculture programs in Ledyard, Stamford and Wallingford, as well as the Marine Science Magnet High School in Groton, which opened in 2011.

Now, after nearly 28 years of serving as coordinator for the Sound School, Visel, 68, retired from his position in June, giving him the chance to reflect on a career well-spent.

"No one really thought aquaculture would grow as fast as it did, and it's growing faster," Visel said.

The inspiration for Visel's work toward starting these vocational aquaculture programs in the state came when he first learned about Connecticut's rich history of high school-level agricultural education, which started in 1875. One of the schools Visel attended growing up in Madison was once an agricultural school. That led to Visel learning more about high school-level agricultural education from the school's former agriculture teacher, Archie Holdridge.

"Connecticut actually piloted the concept of teaching agriculture at a high school level," Visel said. By the 1970s, though, interest in agriculture education along the shoreline was declining, as many coastal farms were being developed for housing and commercial uses.

But Visel, for one, didn't lose interest. Throughout his schooling and early career in running workshops on fishery technology, he held onto the idea that Connecticut's students could not only learn farming at the high school level, but ocean farming as well.

Years later, in 1981, Visel was leading an oyster management workshop where he met Roger Lawrence, a vocational agriculture consultant who worked for the state Department of Education and spent years beforehand teaching agriculture to students. After talking with Visel, Lawrence realized the similarities between aquaculture and agriculture education, and the idea grew from there.

Tim Visel visits Clinton Harbor, where at age 13 he and his brother Ray started a small-scale fishing business after they found and fixed up an old Brockway skiff. Photo: Ben Crnic

"He said, 'You build boats. We build barns.' And I said, gee, Roger, it's the same thing," Visel recalled, adding that Lawrence became instrumental in getting the state aquaculture vocational programs started.

"If he didn't take an interest, I don't think we'd have these schools," Visel said. "So many people helped along the way…it wasn't just me. It was dozens, if not hundreds of people who got behind the concept."

Tim Visel, left, talks with a Sound School senior José Carrion about an oyster shell on the shore near the school last spring. Photo: Judy Benson

One of those was Richard Schneller, who served as State Senate Majority Leader from 1981 to 1984. Schneller played a key role by helping to secure funding for developing aquaculture curriculum along with Errol Terrell, who ran the Department of Education's Bureau of Vocational Services.

Eventually, the Department of Education developed a proposal in 1986 to build four regional aquaculture centers in Bridgeport, New Haven, Old Lyme, and Groton. Execution of the plan hit a few snags, though, when some school district leaders became overwhelmed by the prospect of developing such a program, even though the state provided all the necessary funds.

When he proposed that districts build facilities such as pathology labs, bacteriology labs, computer-assisted design (CAD) labs, engineering labs and boat shops, some school boards balked.

"The curriculum was so different and so new, and a lot of times so advanced, I think districts felt they just couldn't do it," Visel said. Because of this, towns such as Old Lyme ended up returning the state funds meant for starting aquaculture centers.

Despite the difficulties in getting the schools off the ground, Bridgeport and New Haven were willing to take the leap and start the aquaculture programs, Visel said. In 1989, Visel started working on coordinating the architectural plans, engineering and laboratory designs for the construction of the Bridgeport school, and also coordinated the design and construction of the Sound School's aquaculture center, which was dedicated in 2003.

The school introduces students to topics such as vessel construction, aquaculture biology, marine mechanics, aquatic chemistry, toxicology and water quality. More than 100 people helped develop the different labs for the aquaculture center, Visel said.

"When we started working on this, aquaculture was pretty unknown," he said. "But we figured it was going to be important in the future."

One particularly relevant fact, he noted, is that most of the seafood people eat today is raised through aquaculture, including oysters, mussels, shrimp, tilapia and salmon.

Visel knows about seafood. He got his start in commercial oystering and lobstering with his brother, Ray, when he was just 13 years old, after they found an old Brockway skiff washed up on a beach. Soon, they set out in Clinton Harbor and the Hammonasset River, and were operating a small-scale fishing business.

During this time, several experienced oystermen in the area took a liking to Visel, including George McNeil. He owned the McNeil Oyster Company at City Point in New Haven, where the Sound School is currently located. McNeil lived next door to the dock that the brothers would frequent in Clinton Harbor and would often talk to them about oystering and lobstering.

