



Special Issue!

Diving In: A Deeper Understanding and Appreciation of Lakes Starting on Page 8


Paddle Battle II
Saturday July 7th
Details on Page 5


Summer 2018 Free

LEA Lake News

A Publication of the Lakes Environmental Association, Protecting Lakes Since 1970

Lake Courses Offer Something for Everyone

Are you looking for a way to build your resume? Do you have an interest in micro-electronics? Do you want to learn how lakes work first hand? This summer, a series of fun and educational courses is being offered at the Maine Lake Science Center in Bridgton. We are hosting three new courses geared toward students in college or late high school and interested adults looking to enhance their understanding of natural systems and scientific methodology. Participants in these courses will enjoy learning about environmental science in a relaxed classroom environment and then get a chance to collect samples in the field and run them in the lab.

Modern Environmental Monitoring is a three day course that will cover the principles of freshwater science both in the classroom and in the field. Days one and two cover on-the-lake sampling, including the basics of water column characterization using everything from a Secchi disk to advanced multi-parameter probes. Students will learn how to take surface and deep water samples for nutrient and algae analysis and get an overview of the lab work that finishes the process. Day three is a comprehensive overview of rivers and streams. This course will be taught by LEA's Staff Researcher, Education Director, Teacher/Naturalist, and Research Director. **July 30- August 1, 8am-3pm**

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Long Lake Milfoil Update by Christian Oren

LEA's milfoil control team was rapidly deployed to Long Lake after the surprising discovery of variable leaf milfoil in August of 2017. The crew found over an acre of thick plants growing directly in the range of boat propellers in Mast Cove. The boats were chopping up plants, further spreading milfoil in the lake. After weeks of intense removal, the weed was knocked back significantly, and plants were no longer at risk of spreading throughout the lake. This summer the crew will return to Long Lake to remove any

remaining plants and work towards eradicating this threat for good. Long Lake has many acres of potential habitat and could easily fall prey to another infestation of milfoil. LEA has worked diligently to protect this ecologically and economically significant resource. Milfoil has been kept at bay by the control team in the connected waterways of Brandy Pond and the Songo River for years, and Courtesy Boat Inspectors are posted at all of the public boat launches around the lake. However, milfoil was still able to hitch-hike its way into the lake, likely through a private boat launch. Many of these private launches exist around our lakes, too numerous to monitor by LEA and not subject to any regulation by state or local law. Over the winter and by request of the Naples Select Board, LEA drafted an ordinance to require owners of private launches and large docking facilities to inspect nearby waters for invasive aquatic plants. The draft ordinance has been passed on to the Bridgton and Harrison Select Boards. At press time, the document is still under review and pending adoption.



LEA diver Derek Douglass holds a clump of milfoil

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Completely eradicating invasive species is a difficult, and often impossible task. Only a few lakes have been taken off of the list of infested waterbodies. Still, that is LEA's goal. Surveys were done over

the majority of Long Lake, and only one other area was found to contain plants: Salmon Point in Bridgton. The plants there were young, and easily removed by the control team, in contrast to the well-established growth in Mast Cove. This summer, we hope to effectively eliminate the last of the patches in Long Lake.

That said, we will need to perform repetitive, methodic surveys in the cove for years to come and remove any regrowth we find. Milfoil is a stubborn weed, but with constant surveillance we hope we will be able to achieve eradication. LEA will need all the help we can get to accomplish this goal. Control work is expensive, and vast areas need to be surveyed. We need donations to keep this project strong, and volunteer support to survey every inch of the lake. If you would like to help out this summer please contact Christian, at Christian@leamaine.org, or donate to the milfoil fund directly online or by mail.

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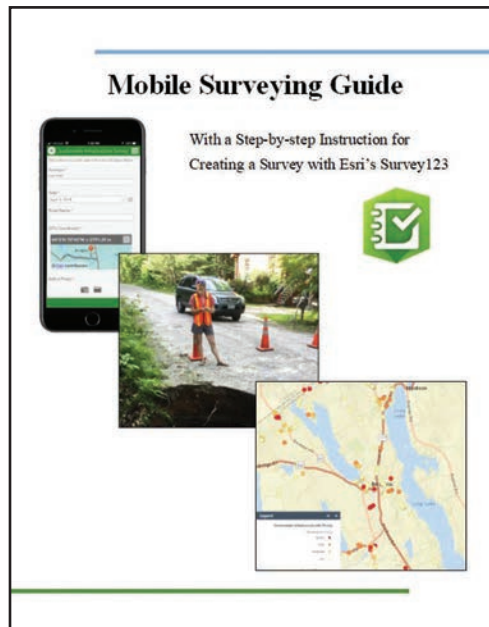
Smartphone Stormwater Mapping Update: Erosion Map and Surveying Guide Now Available!

by Christian Oren

Identifying erosion problems is essential to maintaining and improving water quality. Erosion brings soil and the nutrient phosphorus into waterbodies, which can cause sedimentation and algal growth - two major causes of water quality decline. Remediating these sites is paramount to preserving water quality and possibly improving it in the future. However, erosion sites are numerous and watersheds are vast. Finding and properly documenting all of these sites can be both costly and time consuming. As reported in our Fall 2017 issue, LEA started an ambitious project last summer, with funding from the Horizon Foundation, to improve erosion surveys by using mobile phones. We piloted this project in Bridgton, and have now created a guidebook to help other groups replicate this novel and efficient method.

