

Looking Forward at the MLSC

The Maine Lake Science Center can become a perfect venue for public seminars, where top-notch scientists communicate regional and global research results and their implications to the community. Page 11

LEA
230 Main Street
Bridgton, Maine 04009
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Get a Voluntary Milfoil Sticker

Placing one of these vinyl, weather-proof stickers on your craft is a way to show your love of your lake and to help spread the word about the importance of controlling invasive aquatics. Page 15

Summer 2017

Free

LEA Lake News

Protecting Maine Lakes since 1970

LEA and its Maine Lake Science Center

If you are confused about how these two entities relate to each other, the answer is simple: The Maine Lake Science Center is LEA. The Center is the latest step in LEA's evolution as an organization. It was established to harness new water testing technologies and to expand the scope of monitoring to include new parameters identified by scientists at Maine's academic institutions and at the Maine DEP.



As a result of this initiative, LEA's lake testing program added important monitoring equipment such as remote sensing buoys, temperature loggers, weather stations, hydrology equipment, and portable sondes that can sample for multiple parameters

throughout a lake's water column (see separate article). New tests of sediment chemistry, lake bottom cores, algae identification, and fluorescence (to measure algae concentrations) have been instituted and are greatly expanding our knowledge about the condition of lakes.

LEA does not work in a vacuum. The Center has helped introduce more and more lake advocates in Maine and beyond to our nearly 50 years of lake study and protection. And new partners are sharing their knowledge, creating a broad-based network of people, ideas and action. These are exciting times for Maine's lakes, and the new energy could not have come at a better time. Many scientists consider our lakes to be very much at risk, and for some water bodies, strong intervention is needed to avert disaster. Warning signs are everywhere, and climate change is exacerbating the threats. The more groups we can empower to expand their monitoring and strengthen advocacy, the greater the chances are for meaningful and timely policy change.

LEA is engaged in a fundraising campaign that has already built and staffed the Center and that will fund its operations through our 50th anniversary year in 2020. The \$1,450,000 campaign passed the \$1,000,000 milestone early in 2017. Your help is essential to support LEA and the new Center!

Sondes for Ponds

New Technology Arrives at the Maine Lake Science Center by Ben Peierls



Dr. Ben Peierls with a Sonde

Ever since sailors first used a weighted line to make depth soundings, scientists and mariners have been using suspended instruments to measure physical, chemical, and biological characteristics of ocean, river, and lake water. Over 150 years ago, for instance, a priest named Pietro Angelo Secchi used a white plate lowered on a line into the Mediterranean Sea to measure water clarity. Scientists and citizens still use Secchi's disk to this day, as many of LEA's volunteers will attest.

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Here's What We Expect from our Courtesy Boat Inspectors

It remains our job to train CBI's throughout Maine and to support the many organizations and towns that operate inspection programs. This is done through a contract with the Maine DEP, funded by "Milfoil sticker" fees. In the Lake Region, we work with towns and lake associations to train, support and schedule inspectors on 12 lakes and 16 launch sites. Funding comes from towns, associations, DEP grants, and private donations. There are several "rules" for LEA inspectors:

- Inspectors should be courteous and should identify themselves, requesting to assist you with inspecting your boat and explaining why this is being done.
- Inspectors should be on their feet engaging with boaters at all times when there are boats present in the launch site. If the site is empty, they are allowed to read or even fish, but they must immediately discontinue those activities when a boat appears.

- They must always wear an official inspector shirt.
- Inspectors should conduct full inspections of boat trailers, boat hulls, motors and props, anchor lines, wet wells, and fishing gear.
- They encourage a clean, drain and dry approach – Clean everything and drain all water reservoirs and let them dry before entering another lake.

Each year we review our protocol and try to improve the effectiveness of inspectors. Since public and private money is involved, you should feel a sense of shared ownership and responsibility for their success. You can help us by interacting with inspectors to encourage them, and to offer constructive comments when appropriate. We welcome and encourage any comments you might have about your experience with CBIs and any suggestions you have that could help us improve the program. Please contact Mary Jewett at 207-647-8580 or at Mary@leamaine.org.

Lake Tipping Points Explained

Do you remember ever playing on a see-saw that was balanced, but just ready to drop, given a little push? You were on a tipping point – the point where you shifted from being high in the air, to finding your derriere on the ground. Like see-saws, lakes have tipping points, only instead of high or low, they can alternate between clear versus turbid, pure versus algae-filled. And the push comes not from a shift in

weight, but from shifting human and climate pressures from the surrounding landscape. LEA is working with dozens of partners statewide to uncover what governs how lakes change, and how close each lake is to that threshold. This information will be used to calibrate a protection strategy to insure that water quality is stabilized to prevent a lake from "tipping." Continue on page 2

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Lake Tipping Points Explained

There are three major factors that contribute to the deterioration of lakes: landscape features; lake basin shape; and water cycle dynamics. The building blocks of understanding and analysis begin with the physical characteristics of a lake's watershed: the soils, slopes, drainage patterns, vegetation, and land uses. These factors dictate how much sediment and phosphorus are delivered to the lake by stormwater. Phosphorus is the trigger for algal growth, usually entering the lake attached to soil particles.

Next, comes bathymetry, or the shape of the basin. Water in deep lakes stratifies during summer into upper warm waters and colder bottom waters. Characteristics such as depth patterns, perimeter shape, coves and distribution of deep "holes" are unique for each lake and influence how the system reacts to sediment inputs and weather events.

Hydrology refers to the way water flows through the system: the tributaries, overland flows, how inputs mix with lake waters and the flushing rate (how long it takes a lake to fully exchange its water). The rate at which water passes through the system has a big impact on chemical concentrations, stratification, and the nature of plants (algae) and animals (zooplankton) living in the lake.

The better we document watershed conditions, bathymetry, and hydrology, the better we can evaluate what we learn from water quality monitoring. LEA conducts a broad array of in-lake tests: clarity, temperature profiles (top to bottom), oxygen profiles, phosphorus profiles, pH, alkalinity, color, sediment chemistry, chlorophyll (to measure algal biomass), and algal diversity. To do this, we use a variety of equipment: electronic meters, water samplers, temperature sensors, oxygen and temperature meters, sediment core samplers, drag nets (to collect algae), and exotic equipment such as autonomous, instrumented (GLEON) buoys. Fluorometers can now measure chlorophyll, saving lab expenses and even differentiating between populations of different types of algae. Bottom-located sensors can measure stream depth, and flow meters compute volume passing through a stream channel. These are important tools for understanding hydrology. GPS-equipped depth meters allow us to collect bathymetric readings quickly to build depth maps.

The accumulated information about watersheds, basins, hydrology and in-lake conditions is allowing us to gauge the sensitivity of each lake. Each water

body is a unique mix of conditions, but there are several universal factors:

- All Maine lakes are "phosphorus limited." Algal growth is determined and limited by the amount of this nutrient in the water. If you increase phosphorus inputs, you increase algal growth. It is very important to control erosion, because soil particles are the source of most lake phosphorus. They are carried to the lake in stormwater.

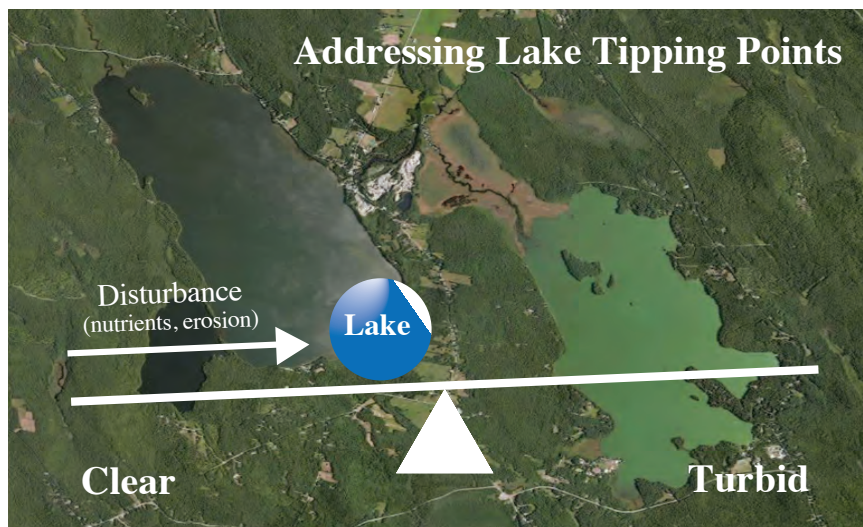
- Except for very shallow lakes, most stratify during summer. Colder bottom waters can become devoid of oxygen when bacteria decompose dead algae that settle from the upper warm and sunny layer where they grow. This is why limiting phosphorus (and thereby algal growth) can help a lake maintain healthy oxygen levels. Oxygen is not an issue in the lake's upper layer because winds continually mix and replenish it. Deep waters are thermally stagnant with a finite amount of oxygen accumulated while the lake is fully mixed and before stratification sets up in the spring.

- If the cold layer loses its oxygen (a condition called anoxia), phosphorus can be released from bottom sediments, potentially increasing algal growth. If sediments are rich in aluminum, this "recycling" of bottom sediment phosphorus does not occur because aluminum chemically binds phosphorus. This is why it is important to test sediment chemistry. Fortunately, most lakes we have tested in LEA's service area have aluminum-rich sediments.

- Healthy lakes have diversity of microscopic algae and zooplankton. This is why it is important to study their populations. Some species of algae can even become toxic to humans if their populations flourish.

Weather can be the wild card for water quality. Heavy rains scour soils, bringing nutrients to the lake. High winds can break down stratification to mix phosphorus-rich bottom waters into the growing zone to trigger algal blooms. Early ice-out and late ice-in expand the growing season for algae and warm lake waters beyond that which is healthy. Weather stations located onboard LEA's instrumented buoys are adding crucial information to the mix of knowledge. With buoys providing oxygen and temperature profiles every 15 minutes, we can track the impact wind is having on stratification and oxygenation.

As you can see, water quality and tipping points are complex topics. There are many factors interacting with each other. As data is gathered, a clearer and clearer picture emerges of how fragile each unique lake is. Though the volume of data may sometimes seem overwhelming and confusing, a sort of "melody" emerges if you "listen" to each of the "rhythms and sounds" generated by the data. Drawing conclusions is an art and a science because the relationships and interactions of factors sometimes defy rigid scientific rules, requiring intuition to draw conclusions.



Sondes for Ponds

Continued from page 1

Technology has improved a bit in those 150 years, and LEA has been fortunate to be able to incorporate more advanced water quality instruments into our lake testing regime. This spring, using a generous gift from an Anonymous Family Foundation, we moved even further ahead with the purchase of two multiparameter sondes from YSI, Inc.

The word sonde comes from the French word for sounding and is used to describe an instrument that automatically transmits information about its surroundings, be it underground, in the atmosphere, or in this case, underwater. You may have heard of radiosondes, which are devices sent aloft on weather balloons by meteorologists to radio back atmospheric conditions. The water quality sondes used by limnologists (lake scientists) and oceanographers do a similar duty, but are lowered through the water column on a cable that carries both the instrument and the information.

The simplest of these water-based sondes measure few things. Oceanographers use a standard tool called a CTD, so called because it measures water

Conductivity (used to calculate salt content), Temperature, and Depth. Our new sondes can be configured with up to seven different sensors, plus a built-in depth meter. We have started with a selection of seven that measure lake water conductivity, temperature, depth, pH, dissolved oxygen, turbidity, chlorophyll, and phycocyanin. It would be a bit awkward to call this device a "CTDPOTCP", so we will stick with "sonde."

Of all the sensors, temperature and depth are probably self-explanatory and are critical for understanding when and how deep lakes become divided into layers (stratified). Conductivity measurements dictate the purity of water and will increase with increasing concentrations of dissolved material such as chloride from road salt. pH tells us about the lake water acidity, which is critical for understanding internal chemistry and delineating suitable habitat for aquatic organisms.

