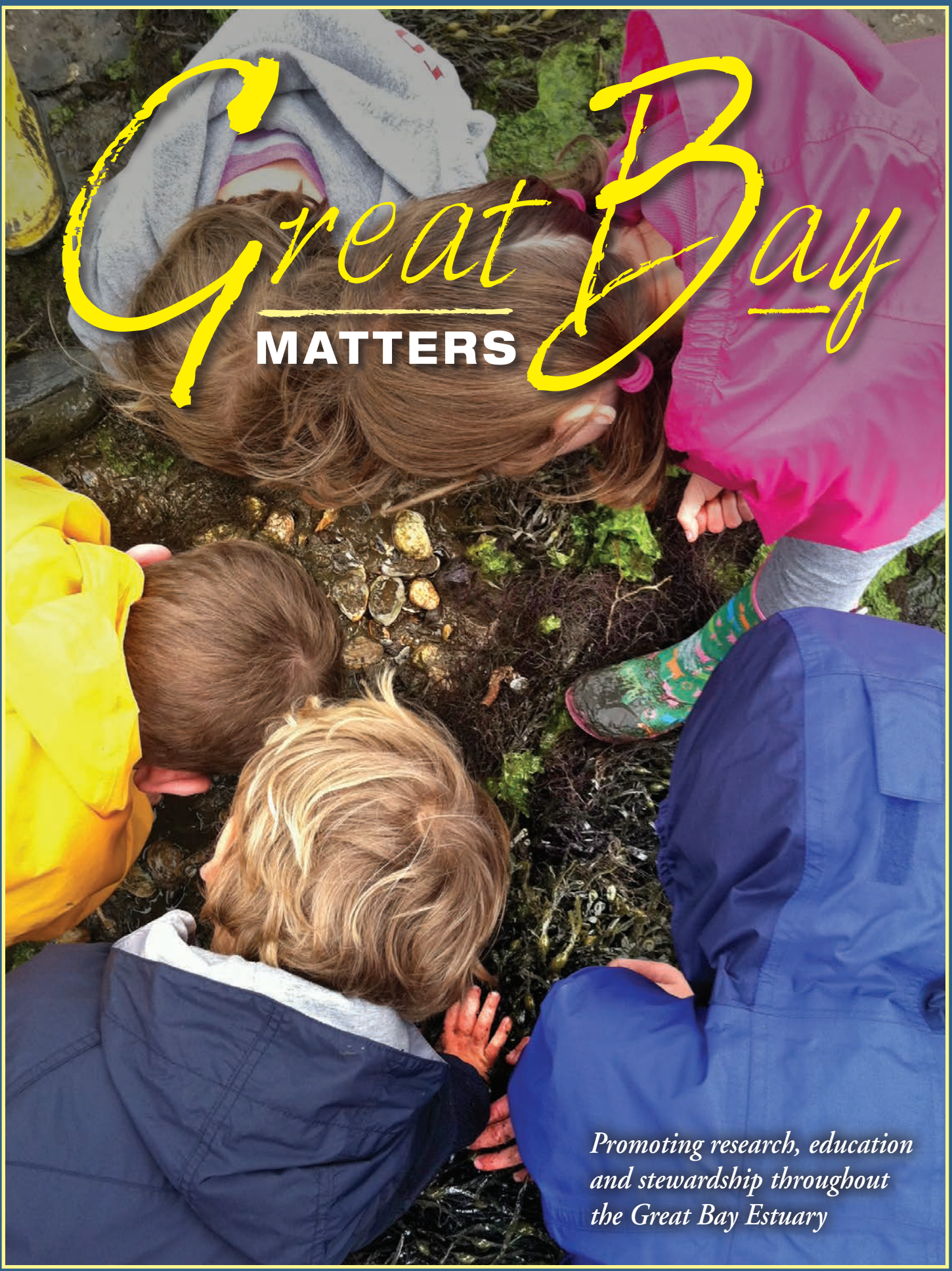
9-1-2016

Understanding Nitrogen Sources in the Great Bay Watershed

Michelle L. Daley
University of New Hampshire, Durham



Spring/Summer 2015 Volume 22 • Number 3

GET TO KNOW GREAT BAY

TWENTY-FIVE PERCENT

AMOUNT OF NEW HAMPSHIRE'S POPULATION THAT LIVES IN **THE GREAT BAY WATERSHED**

$54,000

ESTIMATED ANNUAL VALUE OF **ECOSYSTEM SERVICES** PROVIDED BY ONE ACRE OF EELGRASS IN GREAT BAY

1,000 acres of eelgrass lost in GREAT BAY since 1996

total annual TONS of **NITROGEN** ENTERING GREAT BAY IN RECENT YEARS

1,265

16.04 MILES LONG

90% decrease in adult oyster populations from 1997 to 2009

52 COMMUNITIES THAT INTERSECT WITH THE GREAT BAY WATERSHED (42 NH, 10 ME)

GREAT BAY NATIONAL ESTUARINE RESEARCH RESERVE

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
President: Jack O'Reilly

Great Bay MATTERS

89 Depot Road,
Greenland, NH 03840
603-778-0015

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manager's corner

Nutrients are essential for growth in everything that is alive. But as is true in any environment that is growing, too much too fast can cause problems. Over the past few years, people who care about the Great Bay Watershed have been witness to intense interest and debate around the topic of nutrient enrichment. Having many people explore a topic from multiple angles has led us to ask new questions, invest in good science, and put sincere effort into understanding how nitrogen moves through the Bay. Great minds are studying where it is coming from, what the impacts are to water quality and living resources, and what we can do about it. As