Traditional surveying techniques require a GPS, camera, maps, and a lot of paper forms. Fortunately, technological advancements have made all of these available in the palm of your hand. Modern smartphones have GPS location, cameras, and the ability to fill out and upload forms all in one device. Having all of these tools available together makes surveying much faster and simpler, and the device is always at hand! The data is automatically uploaded and immediately available, unlike paper forms that have to be tediously transcribed. Another advantage of this program is that new sites can be added at any time and old sites can be updated as conditions change. All you need is one minute and your phone. This new method of surveying saves time, and frees up funding for more important work, like remediation.

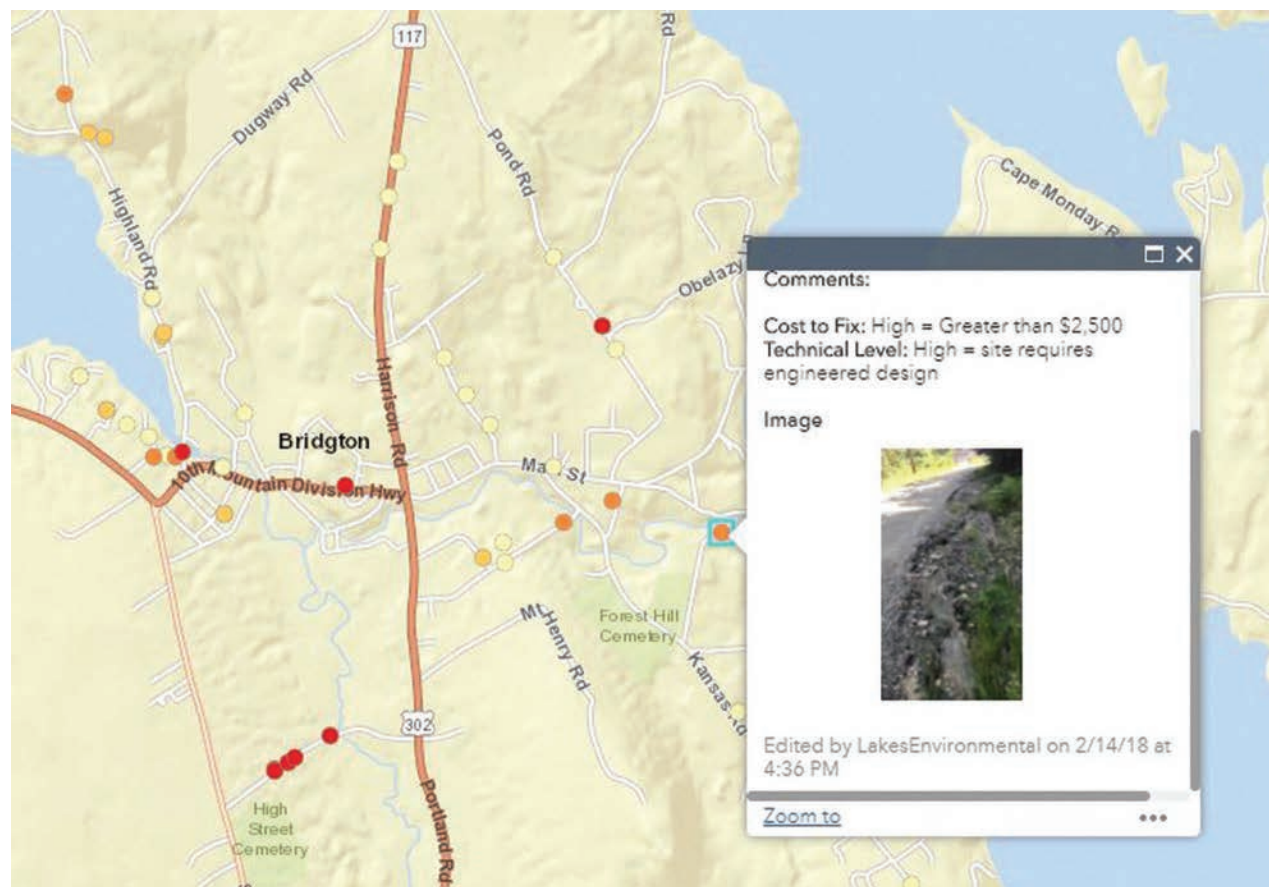
Over last summer and fall LEA interns and staff gathered erosion data for all of the public roads in Bridgton. Over 300 sites were identified on 66 roads throughout the town. This survey took weeks, but it would not have been possible without using mobile surveying. The data was com-



pleted into a map that ranks the erosion sites on their severity and proximity to a waterbody. The map is also available online at mainelakes.org/stormwater_survey where you can click on sites to get more info and view pictures. This interactive map was shared with the Bridgton Public Works department and will be used to help inform road work to alleviate these erosion problems.

