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Susan Bartlett Rice, detail from the painting *Storm Surge*, acrylic on canvas, 2024, 40 x 40

“One of my goals as an artist has always been to capture scenes before they are gone or changed. My hope is that my work looks like it was painted in my own time, but captures the places and traditions that make our home ‘Maine.’ The boathouses, docks, cottages and landscape around South Bristol have been my favorite subject for over 20 years.

In January, 2024, everything changed. While we are used to nor’easters and the occasional snow day, we were not prepared for the dramatic and devastating back-to-back storms when they arrived. In less than a week, two storms ripped through our coast and structures that had stood for decades were gone.

So many places that I have painted changed or disappeared all at once. I am more grateful than ever to have documented them as they once were, but shocked to see so many places slip into the storm surge.

Beach roses that grew everywhere are gone, land and roads washed away and rock-weed was stripped from the rocks making low tide look very different than before. Most dramatically, at the height of the storm, boat houses tipped into the ocean and docks were reduced to splinters. This was a stark reminder of the power of the ocean, the new reality of climate change, and even the unpredictable nature of life on the coast. We had hoped the new year would start peacefully, but instead it came in with a roar. We were forever changed by the forceful winds and waves.

Thankfully, our community is resilient and rebuilding efforts are already underway. In our common goal to continue to live and work on the water, we all share a new found respect for the ocean’s increasing power.”

Susan Bartlett Rice’s paintings are autobiographical and reflect the contrasts, challenges and comforts of living year-round on the Maine coast. Her work has been exhibited and collected nationally. www.susanbartletrice.com



RIVER TIDINGS

SPRING 2024 NEWSLETTER



Community-based conservation in a changing climate



We are your community land trust, caring for the lands and waters you love in the Damariscotta-Pemaquid region.

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Where climate, conservation, and community meet

Letter from the Executive Director

With the Gulf of Maine among the fastest-warming water bodies in the world, the effects of climate change are especially acute here. Our coastal area is subject to the impacts of sea level rise and more intense storms. These changes in turn impact biodiversity – the variety of our fellow creatures and their interactions – and so the two challenges must be addressed in tandem.

Coastal Rivers is a conservation organization focused on the health of the lands and waters of the Damariscotta-Pemaquid region. We are devoted to the strength and resilience of the local communities and economies in which we work, and of our friends and neighbors, including the wildlife around us.

That’s why addressing climate change is at the very center of Coastal Rivers’ strategic plan. It’s the topmost goal of our April 2021 five-year plan, given even greater emphasis in the past year and a half with the addition of a Climate Action Coordinator to our team, and the launch of our climate action plan.

Climate, not surprisingly, turns out to be a very powerful and integrating lens for our work as we ask, “What roles can Coastal Rivers best play in addressing climate change, given our particular capabilities and assets? How do we best engage our members and local communities in mitigating climate impacts and building local resilience? In what ways can we meaningfully lead on the issue, and in what ways can we also be valuable participants in an ‘all hands on deck’ effort?”

We’re already well along in taking action to address climate change. In fact, the very core of our work in land conservation and water quality means that for decades we have been actively sequestering carbon in forests, fields, wetlands, and salt marshes (more about that on page 3). These same natural areas help to keep our waters clean and reduce damage from storms by absorbing, slowing, and filtering the flow of water. The water is cleaner, and more of it is captured for future benefit this way, rather than running off or filling with excess

silt, debris, or pollutants.

In our 2021 five-year plan, we committed to doubling the pace of conservation, and even more deliberately focusing on properties that have the most potential to sequester carbon. Additionally, our landscape-wide efforts to connect large blocks of forest will allow continued movement of wildlife and natural communities, even as conditions change.

To keep our forests healthy and resilient, we’re addressing invasive species that continue to spread in a changing climate. We’re actively working to identify and combat the spread of new invasive plants and insects, such as knotweed and hemlock woolly adelgid.

