Great Bay Matters

Promoting research, education and stewardship throughout the Great Bay Estuary
**GET TO KNOW GREAT BAY**

**1800s**

European strain of Phragmites introduced

**ONE**

Perennial pepperweed plant can produce thousands of seeds per year

**1950s**

Autumn olive promoted as great shrub for wildlife and erosion control

**67%**

of the Japanese knotweed plant grows below ground

**2011: NH BANS FIREWOOD IMPORTATION**

- European strain of Phragmites introduced
- Perennial pepperweed plant can produce thousands of seeds per year
- Autumn olive promoted as great shrub for wildlife and erosion control
- 67% of the Japanese knotweed plant grows below ground

**5 YEARS**

Garlic mustard seeds remain viable in ground
Intruders from space, intruders from across the sea, intruders in your house! We have a strong reaction to that word. When I think of an invader, I think of a Viking armed with a frightening blade and fearsome facial hair. Most people do not think of rabbits, ants, freshwater mussels or pretty purple flowers as frightening. But depending on where you live, these are all intruders that have wreaked havoc on local flora and fauna and on built infrastructure and agriculture. An “invasive species” is defined as a species that is: 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. This issue of Great Bay Matters highlights some of the invasive species we need to be on the watch for in this region, and what all of us can do to slow them down or keep them away. A challenge in managing invasive species is knowing where to start and evaluating if your efforts are making a difference. As with so many worthy pursuits, the battle can seem endless. But here in New Hampshire, we have an army of dedicated and creative people working on invasive species management. We hope this issue inspires you to enlist and join us.

Cory Riley, Reserve Manager, GBNERR
A plant is considered invasive when it is not native to the region and is likely to cause economic or environmental harm. Many of our ornamental garden plants, such as our state flower the purple lilac, are not originally from New Hampshire but they do not spread easily or cause problems so they are not considered invasive. When a plant is invasive, it often out-competes native species by monopolizing light, moisture, nutrients, soil or space. This can have negative impacts on the biodiversity of the plant community and disrupts the feeding, nesting, migration or sheltering habits of native birds, wildlife and fish. Controlling invasive plants can be daunting to land managers and land owners, but guidance exists to help set goals, prioritize projects, and implement best practices in a strategic way. In 2015, NH Fish and Game published “Picking your Battles”; a guide to planning successful invasive plant management projects (wildlife.state.nh.us/invasives/). A central strategy in prioritizing what species to focus on and where to conduct projects is “early detection and rapid response”.

Early detection and rapid response tries to prevent or slow a new invasive species from coming into an area. It is much easier to remove a few plants of an “early detection species” to stop it from becoming established, than it is to tackle a plant community that has firmly taken root throughout a region. Early detection can take place at any scale. Even if it is common in surrounding areas or other parts of the state, if it is not present where you are, then focusing on preventing it from moving in is the most important battle to pick. Since early detection is such an effective approach for managing invasive species, it is important to be as specific and timely as possible about which plants to be looking for in your community.

We all know them: those plants that take over your garden, your favorite hiking path, or your local park seemingly overnight. Where did they come from? How did they spread so quickly? Why are they so darn hard to get rid of?

Perennial pepperweed at Odiorne State Park. (above)

Long-time wetland scientist and friend of Great Bay, the late Frank Richardson (far left), works with a crew of enthusiastic volunteers to tackle invasives along the New Hampshire Seacoast. Photo credit, Kevin Lucey, NHDES.
Here in the seacoast region, we are lucky to have several partners working together to stay one step ahead of invasive plants. The Nature Conservancy (TNC) conducts a training each April to create a cadre of informed professionals and citizens that know what to look for, where to look for them, and what to do if you find an early invader in the seacoast region. Joanne Glode, the southern New Hampshire Stewardship Ecologist for TNC, puts on the training each year. She keeps a running list of invasive species that she reads about in surrounding areas and hears about through her professional network throughout the year, then she selects a handful of the most concerning invaders to highlight every spring.