LEA's guidebook on mobile surveying is designed for people and organizations who want to use this technology but aren't sure where to start. Initially, the survey programs and platforms may seem complicated, which is exactly why we created this guide! The guide is designed to be insightful and intuitive for both professionals and volunteers to use, and could be used to develop any type of survey or data collection program. Already, staff at LEA have used the guide to create a citizen science algae monitoring survey.

This new way to survey is faster, more efficient, and easier than current methods. Sharing this method will help protect water quality and advance scientific efforts on a statewide level. Get a copy of the guide on our website, mainelakes.org/stormwater_survey.



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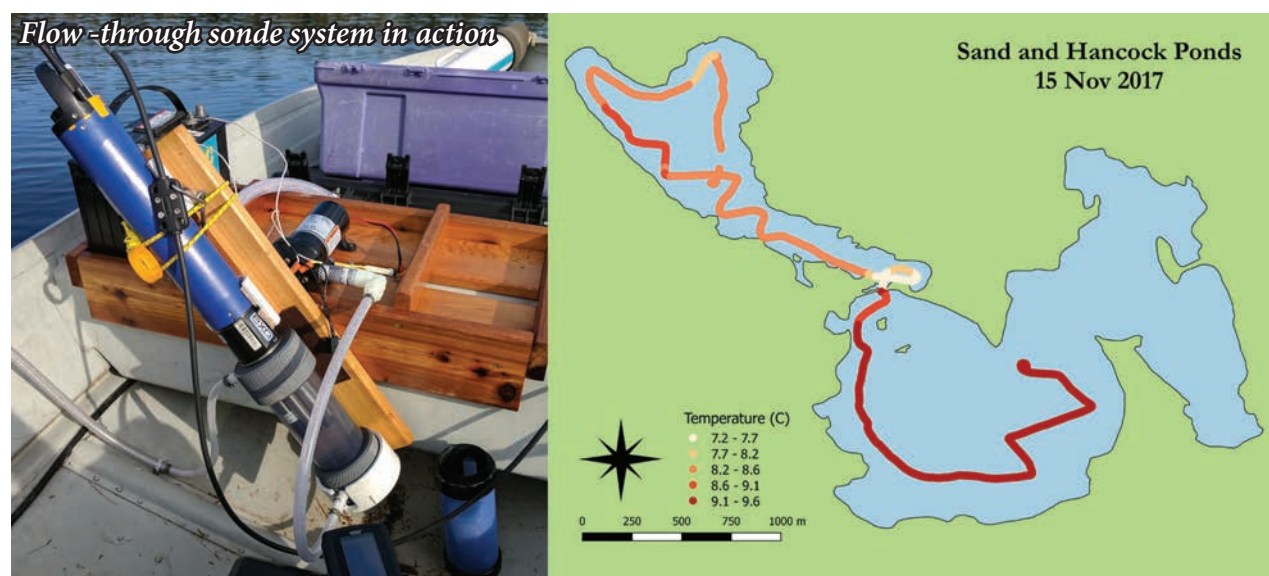
Sonde Data on the Move by Ben Peierls

While brainstorming newsletter article ideas last year, I coined the phrase “sondes for ponds”. This bit of rhyming fun produced much office levity - Alanna and I even tried to create the “Sondes for Ponds” rap.

More than just fun though, sondes are good for understanding ponds (see Fall 2017-Winter 2018 newsletter, available online). We have used them in the field to collect profiles of seven different water quality variables (temperature, conductivity, dissolved oxygen, pH, turbidity, chlorophyll, phyco-cyanin) on 17 different lakes, sometimes multiple times. This past winter we succeeded in doing the same sonde measurements through the ice on several lakes. In the process, we have added to our growing database and learned more about our lake water quality conditions. We were able to use the sondes as backup data when our DO meters were not working and as a calibration check for the GLEON buoy sensors.

Now there is a new way to use the sondes, where instead of moving the sonde up and down through the water, we move the water through the sonde while it sits inside a boat. A strong pump pulls water from just below the lake surface and sends it through a flow cell that encompasses the working end of the sonde. By combining the sonde readings with GPS coordinates, I can produce a map of conditions all over the surface of a lake. My design is based on published methods and instruments, with modifications for our boat and specific needs. For now we simply call the device a “sonde flow-through system”, though I welcome clever name or acronym suggestions.

I tested the prototype system several times last season. The data reveals that surface water conditions are not the same all over a lake; determining the extent and importance of these spatial differences is a part of our advanced research initiatives. For this year, I plan to sort out some issues with spikes in turbidity readings and redesign the pump plumbing so the flow-through device will be usable on different boats. We hope to survey many more lakes this summer, so stay tuned.