"George was a tremendous benefactor and got me interested," Visel said, adding that from McNeil and the other oystermen he met, he gained much of his knowledge about the oyster industry in Connecticut, which in the 19th Century was the largest in the country. By the 1970s though, the industry was in a state

of decline due to pollution from runoff and sewage overflows.

Learning about oystering from McNeil and others helped inspire his research as he moved on in his schooling at the University of Rhode Island, earning undergraduate and graduate degrees in commercial fishing, resource development and animal pathology.

As part of his work toward his master's degree, Visel developed shellfish management plans for many towns along the Connecticut coastline, including Old Saybrook, Guilford, Clinton and Madison. These plans included details on oyster cultivation and harvesting operations in rivers and along the coast. He also showed towns that if oysters were transplanted to cleaner waters not affected by pollution, they would naturally rid themselves of pollutants and become edible, a process known as depuration. Ultimately, although some towns were slow to catch on, Visel helped revitalize interest in recreational and commercial shellfishing.

After receiving his degrees, Visel continued to educate people about fishery technology and conduct workshops through positions with the University of Massachusetts and Connecticut Sea Grant. During his time with Sea Grant, Visel also worked to write curriculums for high schoolers about the marine environment and aquaculture.

"Tim has always been visionary in his thinking, whether working with commercial fishermen or on behalf of students interested in learning about aquaculture and marine trades," said Nancy Balcom, associate director for Connecticut Sea Grant and senior extension educator for UConn Extension. "When I took over his position after he left Sea Grant, I knew I could never fill his boots, given his breadth of experience, his focus on the enormous possibilities offered by this new industry and his ability to bring people together to work collaboratively toward common goals. It's been inspiring to see what he was able to accomplish during his career."

From Sea Grant he moved to his position as coordinator of the Sound School, where he helped oversee the school's curriculum, develop educational programs and supervise staff.

Peter Solomon, teacher at the Sound School for 14 years, is now filling Visel's shoes as coordinator.

"I can comfortably say The Sound School as we know it today would not exist without Tim," Solomon said, adding that Visel served as his mentor and always reminded him, even through the difficult times, that they were doing it for the students.

"He was really good at refocusing on what mattered most, which was doing what was right for the kids, and for really allowing and encouraging innovation and change in education," Solomon said. Visel also served as an encyclopedia of knowledge about the Connecticut shoreline, oystering, blue crabs and other topics, which made him an invaluable resource for the school, Solomon said.

"I learned a lot from Tim's stories and experience, and that's why I was like, 'I need your personal email,'" Solomon said. One of the last educational programs that Visel helped create with Solomon was an artificial oyster reef using concrete reef balls placed in the school's harbor where oysters could attach.

"We became the first place in Connecticut to use subtidal reef balls and to start restoring an oyster reef," Solomon said. "The pilot project that he inspired had tremendous success."
In addition to inspiring groundbreaking educational projects such as this, Visel

Students at The Sound School prepare air tanks as part of a diving lesson in June. Photo: Judy Benson

was also prone to getting excited about seemingly insignificant finds. One such time was when a student brought Visel a tray full of sapropel, a type of black mud found at the bottom of the school's harbor that is rich in organic material and sulfur.

"He got so excited. He said, 'this is the stuff, I'm going to bring it to my conference tomorrow,'" Solomon said, adding that the student who brought Visel the tray "had never seen anyone get that excited about a pile of mud," sometimes also referred to as "black mayonnaise."

"That was how Tim was. He could just light up when he was doing this work," Solomon said.

As the school moves forward without him there every day, Visel is hopeful that it will continue to impact students.

"It's been a bumpy ride, and hopefully the schools will thrive," Visel said. "I think it's important to the future, to the schools, that they keep up with the industry."

The schools are especially relevant, Visel says, as climate change impacts intensify.

"People say, 'Tim, should we be concerned about this warming?' Yeah, because the fishermen are going through it right now," Visel said.

The effects of climate change on species in Long Island Sound can be varied, he added. The blue crab population in the Sound has taken off in recent years, Visel said, but lobsters in Connecticut waters have become scarce. Ultimately, aquaculture education is vital for dealing effectively with the effects of climate change, he said.

"Climate change is a real serious problem, and a lot of what happens to inshore waters, because they're shallow and they warm up quickest, we can see first," Visel said.