In our own operations, we designed our offices to be well-insulated and fossil fuel-free: a Victorian farmhouse heated only by electric air-source heat pumps! The solar farm that we completed in partnership with Kieve-Wavus Education supplies the electricity for all our facilities, in net. A dual-vehicle charger, powered by the solar array, is now operational at Round Top Farm.

We are working on updating our stewardship practices to further reduce carbon use, such as by switching to electric tools and equipment. And we intend to push the effort as far as we can, within the bounds of practicality and thrift, to update our operations to reduce climate impacts and “walk the talk.”

Education and outreach are already front and center to our mission, and climate is a recurring theme in our school and adult programs.

With an eye to the resiliency of our communities, and the well-being of our neighbors, we hope that sharing our efforts will benefit the wider community by highlighting the roles that local businesses and non-profits like us, and everyone in the Damariscotta-Pemaquid Region, can play in addressing climate change.

“What roles can Coastal Rivers best play in addressing climate change given our particular capabilities and assets?”

Climate turns out, again, to be a very powerful way to look at our work and how we do it within the communities we serve. This newsletter highlights just a few of these efforts. I look forward to journeying with you, our friends and supporters,

as we try, learn, sometimes fail, try again, test, and work humbly but consistently toward a better climate future with the resources we have at hand – not least of which is every one of us! Thank you for supporting these efforts in all the ways you do.

With warm wishes,

Steven
Steven Hufnagel

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On the cover: Downtown Damariscotta under a full moon. Photo by Mike Tatro.

Conserving the way to climate resilience

Hands down, strategic land conservation is one of the best tools we have to confront climate change. When it comes to capturing and storing carbon, cooling the earth and air, buffering the effects of stronger storms, absorbing and filtering increasing quantities of rain, reducing erosion, and offering up the best habitat for wildlife, not much can compete with healthy forests, soil, and wetlands.

Some properties pack more of a punch than others when it comes to conserving for climate. Below are four types of natural areas that provide the greatest benefits for a cooler climate, cleaner water, and more resilient human, animal and plant communities.

Salt marsh and eel grass beds



- Act as a natural buffer by reducing the impacts of rising seas and storm surge, absorbing wave energy, and reducing erosion
 - Reduce levels of carbon dioxide in the atmosphere by trapping carbon (up to five times more efficient at carbon sequestration than tropical forests!)
 - Provide safe nursery grounds for marine life – large and small – including fish and shellfish that support our marine economy
- Salt marshes grow best when surrounded by undisturbed land. They also need room to spread inland as sea levels rise, which means it's important to conserve the uplands beyond where these areas currently exist.

Intact, healthy forests



- Remove carbon dioxide from the atmosphere and store the carbon in trees, plants, and soil
- Are composed of trees that cool the air through evaporation from their leaves, and cool the earth and water around them through the shade they cast and by enriching the soil
- Are associated with denser cloud formations, which have a cooling effect on the atmosphere
- Prevent soil from washing away
- Absorb and filter rainfall, preventing it from washing off the land
- Provide important wildlife habitat

Undisturbed wetlands



- Provide critical flood storage by absorbing and slowly releasing rainfall, snowmelt, and floodwaters
- Help recharge underground water supplies by collecting and holding water before it can run off the land
- Protect water quality by trapping sediment and pollutants (their unique plant and soil processes are capable of detoxifying chemical runoff from roads, agricultural land, and other sources)
- Function as a tremendous carbon sink thanks to the standing water, which collects and slows the decomposition of leaves, debris, and other carbon-laden matter

Large, connected landscapes



- Typically contain greater habitat diversity than smaller protected areas, and can accommodate more species
- Can support big mammals such as moose, bear, and bobcats that require larger territories
- Offer safe habitat for species away from human homes, roads, people, and domesticated animals
- Provide room for animal and plant populations to migrate from area to area as climate conditions change over time
- Sustain more bird species than smaller forests

Photos, left to right: Lush salt marsh, conserved in upper Johns Bay. Hunters' Woodlot in Bristol, a preserve with old-growth characteristics. Yates Meadow, a vast wetland complex partially conserved at Half Moon Pond. The range of a moose such as this cow varies from five to fifty square miles.