**TWO PLANTS TO WATCH FOR IN THE GREAT BAY REGION**

**PERENNIAL PEPPERWEED** (*Lepidium latifolium*)

Perennial pepperweed is native to Eurasia and Northern Africa and was accidentally introduced to the United States as a contaminant in imported seeds. It invades coastal wetlands, marshes and roadides forming dense stands that out-compete native plants, ultimately destroying habitat. Already found in northern Massachusetts and in southern Maine, it presents an ideal opportunity for early detection and response. Some stands have been found in NH, and the Department of Environmental Services has run a "Pepperweed Patrol" to encourage citizens to help look for pepperweed in our estuaries. Pepperweed grows to be two to four feet high, has alternating leaves that are finely serrated and dense clusters of small white flowers in July. Pepperweed has not been reported in the Great Bay Estuary yet, and we are hoping to keep it that way.

**JIMSONWEED** (*Datura*)

Jimsonweed was recorded in the United States as early as the 1600s and has been found in every state but Alaska. It thrives in previously disturbed land like abandoned agricultural fields, roadides, or vacant lots. The Jimsonweed has a beautiful flower, a unique and fierce-looking seed capsule, and the poisonous and hallucinogenic properties that are common to the nightshade family. Legend has it that a group of British soldiers sent to quell a rebellion in Jamestown, VA were poisoned with jimsonweed (either by accident or by mischievous colonists). It spread to Northern New England by contaminated agricultural crops and, as with many invasive plants, is now often distributed unintentionally by nurseries and garden supply stores. Jimsonweed has been found growing on NH beaches over the past few years, so now is the time for early action to keep it from spreading.

An extensive network of professional partners and citizens are proactively sharing information and best practices on how to detect and manage harmful invasives like the perennial pepperweed and jimsonweed. One of the most important things you can do is to record a sighting through the “Early Detection and Distribution Mapping System” or EDDMapS ([www.eddmaps.org](http://www.eddmaps.org)). EDDMapS is a web-based mapping system for documenting invasive species distribution around the country. This has made tracking where an invasive is and where it might be headed much more efficient. Work days and volunteer outings to detect and remove invasive species are also offered by several partners. Join the Stewardship Network ([newengland.stewardshipnetwork.org](http://newengland.stewardshipnetwork.org)) to stay informed about opportunities to get outside and get your hands dirty battling invasives. Pulling together, we can keep the early invaders out of the places we love.
To Eat or not to Eat?

Invasive flora and fauna are like Uncle Eddie and his family in National Lampoon’s Christmas Vacation. You didn’t want them to come, but now that they have, you can’t get rid of them.

New Hampshire, one of the first regions to be settled by the Colonists in the 1600’s, has its share of difficult-to-manage invasive species – both plant and animal. Dozens of New Hampshire professionals are working on dealing with the invasive species that have already been established, or are creeping silently into our waterways, wetlands or gardens. Utilizing education and awareness, early detection and rapid response, to mechanical or even biological and chemical eradication techniques -- success depends on the severity and extent of the invasion.

Some think that eating invasive species could help shrink populations. But others fear that eating them might pose the risk of it becoming an integral part of a regional cuisine and possibly turning it into a revered cultural icon. One of the best examples of this is the introduced wild boar to the Hawaiian Islands. The ecological devastation caused by boars includes destruction of endangered plants and massive erosion, which creates breeding pools for nonnative mosquitoes carrying malaria or pox that threaten native bird species. Attempts to eradicate or even control populations of the boar engender passionate opposition from Hawaiians who have feasted on them for generations.

Throughout the world, there are some invasives, particularly fish that have become highly sought after restaurant fare. Often they were introduced on purpose in order to create a sport fishery, or by accident like the Asian carp, who escaped from its job of nibbling algae from an Arkansas sewage treatment basin. The Lionfish is native to the South Pacific but has aggressively invaded the Caribbean and southern Atlantic Ocean. It is believed to have been released by pet owners who didn’t want the beautiful fish any longer but didn’t have the heart to euthanize it or give it to someone else, and thus released them into the ocean. The Lionfish is thought to perhaps be one of the single most destructive and aggressive invasive species world-wide and although restaurants are now serving the delicious lionfish in a variety of ways, it has scarcely made a dent in its population.