Contaminants of Emerging Concern: a knotty challenge that needs unraveling

By Judy Benson

KEY TO NUMBERS & ARROWS INTO RIVER:

1. House/sink/shower/toilet → Pharmaceuticals and personal care products
2. Sewage treatment plant → Treated and non-treatable effluent
3. Hospital → Pharmaceuticals and waste residues
4. Agriculture → Pesticides and fertilizers
5. Livestock → Veterinary pharmaceuticals and waste residues
6. Storage tanks → Chemicals from leaking storage tanks
7. Manufacturing plant → Industrial treated and non-treatable waste

SUSCEPTIBLE POPULATIONS VIA INGESTION OF CONTAMINATED FOOD AND/OR WATER:

- ➤ Humans
- ➤ Aquatic plants (algae and seaweed)
- ➤ Invertebrates (shellfish, bivalves, lobster, crabs)
- ➤ Birds
- ➤ Forage, recreational, and commercial important fish
- ➤ Marine mammals
- ➤ Terrestrial animals

This image shows sources of Contaminants of Emerging Concern and various pathways into the environment. Infographic: Virge Kask

WHY BOTHER?

The world already has plenty of big environmental problems that need attention, namely climate change, consumer plastic waste, species declines and proliferating invasive species, among others. Do we really need to worry about how to untangle yet another complicated mess?

DON'T WE HAVE ENOUGH HEADACHES ALREADY?

Contaminants of emerging concern, or CECs for short, is one of those topics that can seem like just too much to deal with right now. These are the residues of medicines, personal care products, agricultural chemicals, flame retardants and a host of other commonly used chemicals increasingly found in fresh, marine and drinking water. The term CECs came into widespread use over the past two decades, as evidence mounted about the potential harmful effects of these chemicals on people and wildlife, and the wide gaps in knowledge became apparent. How much is harmful? How long do they persist in the environment? What are the pathways for exposure? What happens when these chemicals combine? What can be done?

FACED WITH SUCH A MAZE OF QUESTIONS, WHERE SHOULD WE EVEN BEGIN? SHOULD WE EVEN BOTHER TRYING?

Perhaps different questions need to be asked, ones that look beyond the present. What will the future look like if we ignore CECs? Is that the world we want to leave to the next generation?

"These are newer chemicals that often fall through the cracks between federal and state regulatory agencies," said Sylvain De Guise, director of Connecticut Sea Grant. "There's enough information to know they may be of concern, but not enough to regulate or ban them. The testing hasn't kept up."

Along with his role at Sea Grant, De Guise is also a scientist who specializes in marine animal diseases, including those caused by chemical exposures. That expertise makes him ideally suited to lead the first ever national Sea Grant project, along with colleagues at the New Hampshire and North Carolina Sea Grant programs, to focus on CECs. The National Sea Grant program provided $850,000 for the project to analyze the CECs problem and identify the role the Sea Grant network can play in advancing our understanding and reducing the risks they pose to humans and wildlife.

"Sea Grant is not going to replicate what the Environmental Protection Agency and the Food and Drug Administration are doing," De Guise said. "But we can target research to better understand what's happening with those chemicals on the coast and share information that will be practical" for the general public.

But before discussing the specifics of the Sea Grant project, some basic background is needed. For starters, just what are CECs?

Top, NOAA scientists and state collaborators collect blue mussels in Buzzards Bay, Mass., in 2021. Photo: Tony Williams. Below, a state collaborator collects oysters at a Mussel Watch monitoring location in Delaware Bay, N.J., in 2021. Photo: Marc Resciniti

Above, firefighting foam released by a plane crash at Bradley Airport in October 2019 flows into Rainbow Brook, a tributary of the Farmington River. Below, CT DEEP crews work to contain the foam within booms as part of the cleanup. Photos courtesy of CT DEEP.

The term encompasses a wide range of industrial and household chemicals, from flame retardants to stain protectors for upholstered furniture, prescription and over-the-counter medicines, microscopic plastic shards, pesticides and dozens of other substances used in food wrappers, non-stick pans, cleaning products and myriad modern conveniences, from cars to sunscreen. Varying amounts are found in inland and coastal waters virtually everywhere on the globe, even in the Arctic and Antarctic. As useful and beneficial as these chemicals are to daily life, their accumulation in the environment is clearly having negative effects that need to be curtailed. Research thus far points to a range of health effects on humans and wildlife. Among them, some are linked to various cancers, while others disrupt normal development and reproduction, or weaken immune systems.

