

Winter 2020 Volume 27 • Number 2

GET TO KNOW GREAT BAY



57 INCHES:

WINGSPAN OF A SNOWY OWL





deepest channel in Great Bay known as Furber Strait



90% of waterfowl that winter in New Hampshire coastal areas are found in Great Bay



manager's corne

Great Bay National Estuarine
Research Reserve (GBNERR) is
an estuary comprised of 7,300
acres of tidal waters and 2,935
acres of coastal land. Acquired
through land purchases and
conservation easements,
GBNERR was designated on
October 3, 1989 to be
preserved for the purposes
of education, research, and
resource protection.

GBNERR

Manager: Cory Riley

GREAT BAY DISCOVERY CENTER

Education Coordinator: Kelle Loughlin

GREAT BAY STEWARDS

Chair: Deb Alberts



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A Great Bay Winter

Winter makes me intentional. I make sure there is plenty of wood for the fire; switch our car tires; buy boots that will fit the growing feet of my kids; haul the patio furniture down to the basement. I follow the weather more closely and I check the oil left in our heating tank. I prepare, and I adapt my habits in preparation for the cold. The adaptations that I need to make are eased by my heated car and house, my down jacket and Gore-tex boots. Far more impressive are the ways the plants and animals of New England get ready for and thrive in the winter. In this issue of Great Bay Matters

we explore winter wildlife, and I encourage you to get outside and do the same. Our wildlife viewing requires more intention and concentration in the winter, too, as we search for clues like an animal track leading out from under a deck, or an unusual pile of scat along the trail. Even our programs here at the Great Bay NERR adapt in the winter. We are one of the few estuaries within our network that freeze over, so our water quality data sondes are pulled from the water each November and much of our field work hibernates until spring. The education field trips take a break and we shift to interpretive programs that highlight winter on Great Bay. Staff burrow down at desks like a chipmunk in a den to analyze data, write proposals, and design new curriculum. The adaptations and preparations we see in nature and undergo as an organization each winter, ready us for the fresh renewal that happens each spring. I'm grateful for the cold, calm winters and the way they challenge us all to survive and prepare to grow year after year.

Cory Riley, Reserve Manager, GBNERR





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AWALKen WOODLAND

f you take a stroll along the boardwalk at the Great Bay Discovery Center, you might notice several sets of stenciled animal tracks. These tracks represent the correct gait of some of the animals found in habitats around Great Bay. As the temperatures drop

and the first laver of snow coats the boardwalk, you may wonder what happens to these woodland animals during the winter months. Where do they go? How do they find enough food? How do they survive subzero temperatures? Each of these animals have specialized adaptations which

allow them to survive in a harsh winter climate.

The first tracks are those of a wild turkey. They have become a common sight in Seacoast New Hampshire, but you may notice a decrease in turkey sightings during the winter. During warmer months, omnivorous turkeys forage for insects, grasses, leaves and seeds, but in the winter their diet shifts to what foods are still available, such as any berries that remain or nuts such as acorns. Turkeys will venture further from Great Bay shores in winter, moving deeper into the forest to forage and roost in thick conifers which provide them better protection from wind and harsh temperatures.

The river otter has a reputation of being a highly social, playful and charismatic animal. They are well adapted

> to cold New England winters. Unlike marine mammals, they do not have blubber to keep them warm; instead they have two dense layers of fur and consume a high calorie diet to help maintain their body temperature. Otters are carnivores, and utilize rivers and streams which

are less likely to freeze, providing them the opportunity to find a variety of fish, turtles, frogs, and other aquatic creatures.

Porcupines are found throughout the year around Great Bay and although they are covered in quills, (modified hairs with barbs) they cannot "shoot" them to ward off predators. They can however use their tails like a club, but it is still no match for a fisher, one of the few predators a porcupine has. Porcupines are herbivores and eat tree bark, grasses, leaves and pine



needles. In the winter porcupines forage for food by plowing paths like walkways in the snow. It is not uncommon to find them high in a tree where they feed on bark. If you are lucky you might stumble upon a porcupine den and will know you have by the substantial amount of scat left behind!