LEA's Strategic Priorities



At our February 2018 meeting the LEA Board of Directors approved strategic priorities for 2018-2020, concluding a strategic planning process begun in 2017. This planning process is a continuation of LEA's periodic strategic analysis and is guided by LEA's ongoing mission to preserve and, when necessary, restore the high water quality and the traditional character of Maine's lakes, watersheds and related natural resources.

For the next three years, LEA will focus on five strategic priorities:

1. Maintain and selectively invest in improving the quality and effectiveness of LEA's ongoing education, outreach and advocacy programs,
2. Align philanthropy with LEA's mission to ensure the long-term financial stability of the Association,
3. Build-out the Maine Lake Science Center as a leading center-of-excellence for applied research and data analysis focused on pro-

tecting and enhancing Maine's lake water quality and related watershed health,

4. Heighten the visibility and public awareness of the Maine Lake Science Center as an integral part of LEA and leverage it to help increase the effectiveness of LEA's fundraising efforts, and

5. Ensure, to the maximum degree applicable, that the Maine Lake Science Center's applied research and data analysis work anticipates, supports and helps reinforce LEA's education, advocacy and outreach programs.

Embedded in these priorities are ongoing service efforts to eradicate milfoil, continued monitoring to detect the potential for harmful algae blooms, and expanded programs to educate communities and the public about best practices for protecting and preserving high water quality throughout our lakes and watersheds.

Under the leadership of our new Executive Director, Colin Holme, with the incredible efforts of our hard-working staff and volunteers, and with the invaluable support of our membership, the Lakes Environmental Association will pursue these priorities and continue to fulfill its critical mission.

Orrin Shane, LEA Board President

Lake Courses

Continued from Page 1

For those interested in playing with and building electronic sensors, we are offering a *Build Your Own Sensors* course on setting up and using inexpensive *Arduino*



and *Raspberry Pi* kits. These new customizable and miniature kits are extremely popular because of their wide versatility. They can be used to simplify routine tasks around the home or automate environmental data collection in harsh conditions. This course will be led by Saint Joseph's College professor and technology sage, Dr. Ryan Dorland. **August 8th, 8am-noon**

Lastly, we have a *Northeastern Aquatic Plants* course where participants will study unique plant adaptations and learn how to identify invasive species. After a classroom session at the Maine Lake Science Center, students will go to a nearby lake for identification in the field using canoes and kayaks. The day will end with a visit to LEA's dive crew removing invasive milfoil. Participants will leave this fun day with a renewed and contagious excitement for lake exploration. The class will be taught by LEA's aquatic plant gurus Christian Oren and Mary Jewett. **August 16th, 8am-3pm**



These courses are an excellent way to explore a career in the environmental sciences, a great addition to a college application or resume, and a fun way for anyone to learn about the lake they live on. For more information or to sign up, please go to www.mainelakes.org/courses/. Scholarships are available for those who qualify.



Getting Information on Your Lake or Pond



In the last two years, LEA has been working hard to revamp our water quality reports for our members and the general public. Because we realize collecting information alone will never help our lakes withstand the impacts of watershed development and erosion, we have been putting more emphasis on interpreting and translating our results into a form that anyone can read and understand. While we don't have the resources to send out complete reports every year to our members, they are available online. We also distribute custom summaries to the lake associations we partner with and local municipal leaders.

This past year, we made some new changes including breaking the report up into different chapters, which will allow readers to focus on the topics that most interest them or are specific to their favorite lake.

The first chapter is an overview of the results from our traditional monitoring program that we have been doing for decades on the lakes in our service area. Anyone can look at this section, find their lake, and see recent water quality conditions and any long term trends. The second chapter is dedicated to our automated monitoring buoys on Highland and Long Lakes. While these buoys are only on two lakes, we often look at the live data coming in from these buoys to help us understand what is going on in other lakes during the monitoring season. The third chapter relates to *Gloeotrichia*, which is a type of blue green algae (cyanobacteria) that we have been monitoring on many of our lakes for the past 5 years. The fourth chapter discusses the results of our in-lake temperature monitoring program. These sensor chains are on over a dozen lakes in our area and the data paints a picture of how the lake stratifies during the warmer months. The final chapter discusses our baseline algae monitoring work that we have undertaken with the help of local associations on ten lakes. The reports are filled with graphics and clear explanations and are available on our website at www.mainelakes.org/water-testing-report/. If this still sounds complicated, check out our individual lake pages at www.mainelakes.org/lake-information/. These pages give a basic summary of last year's water quality results and general information about each lake.

Annual Meeting August 22nd



The LEA Annual Meeting will be August 22nd at Camp Fernwood Cove in Waterford. Come learn about all the work LEA is doing to protect this region's lakes. Hope to see you there!

Maine Lake Science Center Pinehaven Trail



Did you know you can explore the woods around the Center on a beautiful loop trail? The Pinehaven Trail connects to Pondicherry Park and weaves through old pastureland and a lowland forested swamp along the Bradburian boardwalk (don't step on any butterflies!). Mary Maxwell and Roy Lambert provided funding to develop low ropes course elements and interpretive signs along the trail and we will have a celebration this summer for the trail re-opening ceremony! Stay tuned and hope to see you in the woods!