Piece by piece, a connected landscape takes shape at Half Moon Pond



Conservation on a scale that's meaningful for wildlife, water quality, climate resilience, and recreation

In April of 2022, Coastal Rivers made its biggest single-day purchase in the organization's history: a total of 487 acres along Poor Farm Road in Bristol.

Named for the pristine, crescent-shaped pond at its center, the Half Moon Pond Conservation Area occupies an undeveloped habitat block of nearly 4,000 acres – the largest, and perhaps the richest in diversity of species, on the Pemaquid Peninsula.

Half Moon Pond is adjacent to a 245-acre area already conserved by Coastal Rivers, made up of a conservation easement and two neighboring preserves, Cosima's and Keyes Woods.

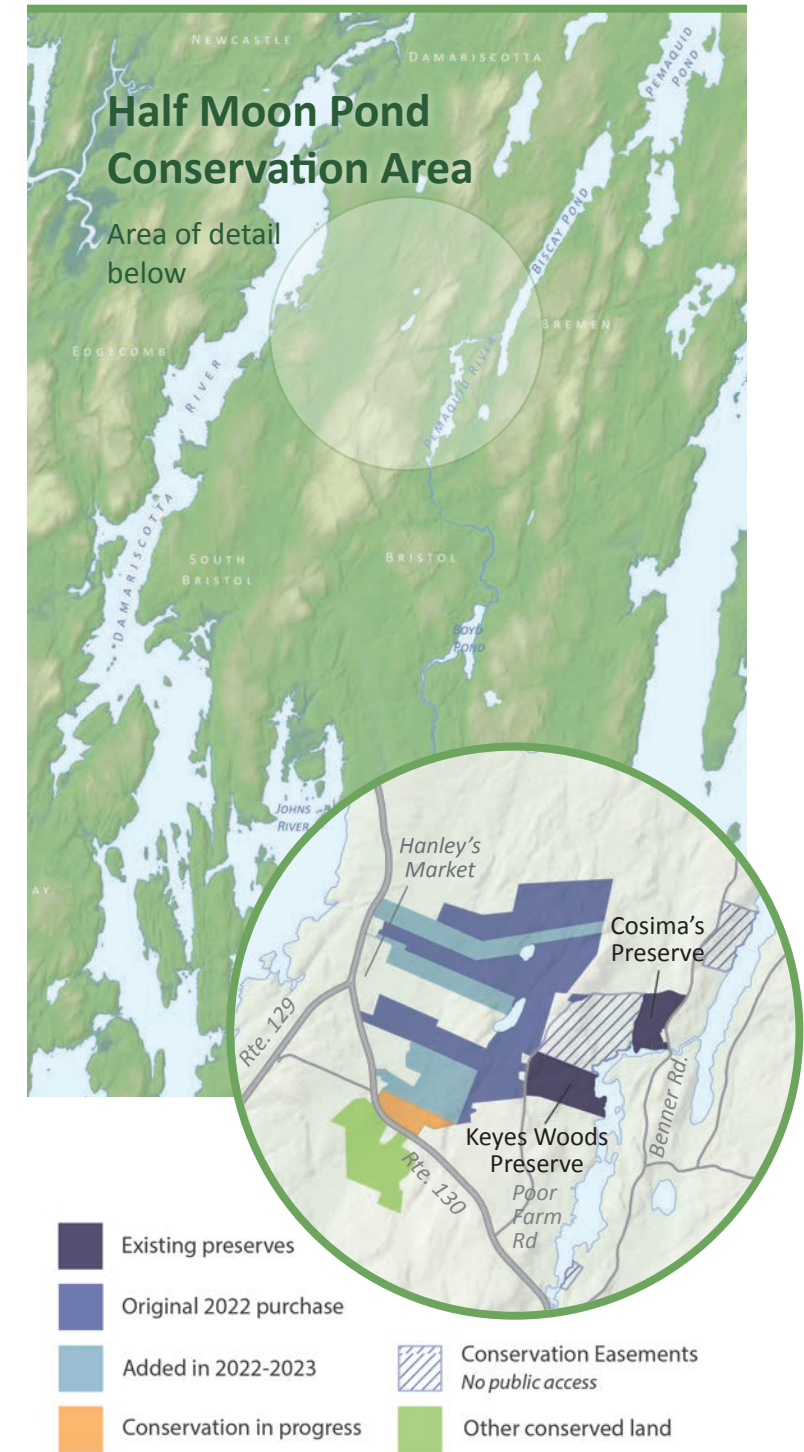
Now, two years after that historic day, Half Moon Pond has grown by three additional purchased properties and one conservation easement, with the acquisition of a fifth property in the works – bringing the total conserved area to over 1,000 acres!