we think through these questions for the topic of nitrogen, I hope we can all keep in mind that many of the solutions to this problem are things we can do to help stop other sources of pollution from entering Great Bay. Wise municipal planning, directly protecting land adjacent to water bodies, upgrading aging infrastructure, taking individual responsibility for your own property and managing stormwater appropriately are all actions that will help us achieve clean water. Working together to implement these strategies will address future threats to all of the important species that inhabit our waters, from the tiniest of microorganisms to our nearshore apex predators such as striped bass. I look forward to continually learning from experts like those highlighted in this issue, and I also encourage all of us to start being a part of the solution, today.

Cory Riley, Reserve Manager, GBNERR

contents

UNDERSTANDING NITROGEN

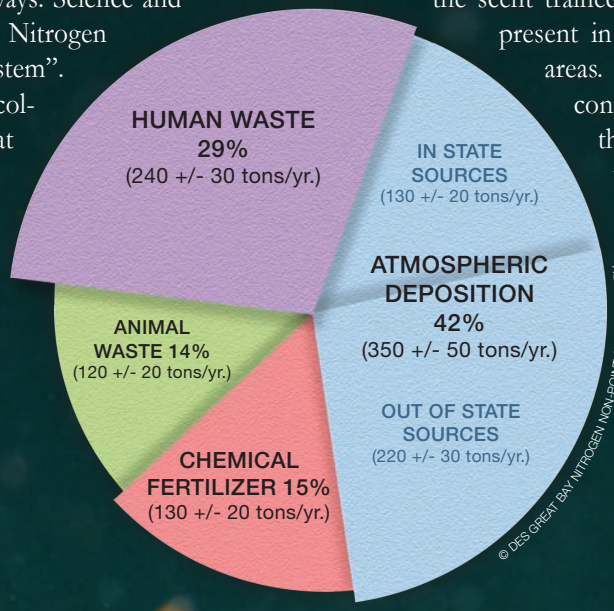
Twisting and winding their way toward the ocean, seven rivers carry freshwater along with necessary nutrients and unnecessary pollutants from 42 New Hampshire and 10 Maine communities into the Great Bay Estuary system. In these brackish waters, excessive nutrient loads contribute to the decline of water clarity, eelgrass habitat and the failure of some tidal rivers in meeting water quality standards for dissolved oxygen concentrations. With a problem so complex and implications so severe, a great deal of effort and scientific resources have been invested to begin to understand where, why and how much nitrogen is entering the Great Bay Watershed.