Naples Proposes Dock Inspection for Invasives

At the June town meeting, Naples residents will vote on an ordinance that requires annual inspection of significant docking facilities and private boat launches for invasive plants. After finding large patches of variable leaf milfoil in private marinas on Long Lake last year, the Naples Select Board requested that LEA develop an ordinance to require regular inspection of all large dock facilities and private launch sites. The two-page ordinance defines significant docking facilities as those that have four or more motor boats. Inspections can be done by owners or staff of these facilities as long as they have adequate training, outsourced to a qualified entity, or done by trained volunteers. As written, the ordinance applies to Long Lake and Brandy Pond. If these regulations are approved and work, we hope to have other towns in the area adopt similar rules which will help deter the spread of invasive aquatics through prevention and early detection.



Dense milfoil growth found in Mast Cove on Long Lake in Naples last summer.

Paddle Battle II

Register Today!

We had so much fun last year that we have decided to do it again! The second annual Maine Lakes Paddle Battle will be held at beautiful Tarry-A-While resort on Highland Lake July 7th and will feature the best flatwater paddle board racing in the State.

Again, we have partnered with generous sponsors to auction off paddle boards and lots of cool goodies for outdoor and water enthusiasts.

The race starts in a protected cove on the east side of the lake and then paddlers skirt up along the eastern shore, past picturesque islands and then either turn back for the 2k course or continue on to the tip of Knolls Point for the 5k course.

While race times are being tallied by volunteers from the Shawnee Peak race team, we will have music, water testing demonstrations, and a fun kids' race in the cove.

The venue opens at 8 am and races will begin by 9:30 am. Awards will be announced by noon or earlier. The 2k and 5k races are open to participants at least 15 years old. Race registration is \$55 and will be open until 12 pm July 6th. To find out more about the event or register, check out www.mainelakes.org.

All proceeds from the race will benefit LEA's lake protection and education programs.



Paddle Battle 2018

When: July 7th, 8 am to noon

Where: Tarry-A-While Resort on Highland Lake, Bridgton

What: 2k and 5k flatwater paddle board races

How to sign up:

www.mainelakes.org/educationevents/paddle-battle/

Volunteers surveying for invasive plants on Woods Pond



LEA Starts Volunteer Invasive Plant Patrol

Last summer's discovery of milfoil on Long Lake has sparked concern in the region and a desire to promote earlier milfoil identification on area lakes. Early detection of any infestation allows for quicker and more efficient remediation, thereby minimizing the risk of the milfoil spreading throughout the lake or contaminating other lakes.

A volunteer Invasive Plant Patrol, or IPP, is the most practical way for us to expand our current identification and remediation efforts. IPP is a state-wide, volunteer program in which community members lead surveys for invasive aquatic plants by swimming or paddling. The program is a great way to get out on the water while actively protecting the lakes you love! IPP volunteers will survey boat ramps and marinas in the LEA region, focusing on high-risk areas. For this program to be successful, LEA needs volunteers to help with this area-wide effort.

This summer LEA will offer an invasive plant workshop and plant paddles for persons interested in learning more about identifying invasive plants. The workshop, led by the Lake Stewards of Maine, will be held on August 2nd at the LEA Maine Lake Science Center. This workshop consists of an in-depth discussion of aquatic plants and how to identify them. The plant paddles are led by experienced individuals and no previous experience is required. All events are free to the public. Paddles will be conducted during the summer season (see dates on the Events Calendar on page 7 of this newsletter). Please consider joining in this effort. Individuals and Lake Associations interested in learning more about the LEA IPP should contact Christian Oren at LEA or Mary Maxwell, LEA's IPP volunteer coordinator:

Christian Oren: 207-647-8580

christian@leamaine.org

Mary Maxwell: 503-515-7946

mary.maxwell85@gmail.com

A Busy Year for LEA's Milfoil Program

LEA's milfoil crew will be very busy this summer, and not only in Long Lake. Brandy Pond, the Songo River, and Sebago Lake all need to be surveyed and managed to prevent infestations from returning to these waters. Brandy Pond and the Songo River have been under control for the past few years, meaning there is very low milfoil density. Native plants dominate these waters. However, fragments from Sebago or Long Lake may drift in and start new patches which must be removed before they spread. The milfoil team is well equipped to manage this task, but with the addition of Long Lake, resources are being stretched. Moreover, LEA is actively battling one of the worst milfoil infestations in the state in Sebago Cove.

LEA adopted Sebago Cove two years ago, and we have been steadily making progress in the area ever since. The Cove is a difficult area because it is shallow and muddy - perfect habitat for milfoil. The invader grows from shore to shore, and there are dozens of boats that are chopping the plants up every week. It is a challenge to remove the vast acres of plants and prevent the fragments from re-rooting in areas we have cleared. Last summer also saw another setback as the crew was diverted to Long Lake to deal with the new infestation. This summer we have hired more divers to better handle the large areas we are covering now. It is a challenge, but the milfoil crew has never shied away from a challenge before. This effort relies on support from the local community. We need donations and volunteers to keep these programs running. Email christian@leamaine.org to volunteer to survey for milfoil, or donate directly to the milfoil program to show your support.