The area represents a rich mosaic of different habitat types, including acres upon acres of undisturbed wetland habitat, vernal pools, beaver dams, and ponds frequented by inland wading birds and waterfowl. Its woodlands provide deer wintering grounds and habitat for moose, fisher, bobcat and other farther-ranging mammals.

Large, connected corridors like this one and the River~Link corridor on the Boothbay peninsula are important because they can support a more diverse mix of wildlife species than smaller, more fragmented areas. They offer safe haven for many birds and other shy creatures that will only inhabit places far from people and pets.

In addition to its clear benefits to wildlife, the success of this strategic effort is a win for the continued health and vitality of our waterways. The sprawling wetlands act as a massive buffer and filtration system – absorbing, slowing, and cleaning the flow of water before it eventually reaches both the Damariscotta and Pemaquid Rivers.

The newly formed conservation area in Bristol takes its name from the crescent-shaped pond at its center, tranquil and teeming with wildlife.



The conserved area around Half Moon Pond in Bristol now stretches from the marsh behind Hanley's Market on Route 130 all the way to the Pemaquid River and Benner Road.

It's also a win for recreation, providing opportunity for hunting, fishing, and nature observation. Some of the woods roads and trails are part of the 35-mile Route 66 snowmobile network, and its protection ensures it will remain open for public use.

Looking ahead, there is work to be done on the existing woods roads to restore stream flow and eliminate erosion. Any new trails will be carefully sited to avoid sensitive habitat. With an eye to forest health, ongoing stewardship will include monitoring and controlling invasive plants and insects.

The most recent additions to Half Moon Pond were made possible by private support as well as a grant

from the North American Wetlands Conservation Act Large Grants Program (NAWCA), which we applied for in collaboration with Maine Coast Heritage Trust.

We are still actively fundraising for the Half Moon Pond Initiative. For more information, please contact Steven at 207-563-1393 x330.

Thinking about conserving your land? There are many different options, including:

- Donating land
- Donating a conservation easement – a voluntary legal agreement between a landowner and a conservation agency or organization, such as a land trust, that details how the land will be managed in the future in a way that helps preserve the wildlife, scenic, and water quality values of the land. The landowner continues to own the land, and can tailor the easement to fit their needs and management goals.
- Selling your land to a land trust at a discount (bargain sale)
- Donating trade land property – with or without buildings – that is explicitly intended to be resold to support other conservation efforts (in fact, two such properties have already supported the Half Moon Pond Initiative!)

Contact Joan or Katie for more information: 207-563-1393 x310 (Joan) or x440 (Katie)

Half Moon Pond is characterized by a mosaic of habitats, from open wetlands to upland forest and everything in between.



Powered by the sun

People are often surprised to learn we have a solar array at Round Top Farm! It's discreetly sited below a rise in back of Darrows Barn, effectively hiding it from view from elsewhere on the property.

Even as we accelerate our conservation of forests, farms, wetlands, and salt marshes in pursuit of climate benefits and healthy habitat, sequestering far more carbon than we emit, we also aim to “walk the talk” in how we conduct our day-to-day work.