The 2013 "State of Our Estuaries Report", published by the Piscataqua Region Estuaries Partnership (PREP), indicates the total amount of nitrogen delivered to the Great Bay Estuary during 2009-2011, was 1,225 tons annually. Thirty-two percent of that nitrogen was from sewage treatment plants which are referred to as point sources. Point sources are fairly easy to monitor and are appropriately named because they typically have a pipe that discharges treated effluent to a specific location in Great Bay or one of its tributaries. Non-point sources (NPS) of nitrogen are sources that are distributed throughout the landscape and consequently are not as easy to monitor or quantify. The major NPS of nitrogen are septic systems, fertilizers, animal waste and atmospheric pollution. Together, these NPS sources account for 68% of the total nitrogen delivered to Great Bay from 2009-2011. Additionally, there are several forms of nitrogen to consider: dissolved inorganic nitrogen (DIN), dissolved organic nitrogen (DON) and particulate nitrogen (PN). Nitrate and ammonium are forms of DIN which is the most reactive type of nitrogen, meaning that it is the form of nitrogen that plants and algae prefer for growth. Too much nitrogen, particularly too much DIN, can cause excessive plant and algal growth which leads to depleted oxygen levels in the water when the plants and algae die off and decompose. Excessive plant and algal growth can also shade out and smother important submerged aquatic vegetation that provides critical habitat such as eelgrass. From 2009-2011, 597 tons of DIN was delivered to Great Bay each year. Sewage treatment plants (point sources) were responsible for 52% of the DIN delivered and non-point sources contributed the remaining 48%. DON is the tea-like color you often see in wetlands or slow moving waters. DON consists of a broad range of compounds that can result from the breakdown of plant material and water leaching through soils. PN is nitrogen that is attached to particles suspended in the water column. Both DON and PN can block light from reaching eelgrass.

The New Hampshire Department of Environmental Services (NH DES) conducted the Great Bay Nitrogen Non-Point Source Study (GBNNPSS) which was finalized in 2014 to model how much nitrogen is contributed to Great Bay from human waste treated in on-site septic systems, fertilizers, animal waste and atmospheric deposition (nitrogen contained in rain and snow and from air pollution settling out of the atmosphere onto the land surface). The Nitrogen Loading Model, originally developed for Waquoit Bay in Massachusetts, was customized for the Great Bay Watershed and local data were developed to quantify imported sources of nitrogen. The imported nitrogen was then routed through surface waters, stormwater and groundwater to model the delivered load of nitrogen to the Great Bay Estuary. The model predicted that on an annual basis the non-point sources of nitrogen are as follows: 42% from atmospheric deposition, 29% from septic systems, 15% from chemical fertilizer (10.5% from lawns, 3.5% from agriculture and 1% from recreational fields) and 14% from animal waste (8% from livestock and 6% from pet waste). The model also predicted that about 34% of these sources are delivered across the land in stormwater.

SOURCES
IN THE GREAT BAY WATERSHED

The NH Water Resources Research Center, Great Bay National Estuarine Research Reserve and the University of New Hampshire Cooperative Extension spent the last 4 years working collaboratively together on the NOAA NERSS Science Collaborative project: "Nitrogen Sources and Transport Pathways: Science and Management Collaboration to Reduce Nitrogen Loads in the Great Bay Estuarine Ecosystem". The team formed a nitrogen sources collaborative advisory board (NSCAB) that consisted of about 15 members representing various stakeholder groups. The NSCAB worked with the team to refine the project objectives and design products that would be useful for decision makers. The team sampled approximately 250 river and stream sites in the Great Bay watershed and assessed the relationship between nitrogen concentrations and watershed landscape characteristics. Results showed that measures of human impact (human population density, % development and % impervious cover) were significant sources of DIN and forests and wetlands were areas where significant removal or storage of DIN occurs. Agriculture was not a significant predictor of DIN. Measures of human impact were not important predictors of DON, instead wetlands were the main source of DON with agricultural land use being a minor source of DON. Also used were specialized mitochondrial DNA analysis and scent trained canines to detect the presence of human waste at select urban sites where all human waste was removed via sewage treatment infrastructure and suburban sites where all human waste was treated in on-site septic systems. Both the DNA analysis and the scent trained dogs indicated that human waste was present in streams draining suburban and urban areas. This suggests that septic systems are contributing human waste to streams (as the GBNNPSS suggests) and that human waste is also reaching streams either through leaky sewage lines or illicit sewage connections.



GREAT BAY NON-POINT SOURCE LOAD

Overall, results of both projects suggest that nitrogen created by people (human waste, fertilizer use and runoff from developed surfaces) is a major source of non-point nitrogen. Although we know agriculture can contribute excess nutrients to local streams, agriculture is not the dominant source of nitrogen in the Great Bay watershed. In conclusion, improvements in land management may reduce DIN in streams, but are unlikely to significantly reduce DON given that wetlands are the major source of DON. Finally, leaky sewer lines and illicit connections may be an overlooked source of non-point nitrogen in the Great Bay watershed.