Most invasives are nearly impossible to contain once established, which is why professionals are developing strategic plans comprised of a variety of approaches. Eating the current invasives that exist today in New Hampshire will likely not have a significant impact in their management and eradication, but can provide delicious and nutritious food while assisting, if ever so slightly, in giving native populations a chance. If viable markets can be established for the worst of the invaders, perhaps there could be a chance of impacting populations. But experts do warn – if you fall in love with a wet and wild invader, never transplant them or relocate them closer to you. Eat them to beat them if you will, but never treat them Willy nil!
Some of the most aggressive local plant favorites to try include the autumn olive, whose berries can be picked like wild blueberries or blackberries, Japanese knotweed, whose shoots do a fine stand-in for rhubarb, or the incredibly invasive garlic mustard. Different edible parts of garlic mustard are ready to gather spring through fall. Learn all you can about how to identify before you harvest, and dispose of unused portions correctly as even the tiniest of live knotweed can sprout a new destructive population if discarded carelessly.

Kelle Loughlin, Education Coordinator, GBNERR Director, Great Bay Discovery Center

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**TRY THE RECIPES BELOW AND BECOME AN INVASIVORE!**

**PICKLED KNOTWEED**

- 2 cups of 2 inch length knotweed shoots (harvest in early spring just as they are coming up)
- ¾ cup rice wine vinegar
- ¼ cup water
- ¼ cup sugar
- 1 tablespoon salt
- ½ tablespoon minced ginger

Place knotweed in clean canning jar. Boil all ingredients and pour over knotweed. Let cool to room temperature and store up to a month in refrigerator. Delicious with pork and rice!

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**GARLIC MUSTARD PESTO**

Combining fresh garlic, sliced garlic mustard and chives.

Puree in food processor with olive oil and walnuts (or pine nuts)

Add parmesan cheese and slightly melted butter.

Add to your favorite recipe calling for pesto!

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**Estuary Almanac**

**Chinese Mitten Crab - (Eriocheir sinensis)**

This hairy-clawed invader is on the Global Invasive Species List of “100 of the World’s Worst Invasive Species,” and though this crab hasn’t been found in New Hampshire yet, it has caused devastation all over the world. As its name suggests, the Chinese mitten crab is naturally found in the pacific waters of East Asia, but in recent years, range expansion has earned it a spot on this “most unwanted” list.

The Chinese mitten crab has two hairy front claws of equal size with white tips. Its carapace, or shell, can be up to four inches wide with eight pointed walking legs about twice as long as the carapace and ranges in color from light brown to olive. These crabs are catadromous, meaning they live in freshwater most of their lives and migrate to saltwater to reproduce and die.

In the last few decades this species has been found in the Great Lakes and coastal waters of California, and more recently on the East coast in Chesapeake, Hudson and Delaware Bays.

So far, the only self-sustaining population found in America is in California, where its population has rapidly increased since first spotted there in 1992. Scientists are currently unsure how the mitten crab will do in Atlantic waterways. But one thing is for sure, if populations establish on the eastern seaboard, it could be devastating.

The invasive populations in Europe and California give us a look into the potential threats it poses for the Gulf of Maine and Great Bay. An opportunistic omnivore, it will feed on live and dead bait and fish and amphibian eggs, and may out-compete native crab populations. Its burrowing habits have increased shoreline erosion, damaged banks and levees, altered the course of streams and blocked cooling systems for power plants. It can also be a secondary host of the Asian lung fluke, a parasite that can cause disease in humans and animals.

Authorities around the US have pushed for help from citizens. If you find a mitten crab, do not release it back to the water. Instead, keep it and either freeze it or preserve it in alcohol. Write down the date and location and method of catch. Take a photo and fill out a report on the USGS site, https://nas.er.usgs.gov/SightingReport.aspx, or contact the Aquatic Nuisance Species Task Force at 1-877-STOP-ANS.