Different pathways carry these chemicals into the environment. Some are released in the effluent from wastewater treatment plants that weren't designed to remove these substances. Some are carried by stormwater into waterways, and some become airborne then fall to the earth in rain and snow. Instead of just allowing them to continue accumulating unchecked, numerous federal, state and academic researchers and regulators are working to dissect different pieces of the complicated puzzle. This Sea Grant project is helping define how it can bridge the gaps between the regulators and experts, and between them and the public. It can add to the confluence of research and data to help identify on a national scale where and how to best use resources and begin to take control of what can seem like a runaway train.

"This award represents a unique opportunity to reflect and engage with partners in helping define how the talent of Sea Grant staff and its network of researchers can move the needle on a topic as broad and complex as Contaminants of Emerging Concern," De Guise said.

The project began in September 2021 by convening a team from the three Sea Grant programs and an advisory committee of outside experts. Over the next 12 months, five key steps were completed:

- A review and analysis of research literature about CECs and summary of key findings and unknowns.
- A survey that collected 646 responses to questions about how the project should be approached, chemicals of greatest concern and how environmental justice considerations should be incorporated.
- A series of virtual workshops around the country to discuss and augment survey results.
- Creation of a national framework for Sea Grant programs to follow in incorporating CECs into their responsibilities.
- A request for proposals for research projects on Contaminants of Emerging Concern focused on the Atlantic Coast.

Susan White, CECs project team member from North Carolina Sea Grant, noted that environmental justice considerations emerged as one of the main concerns of survey respondents and workshop participants. That emphasis was reflected in both the national framework and the research RFP.

"It was very eye-opening that there was so much agreement that CECs are a large environmental justice challenge," said White, who is the executive director of North Carolina Sea Grant. "There is recognition that the burden of contamination is placed on communities with environmental justice concerns, and that that issue needs to be prioritized."

She cited some examples: landfills located more often in poor communities; more contaminants in drinking water where older infrastructure serves underserved populations; fish that are caught in polluted urban waterways are consumed as an important source of protein for low-income families.

"We can't wait for it to become another crisis," she said. "That's not going to support our communities' health and well-being, and it's not the best way to manage it. It's going to be more cost effective to be in front of this than to try to mitigate it."

Dennis Apeti, for one, is pleased that Sea Grant is making a commitment to the CECs issue. As program manager for Mussel Watch, a NOAA initiative that has been sampling oysters and mussels from 300 coastal sites since 1986, he knows first-hand how pervasive CECs are in the environment and how much more work needs to be done. Apeti also serves on the advisory committee for the CECs project.

"Any entity that can dive into assessing CECs is welcome," he said. "There are so many things about CECs that even industry doesn't know. Sea Grant can play a significant role in defining a scope and working with existing organizations that do monitoring and assessment to see where they can fill in the data gaps."

He also believes Sea Grant may be able to make important contributions to the work needed to establish toxicity thresholds for exposure levels—how much is dangerous for wildlife and people—for the most common CECs.

"EPA, USGS and the FDA are trying to define priorities for drinking water," he said. "But we also need to set ecosystem thresholds and sediment thresholds and fish and shellfish consumption guidelines. Sea Grant can help with that."

Apeti and De Guise concurred that Sea Grant can also help fill the need for public education about CECs and how people can take action to reduce risks from CECs to themselves, others and wildlife. Apeti noted that 40 percent of all pesticides are used in households, and much of the time people apply too much or incorrectly, unnecessarily exposing themselves and the environment.

"We don't do enough public outreach to increase awareness and stewardship," he said.

More public messaging is also needed to encourage people to dispose of unused medicines at public collection sites rather than flushing them down the toilet, where they're likely to end up in waterways and ultimately in the bodies of fish, shellfish and other marine animals, De Guise said. While the CECs problem is enormous, individual decisions can make a difference.

"People need to read labels and apply and dispose of things properly," he said. "Look for products that are biodegradable and have fewer ingredients that you can't pronounce. We're all part of the environment."

For more information about the Contaminants of Emerging Concern survey and the National Framework developed for Sea Grant programs, visit: https://seagrant.uconn.edu/research/contaminants-emerging-concern/

Many of the pesticides sold in hardware stores and other outlets are overused or used incorrectly by consumers, unnecessarily exposing themselves, others and the environment to contaminants. Photo: Judy Benson

PFAS: 'forever chemicals' now pervasive in the environment

Above, Ted Rathjen, senior shellfish warden for Groton, steers the boat as Kaitlyn Campbell, post-doctoral student in the Brandt Lab at UConn, and Anika Agrawal, doctoral student in the lab, prepare to collect oysters and mussels to test for PFAS in shellfish tissue. Right, some of the vials and other equipment used in the field work. Photos: Judy Benson

In 2019, two accidents occurred in the Farmington River watershed that startled the nonprofit group that protects the river and its tributaries into learning about PFAS.