Michelle Daley, Research Scientist, University of New Hampshire

Only YOU can Prevent NITROGEN POLLUTION!

WORKING TOGETHER TO MAKE A POSITIVE DIFFERENCE

According to the NH DES Great Bay Nitrogen Non-Point Source Pollution Study, 68% of the nitrogen pollution in the Great Bay Estuary is a result of non-point sources such as atmospheric deposition, fertilizer, human waste disposed into septic systems, and animal waste (NH DES, 2014). The remainder of nitrogen pollution comes from direct discharges of municipal wastewater treatment facilities. While municipalities are working to address both point source and non-point source pollution, residents have an opportunity to address non-point sources of pollution right at home and in their community. Below is a brief list of actions residents can take to help reduce nitrogen pollution in their community.

68% of the nitrogen pollution in the Great Bay Estuary is a result of non-point sources.

Join your local watershed or river association. There are over 17 watersheds or river associations located in the Piscataqua Region. These organizations work with designated municipal representatives and interested community members to address watershed issues in their community or collection of communities. In addition to working with town governments, these associations provide opportunities to connect community members to and offer support for protecting a waterbody. Some activities may include river or shoreline cleanups, kayaking or canoe trips, and workshops about proper lawn care, among others.

Help conduct science in your community. The Seacoast region is bustling with coastal science, and often volunteers are needed to help with monitoring projects within the Great Bay Watershed. One example is the Coastal Research Volunteer (CRV) Program hosted by NH Sea Grant and UNH Cooperative Extension. The program is designed to engage volunteers in meaningful science and stewardship opportunities while enhancing and expanding local coastal research. Additionally, the Great Bay National Estuarine Research Reserve (GBNERR) has a stewardship program that encourages public involvement. Volunteers can help monitor Reserve properties seasonally to assist staff in management activities such as trash or debris removal.

Let your voice be heard and your vote counted. By attending Conservation Commission or Planning Board meetings you can learn more about what your community is doing to protect its natural resources and how you can get involved. Town Meetings and elections are also an opportunity for community members to vote for environmental protection. You can also help support land conservation in your community by voting for town bonds to purchase land

to be permanently conserved. Land conservation and maintaining a naturally vegetated landscape are two of the most efficient ways of reducing nitrogen.

Properly maintain and care for your septic system. A failing septic system negatively impacts water quality and public health, and repairs can be costly to the homeowner. NH DES recommends that septic systems be inspected yearly and pumped out at a minimum of every 3-5 years. To reduce stress on your septic system, make sure to only dispose of human waste and toilet paper into the system. Cooking grease, coffee grounds, cat litter, and harmful chemicals like gasoline, pesticides, and paint, among others disposed of down the drain can reduce your septic system's ability to digest and treat household waste or worse!

Pick up after your pooch. Pet waste accounts for 6% of all non-point sources of nitrogen entering Great Bay. It's easy to do your part by picking up your pet's waste and disposing of it properly.

Use green landscaping techniques on your property. Consider using native vegetation instead of manicured lawns when landscaping your property. Often native plants require less maintenance, watering, fertilizers and pesticides, and provide habitat and food to animals and/or insects. Reduce the amount of impervious surfaces such as patios or walkways and opt for stones or pervious pavers that allow rain to soak into the ground. For unavoidable impervious surfaces — such as the roof of a house — rain barrels can be used to capture runoff to be used later to water gardens or wash your car.

We can all agree that we need to keep our streams, rivers, lakes, and estuaries free of pollution to ensure a healthy ecosystem and to maintain our quality of life. By changing a few behaviors at home we can all make a positive difference in the health of these waterbodies. Let's get started today!

Abby Gronberg, UNH TIDES STUDENT, GBNERR intern

Estuary Almanac

Salt Marshes – More valuable than gold

Hidden within and beneath the visible part of a Great Bay salt marsh are functions we increasingly refer to as ecosystem services, an apt term for the products that serve both Nature and many human needs. Although not immediately visible to the naked eye, biological and chemical processes continually occur within a saltmarsh that aid in a variety of critical "natural services". Salt marshes protect shorelines by buffering the impact of storms and ice, and they serve as critical habitat and nurseries for a variety of life forms that provide nourishment to humans. Salt marshes also perform the invaluable service of sequestering or "capturing" the greenhouse gas carbon dioxide from the atmosphere, decreasing the effects of global warming. Carbon is stored in living and dead plant matter as well as the peaty sediments below the surface. Salt marshes also cycle nutrients, including nitrogen, regulating and even removing excessive nitrogen by a microbial process called denitrification.