At the beginning of the outer loop of the boardwalk, tracks of the Eastern cottontail rabbit can be found. The cottontail is an herbivore and does not hibernate, switching from a summer diet of grasses, herbs







a sure sign of spring returning when The last set of tracks on the

and berries, to twigs and bark in the winter. Cottontails also consume their own fecal pellets, a behavior known as coprophagy. This behavior is necessary for rabbits to maintain healthy digestion. They find shelter in shrubs and brush piles, or use dens or cavities made by other animals to survive the winter.

The white-tailed deer is another species well adapted to surviving during the cold winter months. Making it through a long, snowy winter can be difficult for deer, but adaptations

like a slowing metabolism, allow them to preserve fat and calories to sustain them through the winter. In order to conserve energy, this larger mammal moves and travels a lot less, and can be seen foraging more often during the day when it is slightly warmer. At night and during storms, deer move to more sheltered areas sometimes referred to as "yards". These protected habitats are often dominated by hemlocks and other conifers that provide good protection from heavy snow and wind.

Great blue heron are a common bird species that live throughout the estuary. During the spring and summer they feed on a variety of fish and crustaceans, but will also eat snakes, salamanders or frogs. In the winter, herons migrate to warmer climates including Central America or various southern states. Around April, they are

they are seen foraging in the bay.

boardwalk belongs to a muskrat. They are a semi-aquatic rodent found commonly in wetland habitats. Their diet mainly consists of marsh vegetation, along with some aquatic animals such as fish and amphibians. Muskrats spend the winter in dome-shaped dens constructed of cattails, mud and other vegetation. Their thick waterproof fur aids in keeping their bodies warm and insulated throughout the winter while they continue to feed under the ice.

The next time you take a walk on the Discovery Center's boardwalk, keep an eye out for these creatures. If you are quiet and observant you just might catch a glimpse!

Kelsey Hanson, Naturalist, GBNERR



A Walk on the Watery Side

As winter's grip envelopes us, many in the Northeast are donning winter jackets, lugging firewood, driving with snow tires on our cars, and regularly shoveling out from storms. While we do all this prepping, animals in the Great Bay Estuary are also dealing with the colder weather.

he aquatic creatures that call Great Bay home have adapted over millions of years to handle the harsh seasonal changes in New England; some migrate, some hibernate, and some continue as usual. For those who have visited the Great Bay Discovery Center's Discovery tank, these animals enjoy a consistent environment, rarely feeling the challenge of even a degree in temperature change – but for their counterparts in the bay, it is not so simple.

One abundant critter in the tank is mummichogs, small fish that are well known for their high tolerance to variable environmental conditions. They can live in temperatures ranging from 6-35°C (43-95°F). This high tolerance allows them to live in the bay as the weather gets colder. In winter, mummichogs may migrate upstream or remain in the salt panne they summered in, burrowing themselves in mud to escape lower water levels or ice. They can burrow up to 20 cm below the



surface of the mud. This keeps them protected as they lie dormant for the remainder of the winter. When they are dormant, their physiological processes slow down allowing them to conserve energy until the spring when food is more abundant.

A favorite of the Great Bay Discovery Center is the prehistoric looking horseshoe crab. Other populations of horseshoe crabs in North

America have varying patterns of migrations, where some will retreat into

deeper waters

of estuaries
they may live
in; others
will migrate
farther into
the ocean to
the continental shelf.
Research
locally indicates
that populations
in the Great Bay
will almost always stay

in the bay and very rarely go out into the Atlantic Ocean. When horseshoe crabs do migrate to deeper water they bury themselves in the sand, similarly to the mummichogs.