LEA Milfoil crew member Tommy Chagrasulis. The entire crew will be hard at work this summer addressing infestations at several sites and surveying previously cleared sites for re-growth.



Eco-Explorers!



At LEA we try to vary our outreach to many different groups of people. This summer we will be offering a fun outdoor experience for kids ages 7-11. Eco-Explorers will spend two days at the Maine Lake Science Center exploring the trails around the center and throughout Pondicherry Park. After a day of rest, kids will meet up again, this time at the beautiful Holt Pond Preserve. Holt Pond offers a variety of different ecosystems and trails to explore. There are two sessions of Eco-Explorers available. Here are the details:

Session one – Week beginning July 23

Session two – Week beginning August 6

Monday & Tuesday of each week will be spent at the MLSC

Thursday & Friday will be spent at the Holt Pond Preserve

Parents are expected to drop off their child at 8:30 am each day and pick them up at 3 pm.

Cost is \$150 for LEA members and \$175 for non-members. Scholarships and payment plans may be available.

Deadline for applications is June 22nd. Visit our website mainelakes.org or contact Mary for an application: mary@leamaine.org.

A Grant from the Sustainable Forestry Initiative



**SUSTAINABLE
FORESTRY
INITIATIVE**

We have received funding from the Sustainable Forestry Initiative to develop workshops for landowners, policy makers, foresters, and forestry professionals to share knowledge about best management practices and whole watershed thinking. Whether you are a logger or a landowner of a woodlot - small or large - we will be hosting a number of informational workshops on ideas about how to best manage your land for the future. We are excited to work with our partners, including the Portland Water District, the Maine Forest Service, Maine SFI Implementation Committee, Maine Project Learning Tree, and the Maine Forest Products Council on a number of fronts - one of which includes developing the Highland Research Forest. We appreciate this opportunity and stay tuned for more to come!



The Highland Lake Preserve is now the Highland Research Forest!

LEA received this 325-acre parcel on Highland Lake from the Carol and David Hancock Charitable Trust in 2016. This year, we plan to build trails, a parking area, and other amenities to facilitate enjoyment by the public. The site will also be used for various research and demonstration projects relating to sustainable forestry, forest ecology, and water quality.

LEA Trail Days



Do you want to help make our community better? Well-maintained public trails are one of the great advantages of living in this area as they allow us all to immerse ourselves in the outdoors while getting some exercise! But like everything good, trails need attention and love. LEA currently maintains trails at the Holt Pond Preserve, the Maine Lake Science Center, along Stevens Brook in Bridgton, and we are in the process of creating a new trail system at our Highland Research Forest. If you are interested in helping revitalize our trails at any of these locations, we would love to have your assistance! LEA staff will be meeting at our main office at 8:30 am on **June 15th, July 17th and September 14th** to lead this communal and fun effort. Hope you can make it!

Natural Resource Series

2018 Public Education Programs

For more information on any event, please contact alanna@leamaine.org.

Please note that some events require pre-registration.

All our events are announced on our website and Facebook page (including new pop-up events!)

For the most current information please like us on Facebook!

June

June 2, Sat., 7 pm. The Importance of Spending Time Outside with Your Kids: parent presentation at Spaulding Memorial Library in Sebago. For more info contact alanna@leamaine.org

June 7, Thurs., 10- 1, Reptile and Amphibian walk with State Biologist Derek Yorks, MLSC, free for LEA members, \$5 non-members. Register with alanna@leamaine.org

June 12, Tues., 1-3pm, The Incredible World of Algae! At MLSC. Register with alanna@leamaine.org

June 15, Fri., 8:30 am, Volunteer Trail Cleanup Day - come one come all!

June 18, Mon., 4 pm. Sebago Family Nature Club walk, meet at Spaulding Memorial Library

June 20, Wed., 9-2, GLLT and LEA hike and paddle, 5 Kezars, bring your own boat and sturdy hiking shoes for this joint venture!

June 21, Thurs., 11 am, Family Nature Club picnic, meet at Holt Pond Preserve

June 21, Thurs., 5:30 pm, Celebration of Peter Lowell's career at Bear Mountain Inn, Waterford. Tickets required. FMI: mainelakes.org

June 26, Tues., 6-7:30 pm, The Black Ghost black bear presentation with biologist Deb Perkins. Members \$5, Non-members \$10. Please register with alanna@leamaine.org

July

July 2, Mon., 4 pm. Sebago Family Nature Club walk, meet at Spaulding Memorial Library.

July 6, Fri. 9 am, Orchid Walk at Holt Pond, Caplan Family Environmental Educational Fund event, Register with mary@leamaine.org

July 7, Sat., Paddle Battle! Register early at mainelakes.org!!