A beautiful and complex environment

Great Bay's salt marshes are recognized even by the casual observer as places of great aesthetic appeal and high habitat value. Unlike upland forests and other more predictable, less stressful environments,

S. alterniflora at high tide

Salnicornia in fall color

salt marsh species grow in distinct patterns occupying a niche that is very small in an attempt to survive continual inundation from salt water. Dominant salt marsh grasses visibly delineate low and high marsh zones, with tall, smooth cordgrass (Spartina alterniflora) the prominent species fringing the low marsh zone between open water and tidal flats and the transition to high marsh. In the high marsh, the low-growing salt meadow cordgrass (Spartina patens) often called saltmarsh hay, with its distinctive matted tufts and wavy appearance, dominates. Depending on salinity levels, other short grasses such as blackgrass (Juncus gerardii), and spikegrass (Distichlis spicata) intermingle and may be co-dominant. Dozens of other species pepper the salt marshes, often with showy colors and flowers. The succulent Virginia glasswort (Salicornia depressa), turns orange and then bright red as the seasons progress into autumn, and the showy sea lavender (Limonium nashii), always begs for a photo when in full bloom, but usually disappoints compared to the live show!

Where to see around Great Bay

The Great Bay Discovery Center has one of the most diverse and accessible salt marshes along the estuary. Be aware of the prime growing season for grasses and tread lightly during late spring and early summer. Be sure to explore the salt pannes which are intermittent pools of brackish water teaming with a variety of fish, birds and aquatic insects. Rubber boots, bug spray and binoculars will be welcomed companions, enjoy!

Paul Stacey,
Research Coordinator, GBNERR

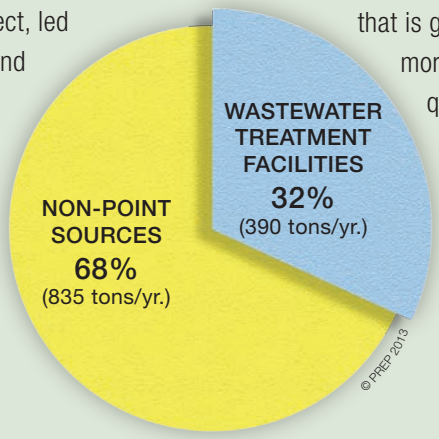
NERRS NEWS

Program News and Events From GBNERR

NITROGEN SCIENCE HAPPENING IN GREAT BAY

The Great Bay region has become a hot bed for research on sources and effects of nutrients on the health of Great Bay. Understanding the science behind nutrient loading, cycling and eutrophication is essential to effective management. Informed by this research, watershed management emphasis is shifting to activities that will both restore and protect ecosystem function to mitigate nutrient overload, especially from nitrogen. The National Estuarine Research Reserve System's Science Collaborative (NSC), a competitive NOAA funding opportunity, has been instrumental in promoting research applications that address these real problems with "good science" solutions implemented through collaborative efforts.

There are three active NSC projects with complementary nitrogen management outcomes that are nearing completion. The first and most senior project, led by Dr. William McDowell and Michelle Daley at the University of New Hampshire (UNH), has the objective of better understanding sources and delivery of nitrogen to Great Bay (see article in this issue). Thousands of water samples collected from streams throughout the Great Bay watershed relate nitrogen loads to specific land use categories. The research indicates that approximately 70% of the nitrogen load to Great Bay originates from runoff, especially development. A subsequent project, led by Dr. Robert Roseen (Geosyntec, Inc.) and Dr. Alison Watts (UNH), has used a watershed computer model to assess nitrogen loads and support planning that is guiding municipalities to more cost-effective runoff quantity and quality solutions. Three communities in the Squamscott-Exeter River watershed are collaborators in the project designed to meet regulatory requirements for sewage and runoff through collective management of nutrients, a more effective and cost-efficient solution. The third project, led by Dr. Jamie Houle (UNH), is demonstrating "green" management practices that simulate and look like natural landscape features. The demonstrations control nitrogen with the simplicity and aesthetics of green infrastructure, and may encourage other communities to view them as an asset rather than a burden.