The remaining sensors are considered optical since they operate using light. The luminescence-based dissolved oxygen sensor, like pH, drives habitat availability and chemical processes such as nutrient availability. Turbidity, or water clarity, is measured by the scattering of light from suspended particles.

The last two, chlorophyll and phycocyanin are pigments used by aquatic plants to grow using the sun's energy and represent lake algal abundance. Chlorophyll is found in all algae, while phycocyanin is specific to blue-green algae, also known as cyanobacteria. Both pigments are measured using fluorescence, the same process used when black light reveals hidden stains.

This data is collected as rapidly as every few seconds as a sonde is lowered through the water or held in one place for an extended time, as on our GLEON buoys. Another technique is to use the sonde inside a boat, and pump water through the working end. With data from the built-in GPS, we can map surface water characteristics over an entire lake. This will be useful for identifying hotspots of erosion, runoff, or algae.

Simple technology such as sounding lines and secchi disks will continue to be useful tools in the mission to assess lake water quality conditions and trends. The capabilities of these new devices, however, will improve our understanding of water quality many fold. LEA is privileged to have such sophisticated new tools, and we eagerly await the novel insights into lake water quality that these sondes are certain to provide.

Get Those Kids Outside!

by Alanna Doughy

By now most of us have heard some mention of Vitamin N (Nature), the Nature Deficit Disorder, the No Child Left Inside Act. The internet teems with sites touting the benefits of children interacting with nature. We shake our heads, and tell our stories of “when I was a kid” – spending whole days out in the woods without our parents even knowing where we were.

Because when we were kids, it was different.



Sure, we spent the whole morning watching Saturday cartoons, but then Mom would kick us out, and we would be in our own world in the woods by the stream, listening to the trickling water and smelling the decaying birch tree that fell over last spring. We built our houses, chased insects, laid on the ground to watch the infinite shades and shadow shapes in the canopy of the beech. We caught fish and frogs. Our play was slow, endless, had no winners or losers, and virtually no rules.

Where did those kids go? We grew up, we began to move faster, and we forgot. We decided that our kids were going to get the very best, have more opportunities than we did to improve at sports, to learn more skills, to do more things. We love them so much and we are trying our hardest. Maybe we want them to be able to relax for a few minutes from their busy schedules, so we turn on a movie or allow video game time. Maybe we are worried about their getting hurt or lost, away from our care. Maybe we have concerns about their problem-solving arsenal and worry about the infinite “what ifs.” Maybe we are scared of our neighbors, or maybe we don't have any woods where we live. Whatever the reasons- real or imagined- our kids are not getting outside, and it shows.

Even here, in the Lakes Region of Maine, our kids are not getting outdoors. The understanding of connections of life, of plant and animal relationships, of terrestrial and aquatic habitats, the sense of place: these are all suffering as a result. When I take students outside for a class, I now make sure we take time to learn how to be outside, how to observe and listen, how to use our senses. How this is not recess, you know, that other time they get outside. However, because we are taking time for that, learning more about the relationships between organisms gets tossed right out the window. How do we get ourselves back there? To a calmer place where simple, natural connections are not foreign to us?

If we are not comfortable sending our kids outside on their own, we, as parents, should join in the fun. It's wicked good for us too, and it will help us deepen our connections to place, and to each other. The sights and sounds of the outdoors will begin to calm our nerves, remind us to breathe in that fern smell, re-teach us how cool it is in the shade of the pines.

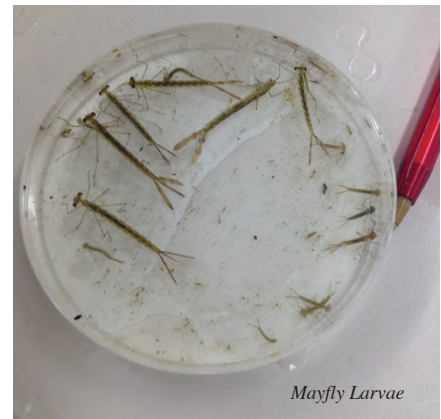
Luckily for us, here in the Lake Region opportunities abound the minute we step outside. Here are some tips to get started. And remember, just breathe and enjoy.

Be prepared. Bring a small first aid kit (bandaids even), some snacks and water. If you are heading for a longer walk, a map and compass are helpful, as are a rain jacket, sunscreen and bug spray. A magnifying glass or loupe, and guide books or sketch pad are nice as well. The cellphone is good for emergencies, but turn off the ringer noise so you can focus on where you are.

Don't know what you're looking at? Don't worry. Take or draw a picture, make a few observations, and look it up when you get home...or not! It is not important that you know everything, or any name at all. In fact, you could come up with a new name for something and pretend that you discovered it on your walk. My kids are tired of me telling them what things are, but they are curious about the connections with other things around them. A caveat: if you do not know what poisonous plants or animals are lurking about- best to have a hands-off approach!

Leave no trace. It's best to have a hands-off approach in general. Whatever you bring in, bring it back out, and leave everything as you found it. Remember, you are teaching your kids how to be kind and thoughtful stewards of the environment.

Have fun. If you are excited- truly excited- it will rub off. Instead of demanding that you all go on a 6-mile hike for some quality family time, go explore the edges of a pond, roll over a log to see what is underneath. Let your kids lead the way. Go slowly, breathe, and smile.



Connect with others. Attend a nature walk or start a family nature club (or search your area to find one - the library, chamber of commerce and community center are good places to start).

Invest in a couple of guide books. If this outdoor habit becomes a regular thing, and you do want to know what you are looking at, go ahead and get a guide book for your area. The more region-specific it is, the better it will be for what you are likely to find. Naturally Curious by Mary Holland is a month-by-month description of natural goings-on in the northeast. It's a joy to read, so if you get only one book- this would be a good one!

The possibilities are endless. Truly! And one day you might find you are comfortable letting your kids out on their own. They will thank you for it! And we thank you for it, too.



Why I Don't Spend Long Under the Table

By Alanna Doughty

I am not going to mince words here. There are days when working with teenagers makes me want to crawl under the table. I have a lot to contend with: raging hormones, iphones, facebook, relationship drama, eye-rolling, instant gratification, and needing to be the center of the universe. There I am, trying to engage them in talking about beech canker, or mayfly nymphs, and wondering why they don't find this as fascinating as I do. And maybe I say "Bueller...Bueller..." once in a while, and while none of them catch the reference, it sure helps me to march on.

But then... then there are the days when I notice a change. When a light bulb comes on, or when a seed is planted. And that's why we teachers do it, as anyone who works with kids understands. We believe in the importance of that seed and whatever extraordinary thing it grows into.

You've probably heard of LEA's involvement with Lake Region High School. Our staff educators attended Lake Region and charted their future paths not from within the brick and mortar of the classroom, but from the forests and brooks surrounding the school. Real learning happens inside the classroom, but it also happens outside. Today, with budget cuts everywhere you turn, those outside options are fewer and farther between - even here in rural Maine - where we are gifted with such incredible outside classrooms! This past year, with grant funding from TD Charitable Foundation and help from LEA members, we were able to bring that concept back into the hallways (and surrounding streambeds) of Lake Region High School.

We worked to build a place-based environmental science course with Science Department Head Joe Dorner. We had a great year exploring hydroponic systems, local ecology, Maine animal winter adaptations, algae, birds, macroinvertebrates, and forested watersheds. The students prepared an ecology field day to host Sebago Elementary fourth graders. With Maine district forester Shane Duigan, they took to the woods to establish Forest Inventory Growth plots for future classes. They participated in Cornell's feeder watch and SeaPerch (an underwater robot competition). They have explored vernal pools, Pondicherry Park in



the rain, and a case study on Sebago Lake and Crooked River that emphasizes the importance of forested watersheds. Some have joined in outside of the classroom as well, volunteering for water testing, attending Big Night, or applying to be a Courtesy Boat Inspector. Those seeds are growing!

Joe Dorner will continue to build aspects of the course in the 2017-2018 school year, and LEA will continue to help when needed. We are shifting our focus toward providing students with a framework to make positive change in their communities and the environment, by pairing with humanities teacher Jessica DiBiase. By dissecting state and federal environmental policy and investigating the science behind regulations, students will better understand why certain things are protected (like shorelands and wetlands). We will study how legislation is drafted, and become better acquainted with the goings-on in our State House. We will also map storm water infrastructure and determine if the school grounds are prepared for increased storm intensity in the future, in conjunction with a larger LEA project.

Seeds need certain things to grow. I am not talking about soil, water, space and sunlight here. I am talking about introduction, understanding, inspiration, analyzing, curiosity, questioning, evaluating and creating. Let us know if you want to be involved. You, too, can make your own Ferris Bueller jokes, and be inspired in turn by the growth of the students you help teach.

The Snakes and Turtles at Holt Pond



Trevor Persons, a herpetologist working with the Maine Department of Inland Fisheries and Wildlife, conducted a visual survey for Spotted Turtles at the Holt Pond Preserve. He recently shared his observations with us. The Department had two previous reports from Holt Pond (one from Jean Preis in 2000, and one from Bridie McCreavy in 2003). Neither had a documenting photograph, but Jean's had a convincing description. When Trevor first stopped by Holt Pond to check out the site he found a Brown Snake (see photo) basking right next to the end of the boardwalk. This, to his knowledge was a new township record, and one of only a handful of these snakes observed that far inland. On his second visit he found an adult female Spotted Turtle (see photo) only about 100 feet west of the boardwalk.

Persons also caught a glimpse of a snake that was likely a Ribbon Snake, which has been reported from the Preserve, but not yet photo-documented. There were no reports of Northern Water Snakes, but he found a few along the boardwalk out to Muddy River and guessed that they are fairly common there. Trevor called the habitat "fantastic" and the Preserve a "wonderful piece of property." So, when you're out in the wild, be extra watchful for turtles and snakes, and have your camera handy. You never know what you will see at Holt Pond. *NOTE: on June 29th from 10-1:00, herpetologist Derek Yorks will be leading a walk at Holt Pond to talk about turtles and snakes. See our events calendar.*



Grants Help Education Program

By Alanna Doughty

The LEA education program is ever-changing and growing. This takes a lot of prep time, curriculum development, and time inside the classroom and outside exploring with students. We were so fortunate this year to receive grants from the TD Charitable Foundation and the Onion Foundation. The TD Charitable Foundation supported a new High School education program we taught with Lead Science Teacher, Joe Dorner. This was a year-long commitment for LEA, and saw us in almost every class, along with guest presentations by other LEA staff on algae, macroinvertebrates, and vernal pools. In addition to staff time, the grant funded a number of classroom materials such as field guides (on amphibians and vernal pools, wildflowers, birds, and forest trees of Maine), forest inventory tools for measuring growth in our forest study plots, and waders for exploring vernal pools and collecting aquatic insects. The culminating project was an ecology field day where third and fourth graders from Sebago came to learn about plant and animal adaptations, natural selection, Maine animals, and the many trees in our



Maine woods with help from Lake Region High School students. This program would not have been possible without the generous grant from TD Charitable Foundation!

The Onion Foundation helped us make strides developing new education materials for primary grade students, and allowed us to offer programs with the after-school and summer students at Stevens Brook Elementary School. We are developing "ecology kits" for classrooms, and are recruiting teachers to pilot them. The Onion grant also allowed us to organize a third grade bat house building day with Bruce Hilton's woods classes at the high school. His classes produced 21 bat house kits and joined third graders at Steven's Brook Elementary to assemble them and determine where to hang them around the school. We were also able to host Project Wild and Project Learning Tree teacher workshops and offer scholarships for teachers to help LEA develop a forest interpretive trail at the Maine Lake Science Center. So many good things are happening as a result of grants and the continued support from our members!