That's the shorthand name for per- and polyfluoroalkyl substances, often called "forever chemicals" because they break down slowly and accumulate in the bodies of humans and wildlife, waterways and soil.

"Emerging contaminants were not something that was on our radar," said Aimee Petras, executive director of the Farmington River Watershed Association. "But we had to learn about it, and we were shocked to learn that PFAS are everywhere."

What prompted the association into "advocacy and action mode," said Petras, was a June 8, 2019, spill of 40,000 gallons of fire-fighting foam stored in a hangar at Bradley Airport into the Farmington River in Windsor. Then in October, another spill occurred after a plane crash and fire at the same airport. It released about 23,000 gallons of fire-fighting foam into Rainbow Brook, which flows into the Farmington River.

State Department of Energy and Environmental Protection emergency crews responded to both accidents with cleanup crews, monitoring of the water, wildlife and sediments, and temporary advisories against eating fish or swimming. DEEP held public information meetings for Windsor residents. A watershed group representative joined a state PFAS task force, which advocated for a state takeback of PFAS-containing fire-fighting foam and replacement with a "green" substitute.

In the aftermath, Petras and others at the watershed group were left with a disquieting new realization about the ubiquitous presence of PFAS and its risks. These chemicals are found in everything from dental floss to drinking water to livestock and microwave popcorn bags. Research points to a range of health effects from exposures, including increasing risks of cancer, hormonal and developmental disorders and fertility problems.

"It's so complicated," Petras said. "How do you protect yourself?"

Results of the survey conducted for the Sea Grant CECs project last year shows concern about PFAS is becoming more widespread. Along with microplastics, PFAS ranked at the top of the list of CECs the 646 respondents wanted Sea Grant to focus on.

"We're just scratching the surface in learning about the health effects," said Ray Frigon, assistant director of the remediation division at CT DEEP who led the response to the 2019 accidents. "Those incidents were very much an in-your-face moment regarding PFAS."

The state takeback program, he said, was an important first step to "stop the bleeding" and get the PFAS-laden foam out of fire departments, but much more needs to be done.

Chris Perkins, also a member of the state's PFAS task force, agrees. Laboratory director for the UConn Center for Environmental Sciences and Engineering, Perkins and Jessica Brandt, professor in the UConn Department of Natural Resources and the Environment, are in the middle of a two-year project focusing on PFAS in the environment, specifically in oysters and ribbed mussels, plankton and water samples from the Poquonnock River in Groton. It's a waterway with proximity to likely pathways of PFAS chemicals from nearby Groton-New London Airport, where fire-fighting foam is stored, and stormwater outfall pipes empty into it. It also has popular recreational shellfish beds nearby.

The research, funded by Connecticut Sea Grant, is challenging, Perkins said, requiring elaborate protocols to prevent contamination from researchers' clothing and skin, which can contain PFAS from synthetic fibers and personal care products.

"It's not easy or cheap work to do," he said. "And there aren't a lot of labs equipped to analyze for PFAS."

Thus far, their work has found small amounts of five of 22 types of PFAS in shellfish tissue and in the water samples. Plankton samples have not yet been analyzed.

"But we don't know if the amounts are harmful," Perkins said. "As far as impacts on health, we don't know what the threshold is."

—Judy Benson

A crab shell, feathers, seaweed and shells of slipper snails are seen in a closeup of the wrack line at the UConn Avery Point. Photo: Judy Benson

What's in our names?

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.

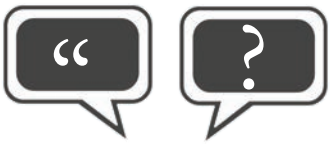
It addresses the challenges that come with living by the water or within the Long Island Sound watershed, in a state with 332 miles of shoreline and three major tidal rivers. This NOAA-state partnership based at UConn's Avery Point campus works with aquaculture farmers, fishermen and seafood purveyors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

José Carrion, senior at The Sound School in New Haven, checks out some of the concrete balls used to create artificial oyster reefs in the schools' harbor. Photo: Judy Benson



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

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Juliana Barrett, coastal habitat specialist and UConn extension educator, looks out onto Little Narragansett Bay from the Dodge Paddock and Beal Preserve in Stonington, where she helped create a living shoreline. Photo: Judy Benson

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