TOTAL NITROGEN LOAD TO THE GREAT BAY ESTUARY

INNOVATIVE NITROGEN REMOVAL TECHNIQUE

Every year there are opportunities for those interested in water quality to participate in a conference to learn about current research. One venue is the Lamprey River Science Symposium in January, is hosted by the UNH Water Resource Research Center. This year there were presentations on several very interesting water quality improvement techniques. One of these was on Permeable Reactive Barriers (PRB), which is an inorganic nitrogen reducing passive technology that is installed in a trench downgradient from the source. The trench is filled with wood chips, exchange media and sand/gravel and as the ground water with the nitrogen load passes through it, the nitrogen in the water is transformed from inorganic nitrogen to nitrogen gas. PRBs are a great tool that can be used downgradient from sources of nitrogen like septic systems, which are designed to kill bacteria but not to remove nitrogen. To learn more go to http://xml2.des.state.nh.us/blogs/watershed/?p=2675

Samantha Wright, Truslow Resource Consulting LLC, sampling monitoring wells at the Brentwood site.

Educational Offerings

SUMMER BAYVENTURES 2015

Summer program schedule for kids entering 1st-6th grade

Bayventure programs are held on Wednesdays. Sign up for one or the super summer series of seven.

July 1st

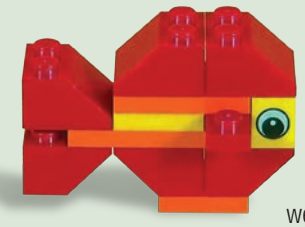
Tweets and Talons

Identifying the birds that live around your house can be empowering and lead to a lifelong passion. Join us as we spot some birds around Great Bay. Make a birdfeeder to take home.

July 8th

Forts and Fairy Houses

Whether you are building a fort with your friends or a fairy house for the woodland spirits, you are spending time in nature. Join us for these favorite pastimes. Create a sign to add to your own fort at home!



July 15th

"Lego" of Your Creativity

Join us to let your creative juices flow, as we use Legos to explore science. Dream up a new fish of Great Bay, create a bridge to span a river and build a small kit to take home. A must for Lego fans!

July 22nd

Mudflat Mania

Low tide reveals the mudflats of Great Bay twice every day. Come explore this amazing habitat at Sandy Point and uncover some of the fantastic animals and plants that live there. Come prepared to get muddy! Create your own painting on a canvas to take home.

July 29th

Mystery on Great Bay

Join us for a day of mystery indoor and outdoor games and activities. If you like surprises, or even if you don't, you will be sure to have a super day near Great Bay! Make a mystery craft to take home.

August 12th

My Cousin is a Spider

Discover one of the oldest creatures on earth, the horseshoe crab and learn about their cousins, the spiders. What makes them similar and different? We will visit the waterfront and explore the boardwalk to look for both of these types of arthropods. Make a creepy crawly craft to take home.

August 19th

Sweet Trail Trek

Grab your lunch, backpack and water bottle and join us for an adventure on the 4-mile Sweet Trail that starts near the Great Bay in Newmarket and ends in Durham. We will search for signs of local wildlife, complete a scavenger hunt and play games along the way.

***Note**: This is an off-site, all-day adventure. There will not be pre-care or after-care for this program. Drop off will be at 9:30 at beginning of trail. Pick-up will be at 3:30 at end of trail. Directions for drop-off and pick-up will be provided at registration.*

All programs are for children entering grades 1st-6th in the fall of 2015. Please have children bring a lunch, change of clothes and a towel. Call (603) 778-0015 or email ***beth.heckman@wildlife.nh.gov*** to register. Each Bayventure program is $35 (or $225 for all 7 programs) for Great Bay Stewards members and $40 ($280 for all 7 programs) for non-members. There is a $5/sibling/day discount for the normal program hours. Pre-care is $5/day. After-care is $10/day. The camper to staff ratio is a maximum of 7:1. Inquire about how to become a member to get children's program and other discounts.

Make checks payable to ***GREAT BAY STEWARDS*** and send to the following address marked ATTN: Beth.

Great Bay Discovery Center
89 Depot Rd,
Greenland, NH 03840
603-778-0015
greatbay.org

"Once Upon an Estuary"

For 2-5 year olds on Thursdays from 9:45-11:00a.m. $2 per child. Children, with an adult, are invited to come listen to a story, play games and make a craft. Most activities will be outside so please come dressed ready to have some fun! Featured stories are listed below. Please call 778-0015 and ask for Jay or Beth.