Regarding the most effective way to address the climate crisis, author and climate activist Bill McKibben urges simply, “In a world on fire, stop burning things.” As an organization responsible for thousands of acres of land and a number of buildings, following McKibben’s guidance means changing our operations to, effectively, burn less stuff: less gas, less oil, and less propane.

To make every dollar go as far as possible, we’ve evaluated where our emissions are highest, and set out to update our practices in the most practical ways we can. Already, we have...

- Refurbished our 1890 farmhouse headquarters to maximize efficiency and to run the building entirely on electricity, with no fossil fuels in the mix
- In partnership with Kieve-Wavus Education, installed a 300+ kWh solar farm at our Round Top Farm property which fully meets, in net, all electrical needs across our facilities

- Installed a two-vehicle electrical charger at Round Top Farm, available to visitors and staff
- Replaced (when it failed) the Boiler Mate hot water heater at the Salt Bay Farm Nature Center with a heat pump hot water heater (so that the boiler no longer has to run just to heat the water)

As funding and technology permit, among other goals, we soon hope to...

- Transition to rechargeable/electric hand-held power equipment (like weed wackers and leaf blowers) which have far lower emissions and maintenance costs
- Change over – slowly but steadily – to electrical lawn equipment, as current equipment comes to the end of its reasonable lifespan
- Increase the efficiency of other buildings in our care, such as the Nature Center and the Schaller House where our interns live, and move toward running them on electricity
- Eventually switch to electric vehicles, including the pickup trucks we use for property maintenance and plowing!

We are stronger together

Three years into our five-year strategic plan, taking stock of our #1 Strategic Goal: *Confront Climate Change.*

Early in 2021, staff and board convened on Zoom to draft Coastal Rivers' next five-year strategic plan. One topic rose to the top of discussion, again and again: climate change.

As a conservation organization rooted in community, all of us felt strongly that we needed not only to double down on our land conservation efforts and reduce our organization's carbon footprint even further, but also to do all we can to help position our communities for a stronger future.

Key to our advancement of this goal has been the creation of a new position at Coastal Rivers dedicated to climate action.

Ashley Eugley joined our team in this role in September 2023. She oversees the implementation of our climate strategy, and works to establish Coastal Rivers as a resource for the region on climate issues.

Here, in her words, Ashley describes the substance of her work.



Flood waters lap against buildings in downtown Damariscotta at high tide during the January 11 storm.

When I was growing up in South Bristol, it seemed nothing about this area would ever change.

However – especially over the past decade – Maine's coastal communities are noticing and experiencing climate impacts. Warming temperatures in the Gulf of Maine, sea level rise, and severe weather events across the region make the need for climate resilience and adaptation clear.

Coastal Rivers is committed to caring for our lands and waters, now and into the future, and to maintain them for future generations. In 2022, Coastal Rivers created the climate strategy position to advance our climate goals and to help our region become more resilient to climate change. Tahlia Mullen started this work in January 2023. Together with Coastal Rivers Staff and the Board of Trustees, she developed a climate action plan that prioritizes local ecological health and community resilience, charting a path forward for the organization's climate initiatives. Tahlia handed the position over to me when she left for graduate school last fall.

As Climate Action Coordinator, my ethos centers on advancing local engagement with climate change

by focusing on impacts at the level where life is lived. I prioritize connecting with a diverse array of stakeholders, including residents, land owners, community organizations, governments, and members of our natural resource economy.

"I am optimistic. Despite the short time I've worked for Coastal Rivers, it is clear that local residents care deeply about the community and the environment."

I've learned a lot from speaking with people who are grappling with climate impacts in their everyday lives. Not only do these conversations reassure me that we have no shortage of ideas about how to address these challenges, they reveal a deep concern for community well-being, and a shared hope that future generations will enjoy what makes our area great, just as we do.