Natural Resources of the Lakes Region Series

Registration Policy: Space is limited for events, so registration is required unless otherwise noted. All are welcome, but LEA members are given an advanced sign up opportunity and free or discounted admission. Please consider becoming a member today! For more information please contact us at alanna@leamaine.org and mary@leamaine.org, follow us on Facebook or visit our website at mainelakes.org

Event	Date	Time	Place	Lead	Pre-register	Cost
Sportshaus Paddle - Join LEA and the Sportshaus for a morning of exploring the Five Kezars by kayak. Sportshaus supplies kayaks, paddles, life jackets and paddling know-how. We will discuss the glaciology that formed the Kezars, and enjoy a quiet morning paddling about. Be sure to pack a snack, water and sunscreen!	Wednesday, June 28	9 to 12	Five Kezars	Alanna	Yes	\$5 members, \$10 non-member
Herpetology Walk - Guest speaker Derek Yorks will help us understand what is so special about Holt Pond. We'll be exploring habitat and looking for reptiles and amphibians that live at the preserve and will also discuss reptile and amphibian diversity in Maine.	Thursday, June 29	10 to 1	Holt Pond Preserve	Alanna	Yes	\$5 member, \$10 non-member
Paddle Battle - Time to SUP it up and paddle for LEA! During this first annual Paddle Battle contestants will race on a 2k or 5k course for bragging rights, clean lakes and the winning time, but there is a twist! See our website for more details. Advanced registration is a must! Join us at Tarry-A-While Resort for an exciting and fun filled race to stand up for clean lakes!	Saturday, July 1	8 to 12	Tarry-A-While resort	LEA staff and Volunteers	Yes!	\$55 race registration
Orchid Walk* - Step out onto the boardwalk spanning the quaking bog and explore for yourself the pink orchids among the sphagnum moss. This walk will cover easy to moderate terrain over forested trails and boardwalks and will last approximately two hours. Comfortable walking shoes, water, a snack and camera are recommended. Meet at the Holt Pond parking lot.	Friday, July 7	9 to 11	Holt Pond Preserve	Mary, Alanna, Ursula	Yes	None, members only
Pondicherry Park Family Outing - Bring the family and join LEA at the Bridgton Public Library for a morning exploration of Pondicherry Park! We will meet, read some stories and then take our fun down the road to the Steven's Brook trail and Pondicherry Park to explore nature right in our back yards. Bring a picnic lunch for afterwards and make a morning of it!	Tuesday, July 11	9 to 11	Bridgton Public Library	Alanna	Yes	Free
Invasive Plants in Pondicherry Park - Join Loon Echo, LEA and an invasive plant biologist from the Department of Conservation for a walk in Pondicherry, identifying invasive plants. We will discuss what makes a plant invasive, and what effects invasive plants have on the rest of the plant community, native habitat and biodiversity of an area.	Friday, July 14	9 to 11	Pondicherry Park	Nancy Olmstead, Jon Evans, Alanna	No	Free
Encore / Coda Concert - Enjoy the remarkable live music from this summer camp's orchestra which donates its time for this event. All proceeds will benefit LEA's school education programs.	Monday, July 17	7 to 9	Lake Region High	Mary	No	\$12 adults and \$8 kids under 12
Moose Pond Invasive Plant Paddle with Sportshaus and the Volunteer Lake Monitoring Program - Are you interested in becoming an invasive plant patroler? This 3-hour guided exploration will take place on shore and on the water. This is a fun, informal way to introduce you to the threat of invasive aquatic plants and the importance of early detection. Learn how to spot and identify suspected invaders, become familiar with some common native plants, and practice the skills needed to be an effective early detector. Register at www.mainevlmp.org . If you would like a boat provided for you by Sportshaus, please contact Mary at mary@leamaine.org .	Tuesday, July 18	9 to 12	Moose Pond	Mary and VLMP	Yes	Free
What is happening to our local pollinators? - Bee populations in Maine and across the country are in flux with some species in decline and others increasing in number. Why? In 2016 a group of University of Maine researchers surveyed the state for bumble bees, seeking answers to a number of questions: What is the exposure to pesticides? How do flowering plants shape bee communities? Eric Venturini of the Xerces Society for Invertebrate Conservation will join us to present findings and implications, and field questions! Join us for this engaging presentation on Maine Pollinators and their future!	Thursday, July 20	4 to 6 pm	MLSC	Eric Venturini and Alanna	Yes	\$5 member, \$10 non-member
Narramissic On the Farm - LEA will be joining the Bridgton Historical Society at Narramissic Farm to explore the fields and forests surrounding the farm from a naturalist's perspective. How did our forefathers change today's landscape? Let's go exploring!	Saturday, July 22	10 to 11	Narramissic	Alanna	No	Free
Invasive Plant workshop - Join the Volunteer Lake Monitoring Program and LEA for a workshop identifying invasive aquatic plants. This 6-hour classroom training will qualify you for Invasive Plant Patrol Certification. The workshop provides in-depth, hands-on learning for those interested in monitoring lakes, ponds, and streams for the presence of Maine's eleven prohibited invasive aquatic plants. Limit: 30 people. To register, please visit www.mainevlmp.org .	Tuesday, July 25	9 to 3	MLSC	Mary and Alyson	Yes	Free
Nature Walk at Holt Pond - Join us for a relaxed stroll along the board walk, looking to see what we can see, including plant identification, ecology, geology, and any animals we can spot. Bring your curious naturalist self and snacks, water, and sun screen, etc. This is a walk great for the whole family!	Thursday, July 27	9 to 12	Holt Pond Preserve	Alanna	Yes	\$5 non-members
Dragonflies - Join naturalist Mary Jewett at the Maine Lake Science Center for an informative presentation and an afternoon of safely catching, handling, identifying and releasing dragonflies. This event is great for kids 6 and older, and of course adults young at heart!	Wednesday, August 2	1 to 3	MLSC	Mary	Yes	\$5 non-member
Stevens Brook Natural History - Stevens Brook was the lifeblood of the old Town of Pondicherry (now Bridgton). The river continues to weave through the downtown today, carrying secrets of the past. Join local historians Sue Black and Ned Allen, Maine Master Naturalist Leigh Hayes, and educator Alanna Doughty for a talk and walk! An evening indoor presentation and a daytime exploration are offered to see it all with your own eyes - a wonderful marriage of history and local ecology, and an opportunity to familiarize yourself with this lovely trail!	Wednesday, August 2 and Thursday, August 3	7 pm, and 9 to 12	MLSC and Bridgton Historical Society	Alanna	Yes	\$5 non-member
Paddling Series with Sportshaus - Join LEA educator and our invasive expert, Christian Oren, and Sportshaus for a morning of paddling on the Songo River. We will learn about river ecology, the battle with milfoil, and hopefully see some wildlife! Life jackets, boats and paddles are provided and pre-registration is a must - these fill up fast! Bring a snack and water, sunscreen and appropriate attire.	Wednesday, August 16	9 to 12	Songo River	Alanna, Christian	Yes	\$5 Members, \$10 non-members
Forestry for Maine Birds - Join Maine Audubon, the Forest Stewards' Guild, Maine Foresters and LEA in exploring best forestry management practices that help support overall biodiversity in the forest, and native bird species in particular. Enjoy indoor presentations and outdoor field exploration in and around the science center. Register with MaineAudubon.org .	Tuesday August 12	9 to 12	MLSC	Alanna	yes	Free
Mushroom Talk* - Plant pathologist and mycologist, Jesse Dubin, is back to teach us about the life history of mushrooms and the many varieties that call Maine home.	Thursday, August 24	TBD	MLSC	Mary	Yes	\$5 non-member
Mushroom Walk* - Those who attended the Mushroom Talk will go out with Jesse and explore the different species of mushrooms at the Holt Pond Preserve. Space is very limited for this walk so participants must sign up early. People who attended the indoor presentation get priority on the walk. Act fast!	Friday, August 25	TBD	Holt Pond Preserve	Mary	Yes	None, members only
Gulf of Maine Research Institute Freshwater Field Day - Come out in the field with folks from Vital Signs and LEA for a fun half-day in the freshwater world! Get hands-on experience and go through the steps of collecting data in the field and publishing data on the Vital Signs website. To register please visit the LEA website for a link to the Vital Signs sign up, or visit vitalsignsme.org for teacher event offerings.	Saturday, August 26	8:45 to 12	MLSC	Alanna	Yes, with Vital Signs	Free

*The Natural Resource Series at LEA is made possible in part through the generous support of Hu and Ray Caplan and their family. The Caplans recognize the vital importance of education in all aspects of LEA's work protecting the Lake Region's most important resource and asset: its waters and watersheds.



Support The Maine Lake Science Center Campaign

The Maine Lake Research and Protection Collaborative



In its first year of operation, Lakes Environmental Association's Maine Lake Science Center organized four retreats for researchers from Maine's colleges, universities and state and federal agencies. The researcher retreats fueled a new initiative called the Maine Lakes Research and Protection Collaborative. Initially introduced by Lakes Environmental Association, and enhanced by Linda Bacon of the Maine DEP, the Collaborative is being used by agencies, organizations and academic researchers as a blueprint for protecting Maine lakes.

Linda wrote this about the new Collaborative: *"By design, the diversity of participants is an attempt to incorporate perspectives ranging from the social and political sciences to the chemical, physical, and biological sciences and to recognize the deep spiritual connection many have with 'their' lakes. This working partnership, the Maine Lakes Collaborative, is expected to be a powerful force for change by identifying needs and proposing a multipronged strategy for future action."* Lakes Environmental Association and others intend to use

the Collaborative's findings to develop new science-based land use standards.

"Hundreds of Maine communities rely on clean lakes as their economic backbone. Thousands of people rely on these fragile resources for 'quality of life' activities on or near the water, and many more plants and animals make their homes in the clear, cool, deep waters. Maine lakes and other waters will benefit from this broad-based and comprehensive approach to resource protection and restoration, one that builds on the foundation of protection implemented in the 1970s under the Clean Water Act. Nearly four hundred diverse Maine organizations, including individual lake associations, regional alliances, statewide organizations, and governmental entities embrace as part of their mission facets of education, monitoring and the safeguarding of water quality. An eye to the future reveals that it is incumbent on these stakeholders to assure that science-based policies are implemented before further damage is done to these precious resources".

Members of the Maine Lakes Collaborative are meeting to brainstorm ideas, identify needs and begin creating a strategy with which to secure funding for implementing the Collaborative. The strategy envisions formation of multiple teams, each with specific tasks. Additional collaborators will be welcomed to the teams and are expected to participate in one or more of tasks for which they are best suited. A steering committee composed of representatives from the various participating organizations will oversee the progress of the Collaborative, which is being coordinated by the Maine Lake Science Center staff. The steering committee will include representatives from the leaders of Maine's regional lake associations, each of the statewide lake organizations, researchers, and state and federal government agency staff. Lakes Environmental Association is excited about the potential offered by the Collaborative and we will be devoting significant resources to make it work productively for the Lake Region and all of Maine.