In the tank you will also find oysters, ribbed mussels, and soft shelled clams, bivalves found throughout Great

Bay. In the winter, oysters will go
dormant and rely on stores of
glycogen they produce throughout
the fall. This is why oysters
are sweeter when harvested
in winter. In addition to the
challenges posed by a hungry
shell fisherman, there is also the
winter kill phenomenon which
usually takes its toll on the weaker
and unhealthy oysters. For the soft
shell clam, however, colder weather

The American eel has been in our tank for 14 years. Caught at our waterfront as a pencil-thin elver, it has become a favorite for people to see. Wild American eels survive the winter in one of two ways. They will either migrate into freshwater systems from estuaries and coastal systems for the winter, or they will migrate farther south into warmer waters. In the winter months, they will burrow into the mud, like many other animals in the Bay, and enter a state of torpor, or complete inactivity. When

the American eel has reached spawning maturity, it will make the larger migration to the Sargasso Sea, in the south of the Atlantic Ocean, where they will spawn. Unlike the anadromous Atlantic salmon which travels

into fresh water to spawn, the American eel is catadromous, meaning it travels out to sea.





The two summer flounder have lived in the thank for 12 years. Donated by Great Bay Aquafarms, they

were destined for the dinner plate. In the wild, when water temperatures fall, summer flounder will retreat into deep ocean waters away from the bay until the spring brings back the

bounty of food

and warms their

spawning grounds.

In contrast to the other critters in the tank, the

co-occurring winter flounder is so named because they spawn in the winter. In New Hampshire, winter flounder migrate to their spawning grounds in the fall and early winter, generally spawning in February and March, their eggs hatching a few weeks later.

This winter, if you are able to visit the frigid shoreline of Great Bay, imagine all of the silent strategies its creatures employ. Whether they are hunkering down or migrating to warmer environs like humans, they will surely come to life again when warm weather returns!

Casey Reynolds, Naturalist, GBNERR



usually means higher survivorship.





Program News and Events From GBNERR

GET YOUR SCIENCE FEET WET IN GREAT BAY! - INSIGHTS FROM AN INTERN



In May of 2019 I began my summer internship with the Great Bay National Estuarine Research Reserve as the Research and Stewardship Intern. I was just about to graduate from UNH with a biology/environmental conservation degree, and

I was looking for experience in the ecology field. I went into this job with the expectation that I would gain real field research experience, but what I actually got was far more momentous. From this internship I gained real, applicable field and laboratory research experience, I networked and gained professional connections, and I learned important interpersonal skills such as effective

communication and team-building as a result of working with staff and volunteers.

In the beginning I was out working in the field a lot, helping the research team with various coastal marsh projects. The very first thing I learned was how to identify marsh plants; for instance, I learned that saltmeadow hav is an indicator species for high marsh habitats whereas smooth cordgrass is indicative of low marsh. In addition to plant ID, I learned a new technology for mapping the elevation of the marsh, and I was able to help the research team monitor changes in salinity and groundwater levels of the marsh using a method called porewater sampling. In September, I participated in vegetation monitoring (A.K.A. biomonitoring), where I was able to put my plant ID lessons to the test.

I mentioned to the research coordinator. Chris Peter, that I also had an interest in lab work and he was able to get me involved with some of those projects going on at

the Reserve. I assisted in environmental DNA projects and water quality projects - I helped filter water samples in order to extract eDNA, chlorophyll levels, and total nutrient levels in the water. I even came back the following week to assist in the analysis of the chlorophyll after filtering it using another new technique called fluorometry.

Outside of the research realm, I also really enjoyed getting out with the Stewardship Coordinator, Rachel Stevens, to work on community outreach projects – such as constructing the Great Bay Wildlife Garden near Chapman's Landing. With the volunteers and staff at the Reserve. I have made some great professional connections; and from them I have learned so much about the different career paths that are available for someone interested in ecology.