I am inspired by our community's enthusiasm for taking action on climate change, and I am committed to building capacity at the local level. To date, I have worked in partnership with the Lincoln County Regional Planning Commission (LCRPC) to facilitate robust public engagement on climate issues. This past winter, we organized surveys and climate workshops in the towns of Alna and Damariscotta to identify residents' climate concerns and priorities.

With our guidance, both Alna and Damariscotta enrolled in the State of Maine's Community Resilience Partnership – a program which makes the towns eligible for state-sponsored grant funding for climate projects – in early 2024. Looking ahead, we will continue our partnership with LCRPC by working with the towns of Bristol and Newcastle to facilitate publicly-engaged climate resilience and adaptation efforts.

I am optimistic. Despite the short time I've worked for Coastal Rivers, it is clear that local residents care deeply about the well-being of our community and



Ashley Eugley and Ed Pentaleri, former Town of Alna Select Board Chair, presented "Service Provider assistance for enrolling Alna in the Community Resilience Partnership" at the 2024 Maine Sustainability and Water Conference in March. In this presentation, they shared insights about how building capacity at the municipal level is essential for making progress on local climate adaptation and resilience.

environment. This – together with Coastal Rivers' demonstrated commitment to addressing climate issues – gives me hope that we will generate an inclusive, resilient, and sustainable future for our special midcoast Maine community.



Ashley Eugley, Climate Action Coordinator

Ashley grew up in South Bristol and graduated from Lincoln Academy in 2018. Her first experience with Coastal Rivers was during the summer of 2021 as a Community Science Intern. She earned her B.A. in Environmental and Urban Studies from Bard College in 2022. After graduating from Bard, Ashley spent a year solo-

traveling the world on a Watson Fellowship for her project "Community Science as Community Agency." She will begin her graduate studies in Environmental Policy at Yale University this August.

Nature education opens doors for conversations about climate change by Sarah Gladu

Nature education is about connecting people to the natural world. We believe that spending time in nature, and getting to know and appreciate the wonders of the plants, animals, and systems around us, leads us to love and care about those things. This is what inspires people to become better stewards of our natural resources, and to take action for a more positive climate future.