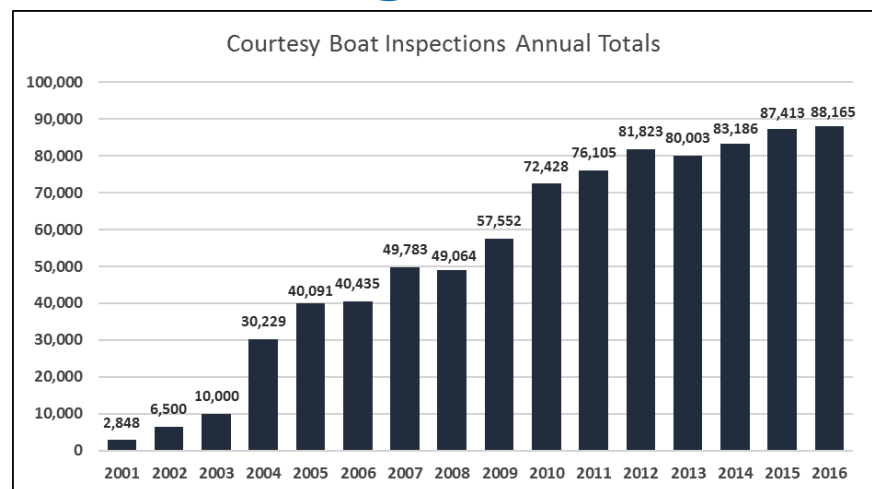
The Maine Lake Science Center's new Research Director, Dr. Ben Peierls, arrived on January 6th, just in time to participate in the fourth retreat. He is strengthening ties with academic and agency partners and working on our new lake lab, the Phil Chute Memorial Educational and Research Lab (see separate article).

The History of the CBI Program

Courtesy Boat Inspections are conducted throughout northern New England and well beyond. In New Hampshire, they are called Lake Hosts, and more than 850,000 boats have been inspected since 2002. During that time, over 1,550 invasive plants were removed before launching. In Vermont, with far fewer lakes than Maine and New Hampshire, inspectors are called Lake Stewards. Since 2007, 83,000 inspections have been conducted. Voluntary inspection programs also exist in other lake-rich states and in Canada. In some jurisdictions, such as Lake Tahoe, they are mandatory.

LEA was at the forefront of establishing the CBI program in Maine. In 1999 we hired a student intern, Beth Packard, to help us develop and test the concept. Long Lake was chosen as the pilot location and the process was perfected there.

Boat inspections are the "flagship" for invasive aquatic plant prevention, responsible for hundreds of intercepts, each of which could have led to a new infestation. Over the 18-year history of the program, more than 855,000 boats have been inspected in Maine and more than 1,200 plants



have been intercepted. Each of these checks results in increased awareness and vigilance on the part of boaters, who have actively supported this vital program.

When you see a CBI this summer, you can thank Beth and LEA. It's hard to imagine how many more Maine lakes would be choked with plants had inspections not been introduced.

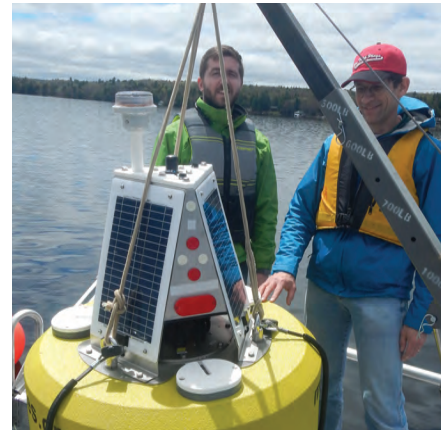
Long Lake Buoy Fully Outfitted

Thanks to Madeline Wikler's gift in memory of her husband and former LEA Board member, Joe Wikler, the new, fully-automated buoy on Long Lake is now capable of monitoring the entire water column. Last year this high-tech buoy, which sits in the north basin of Long lake, was installed with three chlorophyll sensors near the surface and oxygen and temperature sensors reaching down to about 30 feet. This spring, three more oxygen and temperature sensors were added so the buoy can monitor these important parameters throughout the entire water column.

A similar sensor set up on the Highland Lake automated buoy allowed us to see a mid-season

mixing event last year, which decreased clarity, reset oxygen conditions and increased algae levels in the upper waters. This information is crucial for understanding underlying dynamics of individual lake systems. The new sensors will complement the three algae monitoring sensors already attached to the buoy.

Now, we will be able to see how changes in stratification and oxygen conditions affect algae populations at different depths, all in real time. Awesome! This buoy is part of the GLOBAL Lake Ecology and Observatory Network (GLEON) and is one of six buoys in the state recording live data on lake systems.



Maine Foundations Strengthen Lake Protection Projects

Maine Community Foundation - Using LEA staff and citizen science volunteers, LEA will conduct high-resolution water depth measurements in lakes within our service area to improve calculations of lake shape and volume. These metrics are a necessary part of research into the dynamics and impacts of algal blooms and oxygen depletion in lake systems. Citizen involvement will foster efforts to protect and preserve local environmental quality and will engage community members in the stewardship of important natural resources.

Additionally, a more detailed study in the Highland Lake watershed will include inlet and outlet streamflow measurements for more accurate estimates of water and sediment inputs to that lake system in Bridgton. This will improve the understanding of local water cycles and will provide information critical for ongoing research into the susceptibility of lake water quality to human and climate pressures. The goal of this research is the creation of a lake vulnerability index, which will use hydrological, physical, and other data, including biological and watershed land use, to predict lake systems most at risk for water quality degradation.

With Maine Community Foundation funding, LEA will hire and train a summer intern to coordinate the citizen science hydrography project. The LEA intern will manage community volunteers, loan and retrieve fish finders, collect data cards, download and convert depth and GPS data, and communicate results. Depth measurements will be converted into lake volume estimates and contour maps. The University of Maine is loaning us water level loggers, and has trained LEA staff to install them in Highland Lake's inlets. Streamflow into Highland Lake will be measured throughout a range of rainfall conditions and data gathered will be correlated with water levels.

The Horizon Foundation - Local stormwater systems are the front line for climate change resiliency. Road shoulders, ditches, culverts and impoundments are vulnerable during significant storm events due to inadequate design or construction. Their failure, in the face of increasingly-common severe weather events, would have considerable impacts on travel, road budgets, and taxes and will pose a serious threat to water quality. Transportation related stormwater components have always been the single greatest contributor to nutrient enrichment and algal growth in lakes and streams, but climate change will exacerbate their damage many fold.

The sediments that road systems release during storms carry a payload of attached phosphorus, the primary nutrient triggering algal blooms.

With so much at stake, many Maine towns lack an inventory of vulnerable infrastructure. Public works directors, the towns they serve and Maine's natural resources would benefit from a system that would identify early response sites, construction priorities and evaluate the costs involved in "armoring" against climate change destruction. Some of this information, like culvert inventories, exists, but is not incorporated into the Maine Department of Transportation local roads mapping system. That system is currently unable to map culverts, road shoulder and ditch conditions and general stormwater infrastructure.

With Horizon Foundation support, LEA will develop a digital inventory that maps critical stormwater infrastructure, including locations, photos, descriptions and an assessment of vulnerability for each component. We will create a methodology to rate ditches, shoulders, water crossings and stormwater infrastructure. We will partner with the Town of Bridgton Public Works Department to develop this model with the goal of developing a system that will be easily exportable and accessible to all Maine towns. The project will involve training two interns (one provided by the Horizon grant and one by the Town) to collect data digitally in the field. This geo-located data will be transferred to a mapping system that public

works directors can use to identify priority areas and compute construction and maintenance costs.

The Kendal and Anna Ham Charitable Foundation - Has provided a grant to allow the Maine Lake Science Center to outfit its new lake lab. Special lab counter tops and a safety ventilation hood are among the items purchased. The lab is scheduled for completion for operation this summer as a result of their generosity.

An Anonymous Family Foundation continued its extraordinary support for Lakes Environmental Association by providing two sondes for advanced field sampling (see separate article) and a lab centrifuge for sample processing. They also subsidized a truck and the salary of our Research Director. Their help over many years has enhanced Pondicherry Park, LEA's education program, the Milfoil Control Team, our Staff Researcher, Maine Lake Science Center construction, GLEON buoys and planning efforts. Their gifts have been a major factor in the remarkable transformation LEA has gone through.

The 9 Wicket Foundation - Funded the lab fluorometer that was just put in service in June, 2017. This sophisticated instrument provides an alternative method of measuring chlorophyll (a register of algae populations). Once we have a bit more experience calibrating it against conventional laboratory measurements, Lakes Environmental Association may be able to save significant processing costs.



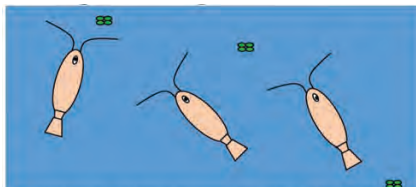
Volunteer Lake Depth Mapping Project

This summer, LEA will begin a project to obtain depth data for the lakes in our service area. But to do this, we need your assistance! We are looking for folks interested in helping us get this information by simply boating back and forth across your lake. LEA has received funding from the Maine Community Foundation to purchase a GPS enabled, depth-mapping fish finder that will allow us to produce high-accuracy bathymetric (depth) maps. This information will be used to better estimate flushing rates (how long it takes water to come in and then leave a lake) and phosphorus loading rates. The maps currently available for Maine lakes were produced in the 1950s by the Maine Department of Inland Fish and Wildlife. While these were very well done for their time, modern GPS and sonar technology allow us to create much more detailed and accurate maps today. If you would like to help with this project, please contact Alyson Smith at the Maine Lake Science Center at 647-3318.

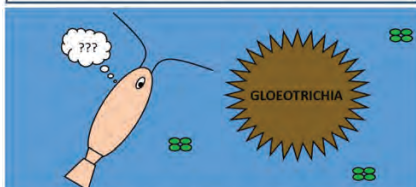


Too Big and Fuzzy to Eat

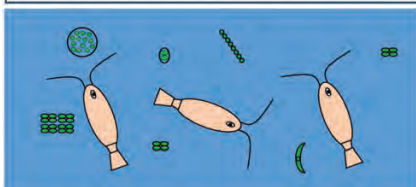
Algae are the foundation of a lake's food web, much like plants are on land. Zooplankton, which are tiny creatures, barely visible to the naked eye, are one of the main consumers of algae. However, there are some algae that zooplankton don't like to eat. These are the cyanobacteria, in particular *Gloeotrichia echinulata*. Cyanobacteria are not true algae, but because they share many characteristics with algae they are often grouped together. *Gloeotrichia* is just too big and fuzzy for zooplankton to eat. This cyanobacteria is made up of dozens of long, filamentous hair-like cells that form a spiky ball. Occasionally some zooplankton, like *Daphnia*, will graze the ends of these cells, but they can't eat the whole colony. By reducing or eliminating predation, *Gloeotrichia* are able to increase their population levels in our lakes.



Zooplankton, like these Copepods, are tiny animals that live in lakes and eat algae and other small particles. They are always looking for their next meal.



They come across a colony of *Gloeotrichia*. *Gloeotrichia* is a type of cyanobacterial algae, which is too big and fuzzy for the Copepods and other zooplankton to eat.



Copepods would rather eat small, nutritious green algae. The fact that zooplankton do not eat *Gloeotrichia* is one reason these algae build up in some lakes in the summer.

The Phil Chute Memorial Lab

by Peter Lowell

Phil Chute brought energy, interest, and fun to everything he touched. He was a sportsman who loved Maine, and loved showing off its natural beauty and resources. This he did as operator of the Chute Homestead on Long Lake, and as a friend and guide who introduced so many to outdoor adventures. His innovative humor created the world's shortest river (the Chute River connecting Long Lake and Brandy Pond), the Sunken Island Society (that issued deeds to a sandbar in Long Lake), and countless other examples, some of which are probably best left unrevealed.

While Phil was a master at serving up humor and tricks, he was also capable of accepting the antics of others. As a kid, my brothers and I decided to string rotten apples across the road to watch cars squish and splatter them. It occurred to us that

placing roofing nails in the apples might amplify the fun. Phil was the first and only victim, suffering flat tires on his boat trailer. His response ended the activity humanely, without even reporting the event to domestic or municipal authorities. I have wondered if he might have perfected this same activity earlier in his own career. In a magnanimous act of forgiveness, it was Phil who recruited me as LEA president decades later.