Colleen McClare, Naturalist, GBNERR
EVELYN BROWNE CONSERVATION AWARD

Congratulations to Molly Dennett of Eliot, Maine, the winner of the 2017 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 contribution toward the protection and conservation of the Great Bay Estuary.

Molly began volunteering for the Reserve just three years ago, but in that time has already logged close to 800 hours! On any given day, Molly might be seen out in the salt marsh, conducting a bio-monitoring survey or collecting invasive green crab data for the Research program. After being in the salt marsh all day, she often grabs a quick meal at the Great Bay Discovery Center and jumps in to assist as a kayak program volunteer for an evening paddle. Molly is both a school program educator, and, an exhibit room volunteer, sometimes doing a shift of each on the same day! She has also given of her time in the Reserve’s Community Wildlife Garden in Stratham. This fall Molly both ran in the Great Bay 5k and then helped the rest of the staff with clean up.

Molly not only volunteers for the Reserve, but she works with the Stewardship Network conducting oyster counts and is involved in a rockweed phenology project with NH Sea Grant’s Coastal Research Volunteer program. In addition, she volunteers for her local Kiwanis Club helping to further their mission.

“The truly special thing about Molly,” says Melissa Brogle, Volunteer Coordinator for the Reserve, “is that when someone is needed for any job at the Reserve, Molly steps up. She does so in a humble, consistent manner, and always with a smile on her face!” For these reasons, Molly is most deserving of the award!

STUDENTS DISCOVER SUPERHEROES AND VILLAINS IN GREAT BAY!

In a first-of-its-kind “Expert Day”, over 80 fifth grade students and their teachers from Oyster River Middle School in Durham spent the day at the Great Bay Discovery Center seeking out Great Bay’s superheroes and villains. Their mission: To learn about its amazing ecosystem and the many threats it faces. Their task: Video the experts and develop public service announcements to be placed on QR codes at venues around the bay, such as Wagon Hill Farm and the Great Bay Discovery Center.

Earlier in the year, science teacher Sunny Sadana, attended the Reserve’s Teachers on the Estuary Program (TOTE) focused on climate impacts to fisheries and wildlife. Sunny and 16 other teachers spent time learning about species such as osprey, saltmarsh sparrows, oysters and ground fish. Sunny went on to pull his science team together to use Great Bay as the foundation to teach a variety of Next Generation Science concepts.

Topics at the Expert Day included in the heroes’ category – osprey, horseshoe crabs, oysters and rainbow smelt and for the villains – excess nitrogen, invasive species and aquatic pollution. “Watching students approach UNH professor, Dr. Steve Jones as though he were a rock-star after his talk, was truly impressive,” said Kelle Loughlin, Director of Great Bay Discovery Center. Other experts who joined the day were Dr. Tom Lee, Dr. Win Watson, Alyson Eberhardt, Steve Weglarz, Dave Cedarholm P.E., Dr. James Houle, Rebecca Heuss, Dr. Robin Ellwood and Beth Heckman. “This is the kind of follow-up stewardship that environmental educators only dream of,” said Loughlin.
Educational Offerings

Winter BAYVENTURES 2018
Winter program schedule for kids in 1st-6th grade

February Vacation Days
Tuesday, February 27th
Animal Autographs
Join us as we look for animals and their “autographs” in different habitats around the Discovery Center...on snowshoes! Over the last couple of years we have identified fisher tracks in the woods and otter tracks on the salt marsh. Take part in winter activities and games and make a craft to take home.

Wednesday, February 28th
Frosty Fun
Do your kids prefer to play inside when it is cold out? Natural landscapes in the outdoors provide rich, diverse, multisensory experiences for free play. As part of a national initiative, let our naturalists provide the opportunity for well supervised, but unstructured play around the Discovery Center. Bundle them up and send them outside with us!

Friday, March 1st
(SAU16 Teacher Workshop Day)
Syrup on Snow
The ice is melting and the sap has started to flow! Join us for a day of maple sugaring, and experience how people through the ages have tapped trees. We will see and touch real tree tapping tools used by Native Americans, Colonists and people today! Try sap straight from the tree, participate in our maple syrup taste test on pancakes for lunch, and make a craft to take home.