Kerri Strobeck, Research and Stewardship intern, GBNERR

EVELYN BROWNE CONSERVATION AWARD

ongratulations to Beryl Harper of Durham, √NH, winner of the 2019 Evelyn Browne Conservation Award. The award is given annually by the Great Bay National Estuarine Research Reserve to an individual who has made a significant volunteer contribution toward the protection and conservation of the Great Bay Estuary.

Bervl has been a volunteer educator at the Great Bay Discovery Center for more than a decade, sharing her love of all things marine and estuarine to hundreds of children throughout the state. "She is the consummate "volunteer

professional"," says Beth Heckman, Assistant Education Coordinator. "Beryl wants to make sure what she is teaching is accurate, but has such a light and cheery approach toward working with children."



Bervl has helped the Reserve on many special events over the years, and is also a UNH Marine Docent, singing with their popular Sea Chanty group. She is very involved in her local church, neighborhood association and is a true outdoor enthusiast. It is not uncommon to see Beryl on the boardwalk with her walking group or really taking the time to mentor a new volunteer educator.

Lastly, Beryl honored the life of her daughter Chelsea by donating a granite bench and graceful arched bridge engraved with the words "Build Bridges" to the Discovery Center's new natural

play area. Her donation sparked more volunteerism and donations to continually improve the space. For her love of Great Bay and her willingness to share it, we congratulate Beryl Harper!

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Educational Offerings



Winter BAYVENTURES 2020

Winter program schedule for kids in 1st-6th grade

February Vacation Days

Wednesday, February 26th

Outside with Owls

Did you know that many owls nest in the winter? Join us as we explore the woods around the Discovery Center for evidence of owls. We will play owl games and make owl crafts too!

Thursday, February 27th

Project Feederwatch

Do you like to birdwatch? Bird watching is a hobby that can be enjoyed for a lifetime. The Discovery Center has participated in Project Feederwatch for over 20 years and would like your help counting birds at our feeders. Join us for a day of bird identification, counting and tallying our feathered friends. Enjoy games and crafts too!

Friday, February 28th

Winter Carnival

Would you be better camouflaging like a cottontail rabbit or sniffing under the snow like a red fox? Learn some cool animal adaptations by joining in some active outside games and challenges. Try out snowshoes and make a craft to take home.

Each Bayventure program runs from 10am - 2pm \$25 GBS member ● \$30 N/M ● \$5/sibling/program discount Each program is limited to 14 participants

Special Bayventure Program for Older Kids! Friday, March 6th to 7th

Wake Up in a Wigwam!

Join us for a wintery overnight in our birch bark covered wigwam. Participate in fire making, cooking dinner over an open fire, and preparing correctly for a night outside in winter. Join in outdoor games and activities. Help prepare a warm breakfast on camp stoves in the morning and reflect on your experience with others. Ages 10-13. 5:00pm— 8:30am. Dinner and breakfast provided. Limited to 10 participants. \$60 members \$75 non-members.

For all Bayventure programs call (603) 778-0015 or email **beth.heckman@wildlife.nh.gov** to register

"Once Upon a Winter Estuary"

For ages 2-5, 10:30 am -11:30 am on select Thursdays in January, February and March

Come dressed ready for some winter fun outdoors! We will start each program outside with activities, games and wintery walks. Following our outdoor exploration, we will move inside to warm up with a story, craft and hot cocoa! \$3 per child or \$5 per family. Pre-registration is required. Email Jay. Sullivan@wildlife.nh.gov or call 778-0015.

January 9th - "Goodbye Autumn, Hello Winter" by Kenard Pak

Each season has a magic and personality all its own. Come say hello to winter and all the things we look for and enjoy about it.

January 23rd - "Waiting for Winter" by Sebastian Mescenmoser

Do you remember the first time you saw the snow fall? We all get excited to see the magic of new snow! Come play with us and learn about animals that like to play in it too.

February 6th - "Winter Dance" by Marion Dane Bauer

Squirrels gather nuts; geese fly south and other animals put on their winter coat. How do you get ready for winter? Join us as we learn

more about what animals do when the days get colder.