His long-time friend, John Mitchell, was privy to myriad life-enriching Chute activities and, like me, was looking for an appropriate way to honor this remarkable man. The Phil Chute Educational and Research Laboratory at the Maine Lake Science Center seemed a perfect fit. Phil had set the stage for comprehensive lake protection in Maine by establishing LEA. Now the lab named in his honor is helping to launch a new era of lake science.



The Phil Chute Educational and Research Laboratory
Dedicated to the Lakes Environmental Association's Founder

Legacy Effects of Acid Rain on Lake Zooplankton

By Amanda Pratt

In the 1980s and 1990s, acid rain was a hot button environmental issue. After a series of regulatory measures aimed at reducing sulfur emissions from power plants, rainwater pH levels largely recovered. LEA has been regularly collecting rainwater samples since 1980 as part of the National Atmospheric Deposition Program (NADP). Samples are sent to a central laboratory where various chemical analyses are conducted. Prior to 1994, pH levels averaged below 4.6, but have improved significantly since 2009, with recent years' averages being consistently above 5.0. The "natural" pH of rainwater – if there were no pollution – would be around 5.6.

Lakes and landscapes are able to withstand acid rain due to something called buffering capacity. Buffering capacity is the ability of a system to maintain a specific pH level by neutralizing any increases or decreases in acidity. In natural systems, calcium carbonate is one of the main sources of acid neutralizing capacity and the primary defense against acidification. LEA tests the buffering capacity of each lake we sample by measuring its alkalinity.

Because of Maine's predominantly granite bedrock, the natural buffering capacity in this region is low. Calcium carbonate enters lake systems through weathering – a natural process that is extremely slow. However, acid rain falling over the past several decades has sped up this weathering, meaning that much of the available calcium carbonate has already been leached from soils and rocks. While rainwater pH levels have recovered in recent years, much of the calcium has been removed from these low-alkalinity systems and it will take much, much longer for it to return to normal levels.

This may not seem like an important issue until you learn about how important calcium is to the biological health of lakes. Calcium is an essential micronutrient for animals just as it is for humans. Mussels and snails build their shells with it, and fish and birds need it for their bones. Calcium is also used by certain zooplankton to make their carapaces (shells) – and competition for this nutrient by different species of zooplankton has caused undesirable changes to the ecology of Canadian lakes, which serve as a warning for our lakes here in western Maine.

But first: what are zooplankton? Zooplankton are tiny, barely-visible crustaceans that live in lakes and oceans and eat algae, detritus, and bacteria. They are an important link in the lake food chain because they control algae populations and feed on small fish, which in turn support larger fish such as salmon, bass and trout.

In low-nutrient, soft water Canadian lakes in Ontario and Nova Scotia, researchers have discovered that the amount of certain types of zooplankton living in several lakes has changed over time. They have attributed this change to falling calcium levels caused by acid rain. They looked at pre-industrial populations preserved in lake sediments, surveys from the 1980s, and more recent data from the 2000s. A type of zooplankton called *Daphnia* (also known as water fleas), who require relatively large amounts of calcium but make excellent food for fish are declining while *Holopedium* zooplankton populations have been increasing. *Holopedium* make poor fish food both because of their lower nutrient content and the large gelatinous capsule that they create as a defense against predators.

Many Maine lakes are similar to the Canadian lakes in the study. Both have naturally slightly acidic waters and have been impacted more heavily by acid rain due to their lower buffering capacity and geographical location downwind of acid rain sources. LEA does not currently monitor zooplankton; however, as part of our *Gloeotrichia* monitoring program we do make note of the dominant zooplankton in each sample.

Daphnia and *Holopedium* species can both be found in the lakes region. *Holopedium* were noted in several lakes and ponds, including southern Long Lake, all three basins of Moose Pond, Middle Pond, Little Moose Pond, Island Pond, Beaver Pond in Bridgton, Foster Pond, Jewett Pond and Back Pond in 2016. *Daphnia* appear to be less common; however, it should be stressed that formal monitoring of zooplankton has not been done on these lakes and this information is from casual observation only.

Daphnia thrive in water with calcium levels above 2 mg/L, and populations suffer when concentrations fall below this threshold. LEA has never measured calcium levels, but they are likely comparable to the Canadian lakes as noted above.

The average calcium level in eight Canadian lakes declined from 2.7 mg/L in 1980 to about 1.5 mg/L in 2009. Calcium levels in precipitation as measured at the NADP site in Bridgton have declined, with 2015 reaching the lowest levels since measurement began. Lake alkalinity and pH levels in the lakes region have stayed relatively constant over time, which suggests that lakes still retain some buffering capacity. However, these measurements do not directly correlate to calcium concentrations because other minerals such as magnesium also contribute to buffering capacity.

Decreasing *Daphnia* concentrations lead to lower nutrient and energy transfer to fish and other zooplanktivores, harming the lake's biological productivity. *Holopedium* begin to dominate zooplankton populations because they are harder to eat and less desirable as food for predators. This causes "jellification" of lakes – an excess of the gelatinous capsules produced by *Holopedium* which can easily clog filters and become a nuisance for animals and human lake users alike. This study shows that the seemingly invisible and long-lasting impacts of acid rain on our lakes are very real. Through LEA's Maine Lake Science Center, we will be able to investigate more of these impacts and how they are affecting the lakes region.



The Zooplankton *Holopedium*

The Cost of Winter Travel

Colin Holme

We have known for years that salt can be bad. But it is more complicated than limiting consumption of pretzels and soy sauce. De-icing our roads and walkways with this common compound comes with its own set of risks that have nothing to do with high blood pressure or heart disease.

An article released this spring by the Proceedings of the Natural Academy of Sciences showed that many lakes are already feeling the effects of salt. The study looked at 371 lakes in North America and found that 44% showed signs of long-term salinization. Salt is toxic at low levels in fresh water systems and is persistent in the environment. It poses a health threat when it enters



drinking water systems and cannot be easily filtered out. Use of salt has also grown tremendously. Within the past 50 years, road salt sales have increased from 165,000 tons to around 20 million tons annually. As winter rain events become more common, this number will only rise. Lakes are not the only affected waters. The impact of salt on streams and rivers has been well documented. Numerous streams in more developed parts of the State already exceed safe thresholds for aquatic life. Roadside pools and depressions are most at risk because of their still waters and low volume. These systems are habitats for amphibian species, which are particularly vulnerable to salinity changes.

Compared to the waterbodies in other states, Maine's lakes are still quite healthy. This is probably because the impact of salt is tied closely to the amount of impervious areas (roads, driveways, buildings) in watershed lands, especially directly adjacent to a lake. Maine's Shoreland Zoning and Natural Resource Protection Act require buffers of vegetation

around waterbodies and this, combined with the rural nature of the state, has protected our waters from salt and other pollutants like phosphorus, sediments, and hydrocarbons.

Making the issue harder to resolve is the fact that there are few salt alternatives. Some states have looked into using beet juice and liquid cheese brines, which can be more effective at low temperatures, but widespread use of these products is not likely.

However, there are still ways we can reduce our salt addiction. Businesses and homeowners account for up to half of all salt use and overuse. Applying salt more judiciously could greatly reduce the impact on our waters. Many towns and states (Maine included) have begun applications before snow or precipitation events, which is generally more effective and requires less salt. Finally, we can also reduce or eliminate use around sensitive waterbodies. This is done by many state highway departments near public water supplies, and should be weighed as an option for those roads and parking areas that are right on the water.

Lakes are Warming Rapidly

By Amanda Pratt

Climate change is one of the biggest threats to lakes in Maine. Lakes are often seen as sentinels – early warning signs of shifts within a landscape. This is because lakes are particularly sensitive to change, and they are affected by most of the activities that occur within their watersheds. Climate change predictions for the Northeast call for longer, warmer summers, less snow, longer periods of drought and more rain falling in heavy storm events. All of these changes affect lakes. It's important to note that many of these predictions are already happening and impacting Maine today. New research shows that lakes are particularly vulnerable to climate change, which adds to the urgency and importance of LEA's mission to protect them.

A large, global study has determined that lakes, on average, are warming at a higher rate than both the atmosphere and the oceans. The warming is particularly prominent in temperate regions where lakes are seasonally ice-covered, such as in the Lakes Region. This study involved over 200 lakes worldwide, and lakes collectively account for about half of all the world's freshwater. The research received funding from NASA, NSF, the USDA, and several universities, foundations, and governments and had over 50 contributing scientists collaborating from universities, governments, and non-government organizations in over 12 countries.

The study found that, on average, lake summertime temperatures have been warming by 0.61° F per decade, whereas atmospheric and oceanic increases are only 0.45° F and 0.22° F respectively. The researchers looked at data from 1985 to 2009 and grouped lakes geographically, finding that the most intense change is occurring in deep lakes that have seasonal ice cover, which are warming at about double the rate of lakes without seasonal ice cover. Less than one degree per decade doesn't sound like all that much – after all, average monthly high temperatures fluctuate by 48° F (or about 27° C) over the course of a year. However, the researchers

predict that this small amount of warming will, by the end of the century, increase instances of algae blooms by 20%, with a 5% increase in harmful algae blooms (HABs) – those that produce toxins that affect animals and humans. The warming may also cause a 4% increase in the release of methane gas from lakes and could turn many from carbon sinks into carbon releasers. This would add more greenhouse gases to the atmosphere, further fueling climate change. Warmer temperatures and lower lake levels caused by increased evaporation will increase the risk of invasive species, and lake oxygen depletion will likely worsen.

While this study did not include any lakes in Maine or New England, its findings can certainly be applied to our lakes. As air temperatures continue to warm over time due to climate change, the length of the ice-covered season will shorten. This will extend the amount of time the lake is exposed to the sun's warming rays, and therefore increase its overall temperature more rapidly than lakes which do not traditionally have ice cover. However, the researchers found that the magnitude of this increase is influenced by lake area and depth, and is much higher in deep lakes. Other factors that influence lake temperature rise are changes in cloud cover, summer air temperature, and shortwave solar radiation.

LEA has been measuring temperature in lakes for over four decades. For most of that time, temperature was measured with a YSI brand handheld unit with a probe that is lowered down at 1-meter intervals throughout a lake's water column. We still use this method during regular water testing, but in recent years we have begun measuring temperature in other ways. In 2014, we installed a buoy on Highland Lake that records high-resolution remotely sensed temperature measurements at 2-meter intervals, as well as oxygen, solar radiation, and chlorophyll. LEA also uses small temperature sensors to take measurements in several other lakes. The resulting temperature data is very similar to that of the buoy, but at a much lower price tag.

The Highland Lake buoy is affiliated with the Global Lake Ecological Observatory Network, or GLEON, from which much of the data and collaboration for the warming study was sourced. The lake warming study used data from similar buoys around the world, as well as satellite and manually collected data. Eventually, data from the Highland Lake buoy will constitute a long-term record that can be used in similar studies.

LEA's record of manually collected data goes back over 40 years on some lakes, and is one of the longest continuous lake water quality records in the state and likely the country. Using YSI-meter data, average surface water temperature recorded between July 1st and September 30th was calculated for the years 1977 – 2016 on Moose Pond. The three summer months were chosen because that was the time period used in the warming study. The results showed that temperature is increasing by about 0.58° F per decade. However, limiting the data to the years 1985 to 2009 - the years covered in the warming study - actually shows a cooling trend.

Data from before 2000 were not collected in a systematic way, leaving some years with no temperature data and others with several readings clumped together in one month. In 2000, the water testing protocol was standardized and each of the years since has had 5 surface temperature readings for the July – September time period that were taken at approximately two-week intervals. Using only the data from 2000-2016, which is the most reliable and most recent data on record, the rate of surface water warming on Moose Pond was 1.4° F per decade.