July 12, Thurs., 6 pm, Loon Presentation with Maine Audubon Biologist Susan Gallo. Free for members, \$5 nonmembers, register with alanna@leamaine.org. MLSC

July 17, Tues., 8:30 am, Volunteer Trail Cleanup Day

July 19, Thurs., 2 pm, Family Nature Club, meet at Holt Pond Preserve

July 23, 24, 26, 27. Eco-Explorers Kids Camp at the MLSC and Holt Pond. Registration required, contact mary@leamaine.org (see box on page 6)

July 24, Tues., Invasive Plant Patrol Paddle on Woods Pond

July 30, Mon., 4 pm. Sebago Family Nature Club walk, meet at Spaulding Memorial Library

July 30, 31, and August 1, Lake, Pond and Stream ecology course, more information at mainelakes.org (see cover story)

Nature Club for Families: We are all busy, but what if there was one thing that we could do for our kids (and us!) that would make all that craziness a little better? There is! Go outside together! Spending time outside builds important bonds, creates lasting memories, exercises our senses and our muscles, and gets us ALL away from our screens for a little while! There is so much to discover outside! Look for "Family Nature Club" events scheduled throughout the summer. This year, with the help of the Outdoor Foundation and BOGS boots, we have several pairs of BOGS boots in a variety of sizes to loan for use on LEA outings, so that anyone who participates will be able to explore comfortably, whether they are kids or adults! FMI contact alanna@leamaine.org.

BOGS

August

August 2, Thurs., 9-3, Volunteer Lake Monitoring workshop on Invasive Aquatic Plants at MLSC. Registration required: mainevlmp.org/invasive-plant-patrol-workshops

August 3, Fri., 1-3 pm Chewonki Bug Mobile and bug catching in Pondicherry. Members \$5, nonmembers \$10. Registration required, please contact alanna@leamaine.org. Caplan Family Environmental Education Fund Event.

August 6, 7, 9, 10. Eco Explorers Day camp at MLSC and Holt Pond. Registration required, contact mary@leamaine.org (see box, page 6)

August 8, Wed., 8-12, Build your own monitoring sensor! For more information and to register, visit mainelakes.org (also see cover story)

August 13, Mon., 9-2, Teacher workshop at MLSC: Macroinvertebrate Bioassessment for the classroom! Pre-register: alanna@leamaine.org

August 13, Mon., 4 pm, Sebago Family Nature Club walk, meet at Spaulding Memorial Library.

August 14, Tues., 2-4 pm, Holt Pond Walk

August 15, Wed., 2 pm, Family Nature Club, meet at Bald Pate Preserve

August 16, Thurs., Northeast Aquatic Plants: plant ID and field survey workshop at MLSC. Registration required, please contact mary@leamaine.org (also see cover story)

August 27, Mon., 4 pm, Sebago Family Nature Club walk, meet at Spaulding Memorial Library

August 28, Tues., Invasive Plant Patrol Paddle on Highland Lake



September

September 12, Wed., 2 pm, Family Nature Club, Meet at the Bob Dunning Bridge

September 14, Fri., 8:30 am, Volunteer Trail Day

September 26, Wed., 10 am, Great Maine Outdoors Week hike at LEA's Highland Research Forest. Register with alanna@leamaine.org

How Do Watersheds Affect Water Quality?

Simply put, the watershed is the area of land that surrounds and drains into a waterbody. Watersheds as a concept can be confusing, since a given point on the map is often part of multiple watersheds. For example, the Sebago Lake watershed is made up of the watersheds of numerous smaller lakes and ponds as well as the Crooked River. The simplest way to delineate a watershed's boundary is by looking at a topographical map and studying the streams and contours. If you were to draw a line around all the surrounding high ridges, that would be the edge of the lake's watershed.



As an organization dedicated to lake protection, we are interested in the characteristics of watersheds because they have a big impact on water quality. In fact, the watershed is one of the most important determinants of water quality in Maine lakes. The size, slope, soils, geology, and land cover of the watershed all influence fundamental lake processes.

In general, larger watersheds have higher potential for poor water quality than smaller watersheds. This is because there is more area being drained and more potential for pollution. However, size alone tends to be less important than what is actually happening on the land within the watershed. The slope of the land also plays an important role. Steep slopes are more prone to erosion, which is a main cause of water quality degradation.

Watershed soils and geology are perhaps second only to human influences in their effect on wa-

ter quality. These two factors represent the literal foundation on which lakes sit, so they are responsible for many of the physical and chemical characteristics within the lake. The pH is ultimately determined by the underlying geology – for example, limestone bedrock tends to produce slightly alkaline waters whereas granite (which forms the bedrock of the Lakes Region) causes lake waters to be slightly acidic. Soils may contain different amounts of elements that can influence lake processes such as silicon, carbon, phosphorus, iron, and aluminum. The types of soil present can also influence groundwater movement and susceptibility to erosion.

Most watershed characteristics are largely unchangeable, but one part of the watershed that is often highly altered is land use. This makes what is happening on the land a key determinant of water quality in many lake systems. Much of the land within the Lakes Region was originally (and

still is) forested. Beginning in the mid-18th century, settlers came to the area and began clearing land for agriculture and logging. Over time, our forestland has increasingly been fragmented by roads, driveways and developed areas that reduce filtering capacity and deliver stormwater directly to our lakes. Research has shown that when more than 20% of a watershed is developed, there is a noticeable decline in water quality.