February 20th - "When the Snow Falls" by Linda Booth Sweeny

We like to play in the snow and the animals do too! Join us as we have some winter fun playing and looking for signs of animals that stay active in the cold.

March 5th - "Fort Building Time" by Megan Wagner Lloyd

Each season brings the perfect materials to build the perfect fort! Join us as we use snow and/or other materials to build and have some fun together!

March 19th - "Goodbye Winter, Hello Spring" by Kenard Pak

Are you ready to say goodbye to winter? Join us as we look for melting snow, chipmunks and other signs of green, as we get ready to say hello to spring!

For all OUE programs call (603) 778-0015 or email *jay.sullivan@wildlife.nh.gov* to register

Send checks payable to Great Bay Stewards to the address below marked ATTN: Beth • Great Bay Discovery Center • 89 Depot Rd, Greenland NH 03840 • greatbay.org

A National Perspective: Will Tidal Marshes Survive Rising Seas?

he National Estuarine Research Reserve System has developed a powerful tool to evaluate and compare the ability of tidal marshes to thrive as sea levels rise. Using consistently collected data from their System-Wide Monitoring Program, Research Reserves applied this approach at 16 sites in 13 coastal states to create the first national – scale comparison of marsh resilience to sea level rise.

While marshes in most regions exhibited moderate resilience overall, all but one showed signs of vulnerability. Pacific Coast marshes appeared better able to track rising seas than those along the Atlantic, where two marshes in southern New England were found to be particularly vulnerable. This open source approach can be applied at different geographic scales to shape coastal policy and management decision focused on protecting tidal marshes, and the benefits they provide for generations to come.

Tidal marshes provide many benefits to nearby communities. They protect people and property against storm surges and flooding, improve water quality, create habitat for commercially important fish and wildlife. and offer many opportunities for outdoor enjoyment. Their ability to capture and store large amounts of carbon dioxide also makes marshes important allies in efforts to address



climate change.

For millennia, many tidal marshes have persisted by increasing in elevation to keep pace with gradually rising seas. With sea levels projected to increase much faster in the near future than they have in the past, the fate of many marshes-and the benefits they provide- is uncertain.

Until now, coastal decision makers have lacked effective tools to evaluate and compare the ability of marshes to persist in the face of rising seas. This information is critically needed to select the most appropriate strategies to manage a particular marsh. The Reserve System's new approach meets this need by assessing and integrating five categories of marsh resilience; 1) Marsh elevation, 2) Marsh elevation change, 3) Sediment supply, 4) Tidal range, 5) Rate of sea level rise.

Open Source Approach for Assessing Marsh Resilience

Anyone with the relevant data can use this novel approach to compare the resilience of different marshes to sea level rise- from federal agencies managing national networks of refuges to managers of individual marsh sites. A free calculation tool is available at *nerra.org/marsh*. Resources there also include a detailed description of the method and the analysis of resilience in a recently published article in the journal Biological Conservation. For more information on Great Bay NERR's resilience to sea level rise contact Rachel Stevens, Stewardship Coordinator – Rachel.Stevens@wildlife.nh.gov.

Reprinted in part from the NERRS Marsh Brochure, available at: nerra.org/ reserves/national-tools/marshresilience-assessment/.

Volunteer for Great Bay!

- Lunch & Learn Series: Join us for a public lecture series once a month Jan-March. No RSVP is required and all lectures are free. We provide snacks and drinks, you just bring your lunch and learn something new!
- Volunteer Educators: Teach school children about the natural history of Great Bay and help shape future stewards of the bay! All training is provided and volunteers
- sign up for programs that work with their schedule. All day training is April 9th, lunch is provided.
- Exhibit Room Volunteers: Greet visitors, assist with the Discovery Tank, and help people learn about Great Bay! Training is April 16th, 1-3:30pm.
- Adopt-a-spot: If you like to spend time outside and are looking for a volunteer opportunity why not adopt-a-spot at

the Discovery Center? We have many gardens, a couple of trails, and outdoor play boats to choose from and the time commitment is just 1-2 hours per week at your convenience.