With record high global temperature records being broken seemingly every month, it is increasingly obvious that the impacts of climate change on our communities are very real. This research has highlighted the vulnerability of global – and local – freshwater resources to climate change. The researchers summed up their study by saying, “the pervasive and rapid warming observed here signals the urgent need to incorporate climate impacts into vulnerability assessments and adaptation efforts for lakes.” LEA will be working hard, as always, to give our lakes a voice and build a community around a common goal of protecting and advocating for our shared resources.

Christian Oren Joins LEA Field Staff

LEA has a new employee to help with property consultations, watershed work, and stormwater control projects. Christian Oren came on staff full-time in May to help landowners with erosion and stormwater issues through LEA's Clean Lake Check-Up program. He will also be helping to implement phosphorus control projects, reviewing

development projects, and helping with LEA's burgeoning LakeSmart Program. Christian is not new to LEA. Many of you will recognize him from nearly a decade on our Milfoil Control Team, which he led for the past few years. Before that, he was an LEA intern and even further back, a Courtesy Boat Inspector.

Christian is a graduate of Lake Region High and the University of Maine College of Natural Sciences. His solid LEA background is a big advantage when dealing with our local lake issues. In addition to his knowledge of aquatic plants, Christian has a strong interest in terrestrial flora which allows him to help landowners select appropriate species for lakefront plantings.

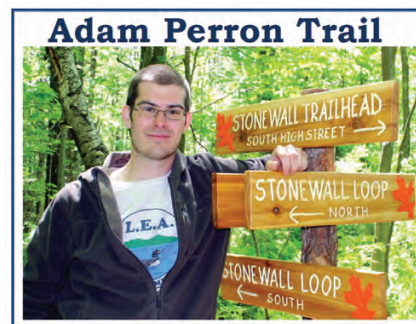
As with all LEA staff, he will be juggling multiple roles, and will continue to provide oversight and support for the Milfoil Control Team as they tackle the robust infestation in Sebago Cove.

If you are interested in having a free property consultation to help lessen the impact you might be having on the lake, please set up an appointment with Christian before he books up for the season! You can reach him by email at Christian@leamaine.org or by calling the office at (207) 647-8580.



A Tribute to Adam

A dedication was held in June for the Adam Perron Trail at Holt Pond. Visitors may now hike and remember Adam's contributions to the Lake Region as a long-time LEA intern and then as LEA's Milfoil Control Team leader, and LEA's Education Director. Adam believed strongly in the power of education and eventually left LEA to become a science teacher at Lake Region Middle School. The memorial trail is most appropriate since Adam was a master trail builder at Holt Pond, The Stevens Brook Trail and Pondicherry Park. His wife Beth and daughter Abigail were present, along with family members and friends.



Looking Forward at the Maine Lake Science Center

Ben Peierls

"The longer you can look back, the farther you can look forward."
—Winston Churchill, speech 1944

As I write this column, it's been a little over four months since I migrated from sub-tropical North Carolina to Maine in the middle of winter. Now that I've finally thawed out, I have been asked to provide my vision for the future of the Maine Lake Science Center (MLSC). So following Churchill's lead, I use my past experiences as a guide forward.

Some of my earliest childhood memories are of summer fun playing in the waters of Sand Pond in Denmark. I loved trying to watch the fish and imagine what was below my deepest free dives. As an undergraduate at Cornell, I spent one summer semester at the Shoals Marine lab off the coast of Maine and New Hampshire learning about underwater research. The summer after graduation I worked at the Hubbard Brook Experimental Forest doing limnology research in nearby Mirror Lake. Those experiences in field research have shaped my career path and now shape my vision for the MLSC. I see the Center developing as an active biological field station, joining the ranks of other field stations and marine laboratories that are part of a growing regional and international network of facilities dedicated to advancing environmental understanding and protection through research, education, and advocacy.

But what is a biological field station and why is it important? Biological field stations are broadly

defined as centers of research located in or close to an environment where scientists can conduct place-based research and turn that information into community education, outreach, and stewardship activities. These range from marine laboratories that focus on offshore waters to terrestrial reserves designed for ecosystem protection, and they involve research covering almost all scales of space and time. The Organization of Biological Field Stations website (www.obfs.org) says it best:

"Whatever form individual field stations may take, they all share the same commitment to advancing our understanding of the Earth by supporting research, teaching, and public education. Research stations provide an invaluable service to local communities and the country by providing unbiased scientific information and facilities to help governmental and other stakeholders tackle critical environmental issues. Field station staff and researchers often play a critical role in ensuring that environmental considerations are factored into local and regional planning and development decisions. Field stations depend upon the support and involvement of nearby communities. In return, many stations offer their communities a wealth of rewarding opportunities. Whether you're a student, a senior citizen, a parent with young children, or simply an adult who wants to know more about the natural world, you can experience the impact of field stations firsthand by taking a class, attending a public lecture, organizing a field trip for your child's school, or volunteering as an educational docent or research assistant."

In many ways, LEA has already been partly fulfilling the role of a field station. Now that we have improved our research facilities, we can move even closer to that goal. Our own expanding research into lake water quality will be a key component of the Center as a field station, but equally important is it becoming a resource for outside research and education. Imagine undergraduate classes using the MLSC as a base for a field limnology course. University faculty and their graduate students could spend time at the Center to focus on our lakes for their research. Or picture a summer workshop on aquatic sciences for middle or high school students. Investments in additional living accommodations (I envision cabins like those at local camps) will enhance our ability to host such activities.

The MLSC can become a perfect venue for public seminars, where top-notch scientists communicate regional and global research results and their implications to the community. Even though the Center's name defines our focus, I see no need to restrict ourselves or visitors to lake science only. Forest and streams in surrounding watersheds are important components of lake ecosystems and our properties at Holt Pond, Highland Lake, and the MLSC would be perfect as study sites for additional ecological research.

Looking back, Lakes Environmental Association has had great success finding ways to protect local lakes. I think the future for the MLSC is bright and full of potential and I am excited to embark on this journey along with you, our dedicated and supportive community.

Members = LEA

There is no way to overstate the importance of membership contributions to LEA. While many organizations are dependent on government funding, corporate sponsorships, advertising and/or grants to survive, LEA has always pinned its hopes for strong and effective programs on its members. This has afforded us the independence to do what we thought was right for Maine lakes without being timid or unimaginative. We have weathered financial turbulence with the stability that loyal supporters provide.

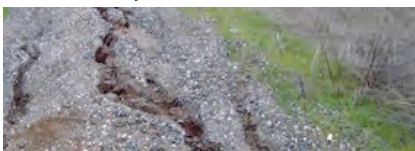
There are still challenges – primarily getting the attention of the majority of lakeshore landowners who have never joined or contributed. Although this seems unthinkable, it is true on all lakes! Imagine what LEA would be capable of if a majority of those who benefitted from our work were to join. Our focus is to use the resources you give us in the most effective and cost efficient ways in order to make the biggest impact. Help us by checking with your neighbors to see if they are members. If they are not, you are our best proponents, so encourage them to join. We can provide membership forms for you and can let you know the membership status of those in your neighborhood. Call Jenny at 647-8580 or email her at jenny@leamaine.org for ways you can help.

LakeSmart Tip: Rubber Razors

Rubber razors (also called rubber razor blades, rubber blades or rubber waterbars) divert water off sloping driveways and camp roads into stable vegetated areas. They are an alternative to open-top culverts when the driveway or road in which they are installed is not plowed. (Plowing will likely destroy a rubber razor.) LEA can provide a schematic for construction of a water bar if you're interested.



Driveway With Razor Installed



Eroding Driveway Without Razor

LakeSmart Tip: Shoreline Buffers



A vegetated buffer (trees, shrubs, groundcover and duff/mulch) across the shoreline (a) infiltrates stormwater runoff; (b) catches sediment and pollution; and (c) breaks up rain drops which compacts the soil. Many varieties of native plants can be used that do not block the view and afford privacy and noise control.

Unlike native plants which have extensive roots systems that hold soil in place, lawns are unfriendly to water quality and wildlife. The shallow roots allow phosphorus, nitrogen, fertilizers and pesticides to easily wash into the lake. Reducing the size of lawns also reduces the carbon footprint of maintaining lawns.

In summary: Lakes love a buffer of native shoreline vegetation, but don't love lawns.

Citizen Science in the Lake Region

by Alyson Smith

In our Fall newsletter we invited you to join us in citizen science, the practice of public participation and collaboration in scientific research. Citizen scientists can conduct surveys, take measurements, or record observations. These actions support professional researchers in many ways – by submitting data, sharing experiences, or spreading valuable information. Scientists benefit from having more data to analyze as well as a pool of volunteers willing to help. Volunteers can have varying levels of expertise: from kids in their backyards, to members of high school science clubs, to amateur astronomers with sophisticated home equipment. Modern advances in technology such as smartphones make citizen scientists more useful today than ever before.

Citizen science programs vary in type and scope. Some are local –collecting data on the nutrient levels in an area stream, for example. Other projects are nationwide. Many large-scale citizen science projects have websites where you study up and learn protocols before heading into the field.

Here are some to check out: **CitSci.org** supports your research by providing tools and resources that allow you to customize your scientific procedure - all in one location on the internet. As your partner in research, they provide tools for the entire research process, including creating new projects, managing project members, building custom data sheets, analyzing collected data, and gathering participant feedback.

Citizen science empowers individuals to pursue their interests in the scientific world through developing and implementing projects using the scientific method. As a member of CitSci.org, you



are encouraged to investigate your own scientific questions or jump on board as a volunteer for an existing project. CitSci.org stands out for its customization features that allow you to mesh your creativity into your research!

iNaturalist.org - Contribute to Science – Every observation can contribute to biodiversity science, from the rarest butterfly to the most common backyard weed. iNaturalist.org shares your findings with scientific data repositories such as the Global Biodiversity Information Facility to help scientists find and use your data. All you have to do is observe.

For information about Maine-based resources please visit:

Vital Signs page of Gulf of Maine Research Institute (GMRI):

vitalsignsme.org/field-missions - GMRI's Vital signs program is an excellent resource if you'd like to start your own citizen science project. This resource allows you to design your own mission and host the data on their website. Maine Audubon Society: maineaudubon.org/about/citizen-science - Maine Audubon is involved with a number of

citizen science projects from The Maine Loon Project, to understanding where wildlife cross roads, to monitoring bats in our state.

LEA will be starting adult citizen science projects this summer. Training will be offered in eBird, with practice workshops on-site at the Highland Preserve, the Holt Pond Preserve, and Pondicherry Park. Additionally, we hope to engage lake-loving volunteers for a bathymetry (water depth measurements) data collection project on local lakes.

In cooperation with the Maine Volunteer Lake Monitoring Program (VLMP), Lakes Environmental Association will be offering two workshops to help train citizens for invasive aquatic plant projects:

IPP 101 - July 25th - Individuals attending this comprehensive 6-hour classroom training at the Maine Lake Science Center will qualify for Invasive Plant Patrol Certification. The workshop provides in-depth, hands-on learning for those interested in monitoring lakes, ponds, and streams for the presence of Maine's eleven prohibited invasive aquatic plants.

IPP Plant Paddle - July 18th - This 3-hour introduction to Invasive Plant Patrols takes place on Moose Pond in Bridgton in watercraft powered by paddle (canoe, kayak).

Look for a reminder email in the fall for a call to action for "ice-in" dates. The success of any citizen science project depends on the establishment of a well-devised monitoring program and the dedication of its volunteers. The Lake Region is filled with a tremendous amount of lake enthusiasts who, year after year, show how much they care about our precious natural resources!

EPA Cuts Will Hurt Lakes

By Colin Holme

Over years, LEA has benefited from Environmental Protection Agency (EPA) funding for numerous watershed projects. We have participated in nine low-cost watershed surveys and nine large projects that fixed the worst erosion problems within each watershed. While these projects all relied on EPA funding, they also required substantial (40-50%) local matching funds and input. For all EPA projects LEA has worked on, this match requirement has been exceeded, usually by a large margin: by landowners who have work done on their property; by towns who donate highway crew time and equipment to fix problem sites associated with public roads; by individual lake associations; and by LEA itself.