Each Bayventure program runs from 10am - 2pm
$20 GBS member • $25 N/M • $5/sibling/program discount
Each program is limited to 14 participants

For all programs call (603) 778-0015 or email beth.heckman@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

"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 wonderland fun outdoors! We’ll start each program outside with activities, games and wintery walks. Following our outdoor exploration, we’ll move inside to warm with up with a story, craft and hot cocoa! This series is ideal for youngsters, ages 2-5; $3 per child participant or $5 per family. Pre-registration is required.

January 4th - “Winter Lullaby” by Barbara Seuling • Do you know where some animals go in the winter? Do you know which animals stick around for the cold and which ones migrate? Join us as we learn more about what animals do during the winter season and make a craft to take home.

January 18th - “Secrets of Winter” by Carron Brown • What is your favorite part of winter? Come learn about some of the animals of winter and what they spend it doing. What do they do while it’s snowing? Join us as we look for some critters (or signs of them) and then try our hand at painting some.

February 1st - “Sleep Big Bear Sleep!” By Maureen Wright • Do you get excited when it’s nap time? Or bedtime? Does the snow make you sleepy? Come have fun with us as we discover who likes to sleep the winter away and make a snuggly craft to take home!

February 15th - “Stella Queen of the Snow” by Marie-Louise Gay • How many snowflakes are there in a snowball? Do snow angels fly? Has winter ever filled you with questions? Come play in the snow with us and ask away! Join us as we make snow angels and try to listen for a frog snoring!

March 1st - “Tracks in the Snow” by Wong Herbert Yee • How can you tell who’s been walking around? Join us as we look for signs of animals that might have been nearby and then make some tracks of your own to take home.

March 15th - “Not a Buzz to be Found” by Linda Glaser • We often talk about the birds and animals in winter, but what about the insects? Where do they go when it’s cold? Join us as we discover where our favorite insects spend the season.

SPRING VOLUNTEER EDUCATOR TRAINING
Wednesday, April 11th, 9:30am – 4:30pm

EXHIBIT ROOM TRAINING
Thursday, April 12th, Time TBA
A National Perspective: Environmental DNA Aides in Detection of Invasive Species

In recent years invasive species, especially crabs, have been entering New England’s waters. Whether brought here accidentally or migrated here due to warming water temperatures, they pose significant threats to the health of salt marshes, native species and fisheries dependent on bivalve resources. The European green crab, Asian shore crab, Chinese mitten crab, and most recently the fiddler crab, have all sparked concern for scientists and researchers of New England Reserves. While traditional monitoring methods for invasive species are essential for estuarine management, they may miss early detection of newly-arrived invasive species or loss of native species. Therefore, scientists and staff from the Great Bay, Wells (ME) and South Slough (OR) Research Reserves have teamed up with researchers at the University of New Hampshire to create a pilot program for early detection of invasive species.

Water and sediment carry traces of DNA, referred to as environmental DNA (eDNA), from fishes and invertebrates that live in that environment. This project aims to design and implement a monitoring system that tests this eDNA to determine if invasive species are present in the waterways. eDNA methods provide a cost-effective way to determine what species are present in aquatic environments without needing to capture and identify them. Some, like the fiddler crab, are very elusive and hard to detect. Therefore, analyzing soil and water samples provides a more accurate way to determine if a species is present. This could act as an early warning system for invasive species, while also determining the presence of biodiversity of native species. The project partners will develop eDNA sample collection and analysis protocols as well as training materials for the use of eDNA materials for the reserves to use system-wide if the pilot program is successful.

This project is funded by the National Estuarine Research Reserve System’s Science Collaborative, which supports cooperative research across the NERR that addresses coastal management problems important to the reserves. Though this project was motivated by the increased concern among the New England reserves, South Slough Research Reserve in Oregon has had similar concerns and therefore has joined in this pilot program. As technology advances the National Estuarine Research Reserve System aims to continue to advance its methods for protecting important estuarine environments nationwide.