July 2nd - *"The Blues go Birding at Wild America's Shores"* by Carol Malnor and Sandy Fuller

July 9th - *"Fairy Houses"* by Tracey Kane

July 16th - *"Nature's Paintbrush- the Patterns and Colors Around You"* by Susan Stockdale

July 23rd - *"Down by the Bay"* by Raffi

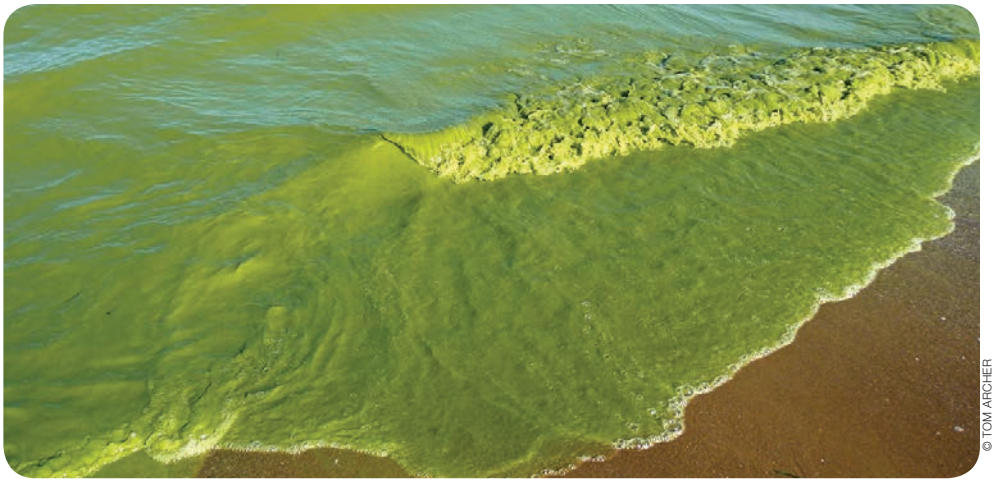
July 30th - *"Pitter and Patter"* by Martha Sullivan

August 13th - *"Are you a Spider?"* by Tudor Humphries

August 20th - *"Jo MacDonald had a Garden"* by Mary Quattlebaum

A National Perspective: *Excess Nutrients*

Excess nutrients are a problem in estuaries nation-wide. The National Estuarine Research Reserve System includes freshwater and saltwater systems that are currently being degraded by phosphorous and nitrogen respectively. Read below to learn more about nutrient loading in our Reserves with a quick look into Waquoit Bay and Old Woman Creek NERRs.



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Blue-green algae bloom on the shores of Lake Erie near Old Woman Creek NERR.

Waquoit Bay NERR, Massachusetts

Due to human impacts (poorly maintained septic systems and use of fertilizer) nitrogen is becoming too available in the system reducing the ability of salt marshes to store greenhouse gases. Waquoit Bay is conducting research to determine how nitrogen loads on the marsh affects its ability to store greenhouse gases. When there is excess nitrogen in the system it releases nitrous oxide and carbon dioxide. The findings from this project have added one more ecosystem service benefit to the list. Marshes, with balanced nutrient levels, not only store excess nutrients like nitrogen but they also store greenhouse gases showcasing the importance of protecting these areas and reducing the amount of nutrients (especially nitrogen) entering the system. Reprinted in part from ***http://wbnerrwetlandscarbon.net/2013/01/23/bringing-wetlands-to-market-overview-video/***.

Old Woman Creek NERR, Ohio

Old Woman Creek NERR is one of two freshwater estuaries in the NERRS. Wastewater, manure and phosphorus-based fertilizers all contribute phosphorous to the system. With excess phosphorous in the water, blue-green algae (photosynthetic bacteria that release toxins) proliferate, leading to harmful algal blooms (HABs). When these toxins reach high concentration levels, drinking water becomes contaminated and recreational activities are discouraged. Old Woman Creek NERR is a focus site for monitoring water quality and educating the public, wastewater management and the agriculture industry's contribution to the problem.

By Jill Bartolotta, UNH TIDES student/ GBNERR naturalist

© WAQUOIT BAY

Researching storage abilities of greenhouse gases by salt marshes under multiple nitrogen loading scenario levels.

Volunteer for Great Bay!

- **Exhibit Room Volunteers**: Help visitors learn about Great Bay while they explore the Discovery Center. Training is provided, and volunteers sign up for shifts that work for them. The exhibit room is a wonderful place to interact with people and help them learn about our estuary!