The drastic cuts to the EPA proposed by the Trump administration will have far-reaching effects on many programs, but most worrisome to our lakes is the proposed defunding of Section 319 of the Clean Water Act. All funding for this program is slated to be eliminated. This is the very section that provides grants for lake watershed projects, and covers all or most of the salaries of nine Maine Department of Environmental Protection staff who work to oversee lake and watershed protection programs.

Scott Pruitt, EPA head, has stated in interviews that individual states have the capability to run these programs, making this funding is redundant. The reality, however, is that the EPA gives this money to the states now and if this revenue disappears, Maine will not have adequate staff to enforce or even review projects to see if they meet existing federal requirements. One of the primary reasons

EPA has provided this money is to assure that projects comply with federal standards and regulations. The administration claims the Department of Agriculture has existing programs in place that serve the same function, but that funding is not available for lake protection projects. The result of the cuts will simply be less money for lake protection and minimal review for projects that impact lakes and fresh water systems. The good news is this is only a proposed budget, and members on both sides of the aisle in Congress will get to weigh in on these program

cuts. You can help maintain funding for lakes by contacting your representatives and letting them know you oppose cuts to Section 319 of the Clean Water Act. Here are phone numbers for Maine's Congressional delegation: Rep. Bruce Poliquin - (207) 784-0768 / Rep. Chellie Pingree - (207) 774-5019 / Senator Susan Collins - (207) 784-6969 / Senator Angus King - (207) 622-8292. Out-of-state residents can also register their concern with their home state delegation.

Here are the Region's lakes that have benefitted from EPA funding: Bear Pond, Hancock Pond, Highland Lake, Keoka Lake, Long Lake, McWain Pond, Moose Pond, Sand Pond and Woods Pond.



Lakefront Planting on Woods Pond Partially Funded by EPA

Lakes A Hot Topic in Augusta

Colin Holme

It was a busy spring in Augusta with over a dozen laws proposed that would affect lakes. Here is a brief summary of some of the proposals that LEA weighed in on and what you can do to help make sure our lakes continue to get the protection, attention and funding they deserve.

Canoe and Kayak Milfoil Sticker Bill, LD 359

This proposal was put forth by local Representative Phyllis Ginzler on behalf of LEA Executive Director, Peter Lowell. The bill would have required all passive watercraft (canoes, kayaks and similar) used on state waters to have a milfoil sticker. The sticker would cost \$5 and revenue raised from sales would go toward the removal of invasive aquatic plants. Currently, organizations that do control work in Maine spend three times as much money to remove invasive aquatics than they receive in state grants that originate from current milfoil sticker funding. Ultimately, the bill was killed over concerns about implementing a fee structure for non-motorized recreation and questions raised about how the public would find out about the sticker. These are valid points, however there are limited options for new control work revenue and many canoeist and kayakers appreciate and benefit from waters free of invasive plants. For this reason, LEA is teaming up with large lake associations across the state to sell voluntary passive-craft stickers. If you are interesting in supporting control work, please purchase a sticker for your canoe or kayak, or for any boat! Stickers are available at the LEA offices for \$5.

Milfoil Study Bill, LD 1178 – Senator Thomas Saviello of Franklin put this bill forward to help better understand invasive aquatic plant control efforts in Maine. The proposal would have increased the annual fee on the lake and river protection (milfoil) sticker by \$1 for one year. This additional revenue would have gone toward funding a study to examine the long-term viability and success of aquatic invasive control work throughout Maine. This was a good bill and the study would have likely highlighted the huge amount of match and private donations that keep invasive control work going in Maine's fresh waters. Unfortunately, this bill was killed in committee.

Natural Resource Protection Act rollbacks, LD 1040 – This terrible bill would have eliminated setbacks and regulation of most small streams within the state. These are the sources that continually provide clean, filtered water for our rivers, lakes and ponds. Native brook trout populations would have been hurt, water quality would decline, and additional flooding would occur. Fortunately, the Environmental and Natural Resources Committee saw the bill for what it was and dispatched it before it could get off the ground. Representative Tom Winsor of Norway, who represents Waterford and Sweden, was a co-sponsor of this bill.

Decks in the Buffer, LD 400 – This bill would have allowed new decks in the buffer setback area around lakes, ponds, rivers and streams, resulting in less effective stormwater absorption and nutrient filtering. Resulting footpaths would increase foot traffic and damage vegetation. Stormwater flows would also increase and wildlife using this natural corridor would have less habitat. Recent studies confirm that Maine's Shoreland Zoning Standards are working and numerous scientific publications show the effectiveness of 75 to 100 foot natural buffers. The Environmental and Natural Resources Committee sacked this harmful bill early in the process.

Septic Discharge Penalties Increased, LD 357, LD 604 – Two bills came out this session to better deter thoughtless people from discharging human waste directly into lakes from on-board, boat bathrooms. This disgusting problem made it to the front page of the Bridgton News in July of 2015. To address the issue, local representative, Jessica Fay, proposed increasing the fine to not less than \$1,000. Naples Representative, Rich Cebra, proposed making direct, intentional septic discharge from a boat into a lake a felony and directed Inland Fish and Wildlife (IF&W) and the Maine Department of Environmental Protection (MDEP) to install signs describing this prohibition at boat launches. Representative Fay's bill passed. Representative Cebra's bill did not make it out of committee but IF&W agreed to place signs at state boat launches and provide signs for other launch sites at cost.

Photos, Training and Fines in the Shoreland Zone, LD 1096 – In 2015, a diverse group met for a series of discussions about the efficacy of Shoreland Zoning. The group surveyed code enforcement officers and lakefront landowners across the state to determine how well the various standards are understood and enforced. One recommendation from the group was to have towns require before and after photos of proposed work in the shoreland zone. "Before" photos are generally required now for most work in this zone through the municipal permitting process. This new standard would mimic the "after" photo requirement already in place for Natural Resources Protection Act that often applies when working around the water. This simple requirement would increase landowner compliance with shoreland zoning standards and reduce the need for field inspections by code officers. This bill also proposed expanding shoreland zoning training opportunities for code officers and an increase in the maximum fine for shoreland zoning violations. After the original version of this bill was defeated, it was reconsidered with only the photo documentation component. The full legislature was slated to vote on the bill in June as we went to press.

Septic Inspections for Property Transfers in the Shoreland Zone, LD 559 - Representative Gary Hilliard of Belgrade proposed this bill to address properties sold in the Shoreland Zone with sub-adequate or failing septic systems. It mimicked the current requirement of the coastal shoreland zone that requires septic inspections for systems older than three years before a house can be sold. Inadequately treated sewage contains high levels of the nutrient phosphorus, which feeds algae and damages our lakes. This bill was long overdue and passed both houses of legislature but was vetoed by the Governor. The House did not have enough votes to overturn the veto.

Bond to Fund Stormwater Management Projects, LD 178 - This bond would provide matching funds to correct erosion & stormwater problems statewide. This would be very good for lakes, municipalities and contractors who do the projects. If federal 319 Clean Water Act Funds are reduced or eliminated as proposed (see EPA cuts article), this may be the only financial incentive for landowners and towns to correct erosion problems affecting our waters. Please keep an eye out for news about this proposal, as we will need your help to get it on the November ballot.



Representative Phyllis Ginzler and LEA Executive Director, Peter Lowell Address a Legislative Committee

The Power of a Regional Organization

LEA relies on membership contributions for the bulk of its work, but there is often confusion about how we relate to individual lake associations in our service area. To add to the confusion, it is difficult to measure the lake benefits from programs such as school education. A closer look reveals the importance of “economies of scale” made possible by regionalizing. The decades of students who have gone through our school-based programs have produced municipal officials, contractors, and even LEA staff members who understand lakes. Hundreds of landowners have benefited from our capacity to conduct Clean Lake Check-Ups and more recently, LakeSmart consultations. We have developed the expertise to intervene in complex development proposals and enforcement situations that bring concerned shoreland owners and neighbors to us for help. Non-members faced with problems in their neighborhoods are quickly convinced of the value of supporting LEA.

The “horsepower” needed to envision and create the Maine Lake Science Center could only have come from an organization that had broad support from a wide area. Consider the resources we bring to studying your water quality and advocating for

appropriate land use standards on your lake. Over the past few years, we have been awarded nearly \$200,000 from foundations to purchase advanced testing equipment and to build amazing staff expertise such as Amanda Pratt’s algae work, Colin Holme’s knowledge about electronic monitoring tools, and Dr. Ben Peierls’ remarkable scientific credentials.

When LEA comes to your lake to monitor or to provide technical assistance, remember that it’s you who make this possible through your membership donations. We charge “staff expenses” to lake associations for advanced testing, but those fees do not begin to cover the value of the expertise and equipment we offer. And we do basic testing on every one of our 40 lakes without any request for special funding.

Please support your lake association, but remember also to support LEA to keep these services flowing to your lake. A separate article describes lake advisory committees established by LEA on lakes without their own associations. These committees were established to insure that all lakes receive the full benefits LEA offers.

Lake Advisory Committees for Bear Pond, Crystal Lake and Highland Lake

Residents of three lakes met last fall to form lake advisory committees (LACs). These committees are an alternative to a formal lake association, but can also function for lakes with associations. The concept is quite simple. LACs are committees of LEA, allowing them to raise funds and take advantage of LEA’s tax-deductibility for donors. This approach also eliminates the need for insurance and for the IRS reporting required of associations. Each fall, everyone from a LAC lake is invited to hear news and information about their lake. Water quality conditions, special problems such as violations, and any other unique circumstances are discussed. LEA staffers explain the work being conducted and any concerns. A plan for the coming

year is developed, together with a budget to implement special projects such as advanced water quality monitoring or expanded boat inspections. Committee membership is open to all, and a chair or facilitator may be chosen by the group to expedite the plan. A communications web spreads word of the committee and its plan, primarily by email, and donations for special projects are encouraged. In the fall, the group is brought together again to evaluate the previous year’s work and develop a plan for the coming year.

If you are interested in helping to form a lake advisory committee for your lake, please contact Jenny O’Connor at LEA.

The Milfoil Control Plan for 2017

2017 is gearing up to be another great year for the LEA’s Milfoil Control Team. Huge swathes of milfoil in Sebago have been targeted for removal, and invasive plant surveys are planned for all around the Lake Region.

In 2016, LEA adopted plant control operations in Sebago Lake, and we quickly realized the massive scale of the problem there. Dense patches of milfoil are scattered around all of the seven towns that border Sebago. We have already mitigated infestations in marinas in Naples and Windham, and coves around Frye Island. However, Sebago Cove in Naples is another story. The milfoil is so pervasive in this large cove that it will take years of constant work to rid the area of this invader. Last year, the Team was able to clean up about 25 acres in the cove, and we are on track to clear another 25 in 2017. That would mean nearly half of the cove would be clean by the end of the summer. If we can

keep this astonishing pace up, the cove could be restored in 5 to 10 years.

Ongoing management work will continue in the areas we have already restored such as the Songo River and Brandy Pond. These areas are still at risk due to milfoil fragments being deposited off boats from Sebago Lake. Surveys reveal small plants, and we can easily remove those before patches arise. In the same vein, the Team will monitor milfoil regrowth in areas already treated on Frye Island and in marinas around Sebago. Additionally, surveys are planned for surrounding lakes to look for invasive species in “clean” lakes. Early detection is key to preventing new species from becoming established. While we hope that no new species will be found, LEA’s Milfoil Control Team has the experience and resources needed. All that is left is to don our wetsuits and make the plan a reality.