A preschooler eye-to-eye with an iridescent dogbane beetle

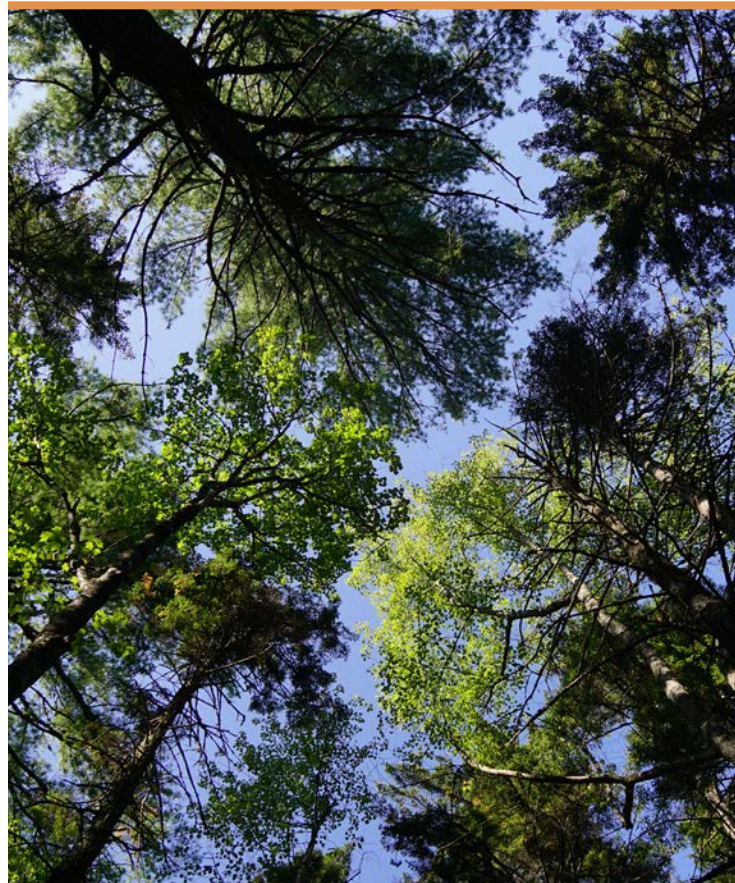
Exploring with young children

We (Education Manager & Camp Director Angela DesVeaux and I) are careful to avoid creating feelings of fear or helplessness in young children before they are old enough to grasp the complexities of climate issues. Instead, our approach is to take them outdoors and give them the opportunity to explore with all their senses at their own pace. We might look at phytoplankton under a microscope, watch an eagle soar, examine a pill bug with all its babies on its back, or admire the fall colors. Very young children react to the natural world in a visceral way, with awe, fascination, and curiosity. Kids who develop a love of nature early on are more likely to become good stewards for the environment when they are older.

How much carbon?

On a sunny fall day, I met with a group of third-graders outside Great Salt Bay School and we set out for their forest classroom, a place they regularly use as an outdoor learning space. On this day, we measured trees and calculated their height. Later on, we would figure out how much each of the trees weighed and then calculate how much carbon each tree sequesters. Next, we would estimate how much carbon each tree was likely to sequester over the next ten years.

Applied mathematics was new for most of these students. In spite of the lengthy calculations involved (by third grade standards), they really seemed to enjoy the discovery that math can be useful! We later visited Coastal Rivers' solar array, just a short walk from the school, and discussed where their school might put solar panels in the future (the group heartily agreed that under no circumstances would they want to see "their" trees cut down for a solar farm.)



Chris Holme



Where did that carbon go? Nobleboro Central School 6th graders learn about nutrient cycles in the salt marsh.

Learning with feet and fingers

In early February, Nobleboro Central School 6th graders joined us daily for a week at Nature School at Coastal Rivers' Salt Bay Farm. Among other topics, the natural setting lent itself to classes on nutrient cycles – that is, how nutrients pass from one part of the environment to another. For example, when a raindrop falls on the land, where does it go, and what does it carry with it?

We took a walk into the salt marsh to observe, first-hand, the cycles of carbon and nitrogen in nature. Later the students took a creative, hands-on approach to the topic and made dioramas, complete with clay animals, to illustrate what they had learned about these natural cycles. Understanding the movement of nutrients within a system is an important starting point for talking about coastal acidification and other aspects of a changing climate.

A deeper dive

I work with Lincoln Academy's IDEAL and edLab classes every week, and climate change enters into our discussions on a regular basis. Over the course of each year we cover a broad range of teaching topics including biodiversity, water quality, natural history, and ecology.

Observing and understanding signs of climate change is an important discussion point in many of our classes. When we built bluebird houses, for example, we discussed how changes in the timing of insect emergence in the spring affects the bird species that depend on those insects. When we worked on a water quality study last spring, we discussed how increased nitrogen can exacerbate coastal acidification in estuaries. When we dissected oysters in a study of local aquaculture, we talked about the effect of increasingly frequent heavy rains on water quality and how this can impact oysters and other bivalves.



A Lincoln Academy student follows lab procedure while collecting a water sample in a stream flowing into the estuary.

Eelgrass in the Estuary

Beds of this humble seagrass provide tremendous benefits for climate and marine life. But do we know enough to protect it?

Skirting the margins of Great Salt Bay, acres of eelgrass wave gently in the current. There is nothing outwardly extraordinary about these slender tendrils, their vivid green color dulled by a coating of marine mud – nothing to suggest that eelgrass is a climate superstar.

In fact, healthy beds of eelgrass hit way above their weight when it comes to ecosystem services like filtering the water, stabilizing sediment, buffering coastal erosion, producing oxygen, and serving as a rich nursery ground for fish and many other marine species.

They also have tremendous carbon-storing abilities – and may be up to five times more efficient at it than tropical forests! Research suggests that by locking away carbon, eelgrass also moderates the effects of ocean acidification, which can prevent marine organisms such as oysters from forming healthy shells.