- **Work Day Volunteers**: The Reserve holds several workdays per year at Reserve properties around Great Bay. We are always looking for volunteers that love to spend time outside and want to help. Work days are a great way to support the Reserve even if you have a hectic schedule.
- **Adopt-A-Garden Volunteers**: If you love to garden and have a little time, we are looking for adoptees for gardens at the Discovery Center! There are many gardens to choose from, and volunteers spend 1-2 hours per week watering, pruning, weeding, and planting. You garden when it's convenient for you, and we provide the tools.

If you are interested in becoming a volunteer, or being added to the work day email list please contact Melissa at ***melissa.brogle@wildlife.nh.gov***.

president's corner

The Perfect Solution for Pollution!

What if you could utilize an available waste product to reduce nitrogen pollution in Great Bay?

Using a vinegar-like substance has helped the city of Rochester reduce the levels of nitrogen discharged from its wastewater treatment plant on the Cocheco River by nearly 75 percent – from 45 plus mg/l to 12 mg/l. Although the plant is not designed to treat nitrogen, this new process brings it closer to the proposed EPA requirement of 3 mg/l.

This is all possible thanks to a mutually beneficial partnership with Pilgrim Foods, a food manufacturer based in Greenville, NH. Several times a week, Pilgrim ships about 10,000 gallons of acetic acid to Rochester. Since Pilgrim cannot legally store the by-product on site, they truck it to Rochester for free.

When mixed into the aeration basin at the plant, the substance acts as a denitrifying agent releasing nitrogen gas into the atmosphere. Since nitrogen makes up about 80 percent of the atmosphere, there are no harmful side effects.

Waste Management in Rochester has also installed reverse osmosis equipment to remove metals that were inhibiting the plant's ultraviolet treatment to kill bacteria before discharge. The process contributes to the reduction in nitrogen.

Finding such an innovative solution is a win-win for the environment. While it may not be the final solution to reducing nitrogen in Rochester's wastewater, this is certainly welcome news for Great Bay.

Jack O'Reilly, President, Great Bay Stewards

Fuller Gardens

Fuller Gardens in North Hampton, NH is a turn-of-the-century estate garden with one of the finest rose bush collections in New England. This spring and summer treat yourself to a visual feast and find a quiet corner to recharge at this local gem.

The gardens, commissioned by former Massachusetts Governor Alvan T. Fuller at his summer estate in the late 1920s, have grown into a horticultural landmark. In addition to the formal, Olmsted Brothers-designed rose gardens, there is a Japanese koi pond and colorful English perennial beds. The lovely statuary throughout the gardens add to the feeling of a bygone era.

Now is the time to buy a membership to the Fuller Gardens. Members receive unlimited visits all season long, a discount at the May Plant Sale, and free admission to the Annual July Garden Party. Fuller Gardens also makes a perfect backdrop for a small wedding ceremony and other events.

Fuller Gardens is a non-profit organization, open seven days a week from 10 am until 5:30 pm beginning in mid-May. Visit www.fullergardens.org for more information.

Great Bay Stewards members get a 2 for 1 discount on passes to the Gardens.

soak up the rain NEW HAMPSHIRE

Your Land. Your Water. Your Solution.

The Great Bay Stewards will be out working around the Bay this year to help homeowners and others manage stormwater runoff problems that contribute to erosion and excess nitrogen in the Bay and its rivers. The SOAK - Great Bay project has funding, and volunteers to install solutions to your runoff problems.

Tell us about your problem and we may be able to help you help Great Bay. Solutions range from simple dry wells, to beautiful rain gardens. We can also give you advice on native plants that help soak up the rain and are good for wildlife. For more information call Laura Byergo, Project Manager and GBS Trustee, (603) 501-0720, or (301) 928-0647.

Great Bay Stewards

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

❑ Guardian $150 ❑ Protector $75
❑ Steward/Family $35 ❑ Student $20 ❑ Other $_____

name _____

address _____

town _____

state _____ zip _____

email _____

Paddle the Squamscott River at 8 am. Learn a new watercolor technique at 11am. Laugh with friends during a dinner you didn't have to cook. Your future health care needs? They're covered. Independence now, peace of mind for the future. Call 1-800-688-9663 or visit riverwoodsrc.org to learn more.

RiverWoods
expect more