Maine Lakes Open Paddle Board Race to Benefit LEA

LEA is bringing a new tradition to Highland Lake in Bridgton this summer. Mark your calendars for the first Maine Lakes Open Paddle Battle, which will take place on July 1st. Registration for the race is online at mainelakes.org. This is the first event of its kind on Maine lakes, and will provide one massive paddle board of excitement. There is a 2K course for recreational paddlers and a 5K course for the cruisers.

Although there will be real competition, the race is also about having fun and raising money. For this reason we have added a TWIST. There is a guaranteed way to improve your time that does not involve a specialized diet or hours at the gym. For every \$100 of sponsorship raised, we will take a full minute off your race time. Don’t worry, medals will be awarded based on best (actual) time as well.

Race categories include the following: Men’s and Women’s Longboard (longer than 12’06”) and Men’s and Women’s Shortboard (12’06” and under). Age Classes are 15-35, 36-55, 56+. The minimum age to participate is 15. Pledge forms and registration can be found at mainelakes.org. Proceeds will benefit LEA’s lake protection work.

Raffle to Benefit Maine Lakes!



Waverunner Raffle

All proceeds benefit
Cumberland County through:
LEA and
Ending Hunger in Maine
Drawing July 18

1st Prize:
2017 Yamaha EX Waverunner
donated by Long Lake Marina

2nd Prize:
1 week cabin on Sebago Lake
donated by New Marblehead Lodge
Other Sponsors: Evergreen Credit
Union and Lake Region Weekly

To buy Raffle Tickets, visit any
Evergreen Credit Union branch

Get a Voluntary Milfoil Sticker

When LEA helped start Maine's "Milfoil Program" in 2000, boat stickers began generating revenues for the State's efforts to combat invasive aquatic plants. Department of Environmental Protection sticker revenues pay for their program staff of three, the Courtesy Boat Inspection Program, plant identification and survey trainings, and grants to help fund plant removal and control. Although all of this work could benefit from increased funding, plant control costs are minimally subsidized as compared to the total local costs of running these programs.

This past legislative session, LEA approached Representative Phyllis Ginzler who agreed to sponsor a bill to expand sticker requirements to passive watercraft (see legislation article). The proposal failed but LEA teamed up with lake associations across Maine to take another approach and now there is an easy and tangible way to support the control of aquatic invasives by voluntarily purchasing a "Milfoil Sticker" for your canoe, sailboat and kayak. These stickers will be sold across the state for a suggested donation of \$5 and the proceeds will go directly to fund local boat inspections and aquatic invasive plant removal programs.

Placing one of these vinyl, weather-proof stickers on your craft is a way to show support for these programs, your love of your lake and to help spread the word about the importance of controlling invasive aquatics. We know you've got a canoe, kayak, or sailboat, so come on in to LEA and pick up a sticker today!



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LEA's 40 Key Accomplishments

(* = Ongoing)

1. 1970* - Water quality testing begins
2. 1972 - Phosphorus bans enacted in Bridgton and Naples
3. 1972* - Holt Pond Preserve established
4. 1973 - LEA hires Peter Lowell as Executive Director
5. 1977* - Bridgton Sewer System on line with LEA assistance
6. 1977* - Stevens Brook Trail built
7. 1978* - LEA trains volunteer lake testers
8. 1979-1981 - Law suits filed against two developments
9. 1980* - LEA intervenes to strengthen DEP enforcement
10. 1982* - Moose Pond Land Fund established to purchase public lands
11. 1986 - Department of Energy High Level Nuclear Waste Dump fight
12. 1987 - Long Lake Watershed Study completed for DEP
13. 1987* - Salmon Point Park established with LEA leadership
14. 1988* - Model Shoreland Zoning regulations adopted in several towns
15. 1988* - Lake testing internships start
16. 1991* - Clean Lake Check-ups begin
17. 1992* - Watershed Education Program begins
18. 1993* - 6th Grade "Hey You" Cruises start on Songo River Queen
19. 1995 - 25th Anniversary Campaign funds endowment and lake center
20. 1996* - Lake Center built in downtown Bridgton
21. 1997* - Watershed restoration projects begin
22. 1999* - Courtesy Boat Inspections pioneered by LEA
23. 1999* - Phosphorus Hot Spots mapping developed
24. 2000* - Maine Milfoil Summit established by LEA
25. 2001* - Milfoil Bill enacted with strong LEA leadership
26. 2004* - Brandy—Songo River Milfoil clean-up begins
27. 2005* - GIS shoreland zoning maps provided for area towns
28. 2006* - Pondicherry Park project initiated by LEA
29. 2009 - Maine Milfoil Initiative funded with Senator Susan Collins' help
30. 2010* - Development Compliance Study begins in 3 towns
31. 2010* - Maine Lake Leaders group established
32. 2011* - Stormwater Compensation Fund watershed projects begin
33. 2011* - Wash Stations constructed (eventually 5 lakes)
34. 2012* - Advanced lake testing begins
35. 2014* - GLEON remote-sensing buoy program starts
36. 2014* - Maine Lake Science Center campaign
37. 2015* - DEP/NADP acid rain and mercury station operated by LEA
38. 2016* - Hancock Foundation donates Highland Lake Preserve
39. 2016* - Sebago Lake Watershed Project
40. 2017 - Dr. Ben Peierls hired as Science Center Research Director

The Very Variable, Variable Leaf Milfoil

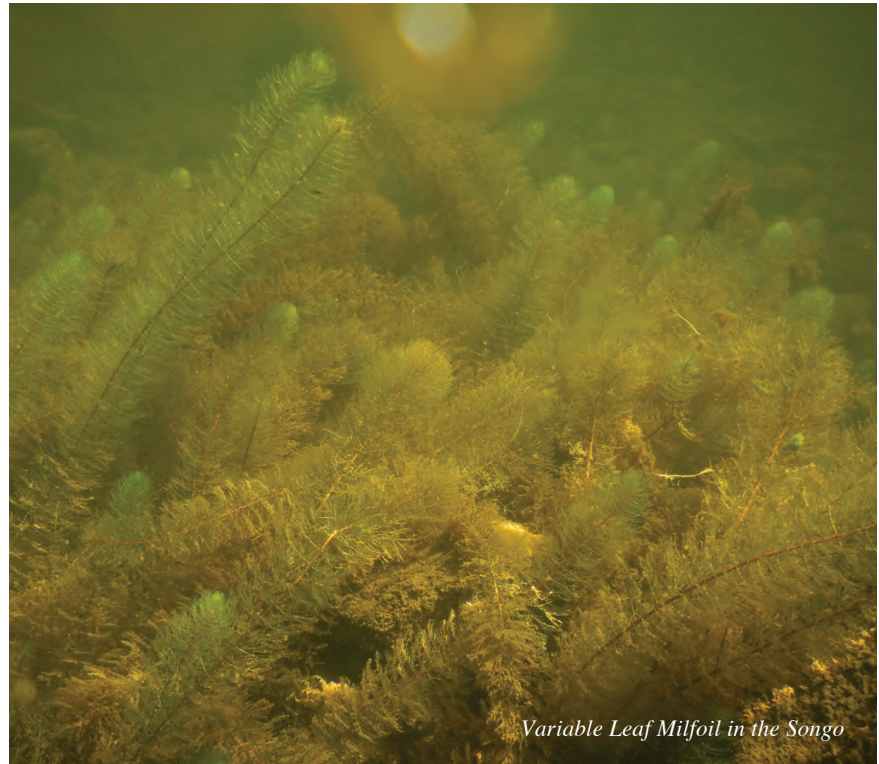
By Christian Oren

For some time, the Songo River and Brandy Pond have been amazing success stories in the effort to bring milfoil-infested areas back from the brink of disaster. We declared victory two years ago, and thought that chapter of the story was, for the most part, closed. And so we began to look to the larger and more expansive infestation in Sebago Lake. While variable leaf milfoil has been all but eradicated from the Songo and Brandy, or so we thought, constant surveys and periodic removal of "rogue" plants must continue forever to assure control is maintained.

When I first started working on the milfoil project nearly ten years ago, the Songo River Queen still made its twice daily commute to the Songo Locks and back. I remember having to constantly move our team around the large paddlewheel's schedule. Patches of milfoil on the river were everywhere at that time. The plant was unmistakable: the feathery green leaves like fresh pine sprigs in the winter, with a dark red stem that cut through the thick green. Each summer I worked with the crew to pull that invasive plant out of the river, and each day we made a little more progress. After years of work we had surpassed even our own best expectations and had removed all of the football field-sized patches from the Songo River.

Having the variable leaf milfoil out of the river was a great feeling, but the true victory for me came later, when native plants started to return to the same places the invasive milfoil once grew. These native plants created needed habitat in the river and no longer had to compete with the invasive milfoil. A few of the returning plants gave the crew pause: they looked almost identical to the plant we had worked so hard to remove, but with differences in color and shape. They were native milfoils. Maine has five species of native milfoil, and it can be difficult to differentiate them from invasive varieties. Despite the trouble in identification, we decided to keep the native milfoils in the river. We wanted to restore the natural ecosystem present in the area before the invasive variable leaf milfoil established itself, and those native milfoils were part of it. Or so we thought.

In 2016, the Songo River and Brandy Pond took a back seat to the more pressing work on Sebago Lake. The infestations in the Songo and Brandy were under control, and only required a bit of



Variable Leaf Milfoil in the Songo

maintenance to prevent new patches from popping up. Regardless, on some of our surveys of the Songo River I noticed something strange. Some of the native milfoil had started to grow into small patches in the same way the invasive variety did in the past. I looked closely at the plants, and they looked different from the invasive I knew. The leaves were more yellow, the stem was green, and the whole plant was smaller and thinner. I shrugged the patches off as an oddity, perhaps areas with fertile soil or some other benefit the plant was taking advantage of, but definitely not invasive. Toward the end of the summer, LEA invited staff from the Maine Department of Environmental Protection to visit the river. They were pleased with our status, but when they saw these patches they became concerned as well. They took a sample to be genetically tested, and the results were conclusive: the patches were invasive.

I was surprised by the results, but I knew this was not unheard of. The plant is called variable leaf milfoil for a reason. This invader can take different forms. The milfoil plants of infestations further north often lack the red stem as well, but I thought I knew enough to tell the difference. It turns out I was wrong, and we had let some new clumps of this old problem re-establish in the river. For our seasoned milfoil crew, these patches will be easy to clean up. We have been tracking their locations and they are quite small, but having them there has brought more attention back to the Songo. We will be spending more time there this year, and we will have to increase our diligence in tracking and conclusively identifying native milfoils. From now on, any milfoil that cannot be completely ruled out as invasive will have to be conclusively identified or immediately removed. There is too much at stake on the Songo River, Brandy Pond and Long Lake upstream to risk more infestations.

LEA Members Keep Us Going

Are you an LEA member? Please join in the effort to protect our lakes

Name: _____ Email: _____

Winter Address: _____

Summer Address: _____

Check enclosed Charge my credit card \$ _____

Visa Master Card Exp. Date _____

Account #: _____

Gift Levels:	I'd like to make an additional donation to the:
<input type="checkbox"/> \$1000 Benefactor	<input type="checkbox"/> Intern Fund \$ _____
<input type="checkbox"/> \$500 Patron	<input type="checkbox"/> Milfoil Fund \$ _____
<input type="checkbox"/> \$250 Sponsor	<input type="checkbox"/> Environmental Education Fund \$ _____
<input type="checkbox"/> \$100 Lake Steward	
<input type="checkbox"/> \$75 Family	
<input type="checkbox"/> \$50 Individual	
<input type="checkbox"/> Any other amount \$ _____	

You can join LEA with a contribution of any amount. Just mail this form and a donation to LEA, 230 Main Street, Bridgton, ME 04009

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