In 2001, with leadership from Coastal Rivers predecessor Damariscotta River Association, Great Salt Bay was designated a Shellfish Protection Zone – protecting the seafloor from any kind of disturbance, such as digging for shellfish. Thanks to Coastal Rivers members and donors, hundreds of acres are conserved around the perimeter of Great Salt Bay.

That is why Coastal Rivers was pleased to support the research of Katie DuBois, Doherty Marine Biology Postdoctoral Scholar at Bowdoin College's Schiller Coastal Studies Center. Among other locations in the area, Katie and her team wished to conduct research on the eelgrass

beds in Great Salt Bay, which are by far the largest between Muscongus Bay and Casco Bay. It was of particular interest to us to learn whether the protections in place at Great Salt Bay make a difference in the health of the eelgrass beds.

Katie was kind enough to answer some of our questions about her research...

Q: What made you interested in eel grass?

Katie: I grew up in Maine, exploring tidepools and developing a deep love for the ocean. Now, I study marine ecosystems as a researcher at Bowdoin College. I became interested in eelgrass because this species forms large marine meadows that influence coastal ecology. Eelgrass meadows are important habitat for many marine species.

Q: How did this project come about?

Katie: Over the last several decades, eelgrass meadows in Maine have disappeared, recovered, and disappeared again. We don't really know why this is happening. After speaking with [the Maine Department of Environmental Protection], [the Nature Conservancy in Maine], conservation organizations, and community members,



Kris Christine

Above: Spawning horseshoe crabs in Great Salt Bay. Eel grass beds provide safe nursery habitat for many marine species, including fish and shellfish that are important to our marine economy.

it became clear that there was a lot of interest in understanding why eelgrass meadow cover fluctuates so much from year to year. I decided to investigate this question as part of my research program at Bowdoin College.

Q: What is the project, exactly?

Katie: We are surveying 15 eelgrass meadows throughout the Gulf of Maine, from Boston, MA to Lubec, ME to understand variation in ecosystem processes like eelgrass growth and species diversity along the coast. For each of these sites we will also determine how connected meadows are to each other through seed and pollen dispersal and how much genetic diversity there is within each eelgrass meadow. Using these genomic analyses are important because it will help managers understand how meadows recover after disappearing (where do the seeds come from?) and how resilient each meadow might be to future disturbance (how much genetic diversity is there within each meadow?).

Q: What questions are coming up as you work on this project?

Katie: We have now surveyed some of our eelgrass sites for two years, and seeing the meadows change from year to year is fascinating. Many questions that come up for me are related to understanding the variation in meadow size and species diversity throughout the Gulf of Maine and seasonally. How important is temperature variation in explaining differences in meadows? How are invasive species having different impacts on meadows?

Q: Has anything surprised you?

Katie: One of my biggest shocks during this project was when I first surveyed the eelgrass meadow in Great Salt Bay! Great Salt Bay is a unique setting and the eelgrass meadow here remained healthy when other meadows in Casco Bay were dying back.



Courtesy Katie DuBois

Katie's team at work in the Damariscotta River Estuary.

Because of its location, eelgrass in Great Salt Bay is very isolated from other coastal meadows and experiences much warmer temperatures compared to coastal meadows. Despite being in a potentially stressful location, the eelgrass in Great Salt Bay seems very healthy to me compared to other eelgrass meadows in Casco Bay. I'm very curious about why this might be, and I wonder if eelgrass in Great Salt Bay might be genetically distinct. Maybe the eelgrass has adapted to the more extreme conditions in Great Salt Bay. I do not know the answer yet, but I'm excited to explore these questions with the data we are collecting.

Katie DuBois is a marine ecologist interested in how ecological and evolutionary feedbacks determine species resilience to environmental change. Katie received a B.A. in Biology from Bowdoin College, and a Ph.D. in Marine Ecology from the University of California-Davis.



Courtesy Katie DuBois