Contact Melissa at melissa.brogle@ *wildlife.nh.gov* or 603-778-0015 with any questions or to register for a training or workday.

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The Great Bay Trust

When former Reserve volunteer coordinator and current Stewards Trustee Sheila Roberge reached out to me about joining the board of the Great Bay Stewards, I was excited to learn more. As a former teacher I truly appreciate the field trips and teacher trainings at the Reserve, and as a homeowner

living near the Oyster River, I recognize the importance of the water that surrounds us in our health and our lives.

Since joining the Board, I have been struck by the vitality and commitment, along with a sense of community and friendship, shared by all those who work and volunteer at the Reserve. The Stewards mission, the long-term protection and conservation of the estuary by supporting education, land protection, research, and stewardship, becomes even more challenging and crucial with our changing climate and an increasing local population.

This fall has been an exciting one for the Stewards. At our Annual Meeting in early October, we announced that we had received our largest single donation ever, a \$75,000 gift from an anonymous donor dedicated to support for Discovery Center facilities, as well as volunteer and education support. The night was a joyous one, with a trivia competition, complete with oysters from local, sister-owner Choice Oysters and Fox Point Oysters; chowder from Newick's Lobster House; soup from Tendercrop Farm; and bread from Me & Ollie's.

Earlier in the fall, you might have spotted us at the Seacoast Microbrew Festival in Dover, introducing festival-goers to "Pollution Plinko" and the goals and message of the Stewards. And of course, the last Saturday in October saw the 21st annual Great Bay 5K | Race for a Healthy Estuary. Blessed with blue skies and perfect temperatures for running, both the men's and women's race record times were broken, with

Adam Martin, 25, of Craftsbury Common, Vt., finishing in a lightning-fast time of 14:33, and Rachel Schilkowsky, 27, of Providence, R.I., setting the women's course record with a time of 16:32. The first ever New England Oyster Cup was won by a team from local group Runner's Alley, who also won the men's and women's team competition. As always, this exciting morning would not be possible without the tremendous volunteers who do everything from direct parking to serving soup to handing out water along the course, plus the dedicated staff at the Reserve.

We hope you were able to attend one of these great events, but if not, we hope to see you this spring at our 15th annual Art of Great Bay, which this year takes place from April 3-5.

It's a great time to make a difference.

Deb Alberts, Chair, Great Bay Stewards

Great Bay 5K

We are especially grateful to this year's sponsors of the Great Bay 5K: Sprague Operating Resources, People's United Bank, Oyster River Running Company, Northeast Delta Dental, Coca-Cola Bottling Company, Points East Publishing, Cardinal Point Property Management, Open Arms Racing Heart Foundation, the Rotary Club of Durham, the Exeter Area New Car Dealers Association, First Student, From the Ground up Podiatry, Rolling Green, and Lang's Landscape Services. Once again, walkers and runners could take their bibs to participating local breweries for a complimentary beer after the event: Deciduous Brewing Company, Tributary Brewing Co., Tilton Brothers Brewing, North Country Hard Cider Company, Liars Bench Beer Co., and Empty Pint Brewing Company, while The Franklin offered a half dozen oysters to race goers.





PLEASE JOIN US!

All interested parties are cordially invited to become Great Bay Stewards. Members receive Great Bay Matters and other pertinent mailings.

Annual dues may be paid by check made payable to the Great Bay
Stewards and sent to: GBS Membership Committee, 89 Depot Road,
Greenland, NH 03840

ī	Guardian \$150	☐ Protector \$75

Steward/Family \$35	Student \$20	Other \$
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name		
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The Great Bay
Stewards would
like to thank
Choice Oysters
and Foxpoint
Oysters for their
donations of
delicious oysters
from the Great
Bay Estuary!