Volunteer for Great Bay!

- **Brown Bag Lunch 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. Bring your lunch and learn something new! Topics and dates to be announced soon on greatbay.org/events.

- **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.

  Training is April 11, 9:30am – 4:30pm

- **Exhibit Room Volunteers**: Greet visitors, assist with the Discovery Tank, and help people learn about Great Bay!

  Training is April 12, 9am – Noon

- **Earth Day Workday at Chapman’s Landing**: Help us spruce up the Stratham Community Wildlife Garden at Chapman’s Landing. The garden is a wonderful demonstration area and helps residents see how to create native gardens that provide food and shelter for local wildlife. The gardens will need a good spring cleaning, and invasive plants need to be removed. Exact date to be determined, and will be posted to greatbay.org/events soon.

- **Adopt-a-Spot**: Want to volunteer but need something flexible? We have gardens, model play boats, and a small stream that are always in need of some love and attention. Contact us for more information!

  Contact Melissa at melissa.brogle@wildlife.nh.gov or 603-778-0015 with any questions or to register for a training or workday.
It has been a busy year for the Great Bay Stewards! At our annual meeting in the fall we said goodbye to our retiring Executive Director of three years, Peter Wellenberger, and welcomed the Stewards own Administrative Coordinator, Allison Knab, as Peter’s replacement. After interviewing several strong candidates, the search committee chose Allison to continue moving the Stewards forward in its mission to protect and preserve the vitality of the Great Bay estuarine ecosystem.

Allison started at the Discovery Center volunteering in the exhibit room, and for the last four years has served as the Administrative Coordinator and chair of the Art of Great Bay show. She also writes for Coastal Home magazine, and has previously worked as a writer for the Seacoast Media Group, Chicago Tribune, Citysearch.com, Science & Spirit, The American Gardener, Blue Ridge Outdoors, and many other publications.

Allison holds a B.A. in Biology from the University of Virginia, has worked in the field of Integrative Biology at the University of California at Berkeley, and serves as chair of the Stratham Conservation Commission.

A neighbor of the Great Bay, when not working she can often be found visiting the Bay with her two daughters, and in warmer weather can be found gardening, as well as trying to climb all 48 4,000 footers in New Hampshire.

Lastly, the new slate of trustees was elected at the annual meeting and is as follows: Chair, Jack O’Reilly, Vice Chair, Deborah Alberts, Treasurer, Kirstin Lawton and Secretary, Joe Stieglitz.

Peter Wellenberger Leaves Lasting Legacy in Great Bay

The Great Bay Stewards say goodbye to a man who has spent over a quarter of a century working toward the protection and conservation of the Great Bay Estuary. Peter was part of the early story of its protection, when Aristotle Onassis proposed to build the world’s largest oil refinery on its shores. He went on to become the manager of the Great Bay National Estuarine Research Reserve for 21 years where he developed and managed the Reserve, grew the staff from one to ten, and became a founding member of the Great Bay Resource Protection Partnership. Upon retirement he became the Great Bay-Piscataqua Waterkeeper with the Conservation Law Foundation and finally took on the role of Executive Director of the Great Bay Stewards in 2013.

Ironically, Peter was part of the establishment of the original group of Great Bay Stewards, and so it was fitting for him to finish his Great Bay career as the first Executive Director of a much evolved, but philosophically same group. In honor of Peter, staff at the Reserve recently dedicated a new natural play area at the Great Bay Discovery Center, called “Wellenberger Woods”.

Jack O’Reilly, President, Great Bay Stewards

Art of Great Bay

Mark your calendars for the annual Art of Great Bay show and sale, April 6-8, 2018. Well-known artists from throughout the Seacoast and beyond showcase fine quality art for sale.

Opening reception Friday evening (April 6) for artists and the public. Visit greatbaystewards.org for more information on how to exhibit at the show or for show details.
The **GREAT BAY STEWARDS** would like to thank the following sponsors of the 2017 Great Bay 5K:

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