Another important threshold to monitor is the amount of impervious surfaces in a watershed. Water quality declines when between 6 and 10% of the land within a watershed is impervious (unable to let water pass through). Roads (including gravel roads), rooftops, and parking lots are all considered impervious surfaces. These studies were the reason behind the impervious area and developed area thresholds that are incorporated into Maine Shoreland Zoning regulations.

LEA works hard to prevent human activities from affecting our lakes. We work with landowners to prevent erosion on shorefront property, procure funding for watershed surveys and site remediation, are a source of knowledge and advocacy of shoreland zoning laws, and are involved in larger development review. Our work aims to give voice to these important resources that support our communities so that they can continue to do so for generations to come.

Making Waves: Boating Tips to Keep our Lakes Blue

Like everything else, recreational boating has evolved much over the years. Power boats have grown in size and average horsepower has increased greatly. At the same time, cleaner, quieter four-strokes have been replacing the smoky two-stroke outboards that used to ply our waters.

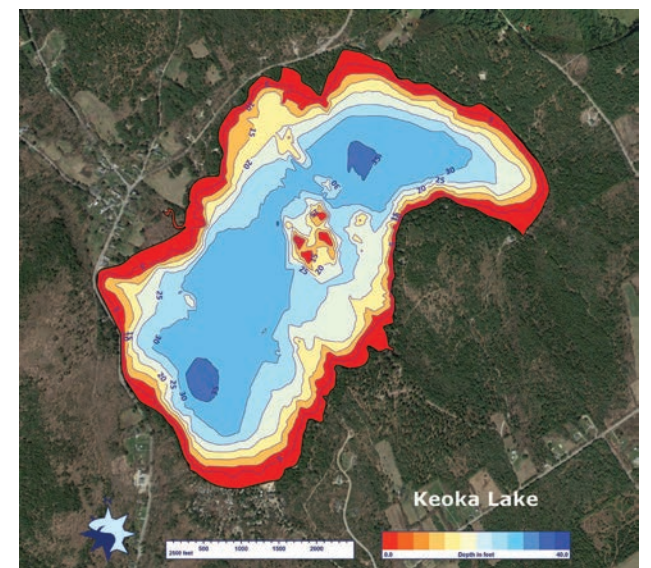
One recent trend has been the growth of wake surfing. This sport involves driving at low speed in a boat that creates a large enough standing wave to surf on continuously without being pulled by a rope. While this is an amazing sport, just like other boating activities, there can be negative impacts if it is done without regard to the environment.

One of the environmental issues with boating, whether for wake surfing or not, is the turbulence caused by propulsion, particularly from propellers. Past studies have shown that this disturbance can go down at least 10 feet. This allows previously settled sediments and nutrients to be re-suspended into the water column, clouding up the water and providing a source of nutrients for algae. Wake boats often take on water ballast which allows them to sit lower and create bigger waves. This means that these boats can generate turbulence deeper into the water

column and their props pose an increased risk of chopping up and spreading both native and invasive plants. Another common complaint is that the large waves created by these boats crash upon the shore and erode the bank. Finally, and often overlooked, is the fact that lake water used for ballast is creating a new vector for spreading noxious invaders like Zebra and Quagga Mussels or the Spiny Water Flea. The young of these species are nearly invisible to the naked eye and can remain alive for weeks in ballast tanks even after the water has been emptied.

A simple and effective way to minimize sediment resuspension from boat propellers and reduce shoreline erosion is to observe the existing no-wake rule within 200 feet of shore. In most cases, this will put you into deep enough water. However, on lakes with extensive shallow areas, a good depth map is also needed. Staying out of shallow areas also greatly reduces the chance of spreading invasive aquatic plants within the lake and from waterbody to waterbody. Using the new depth data that we are acquiring with volunteer surveyors, LEA hopes to produce maps that clearly show deep water areas more suitable to power boating.

Preventing invasives from hitching a ride in ballast tanks requires completely draining these systems and sterilizing them before moving from one waterbody to another. Because these systems are becoming more commonplace, LEA and the State of Maine have adopted the new boat inspection motto: “Clean, Drain, Dry” and are asking Courtesy Boat Inspectors to inquire about ballast tanks when doing routine checks.



Depth map emphasizing shallow areas (red) where boating can adversely affect water quality

What is Lake Stratification?

You may remember from high school science classes that water has several properties that make it unique. These properties, like density and heat capacity, make life within lakes possible and also help explain how lakes are structured.

An important characteristic of a lake is whether or not it mixes, and how often it fully mixes. Most of the deeper lakes in this region of the world are “dimictic” – they mix twice per year, usually in the spring and fall. In the winter ice cover prevents mixing and in the summer a temperature gradient prevents mixing. This temperature gradient is also known as stratification, or the separation of a lake into distinct layers.

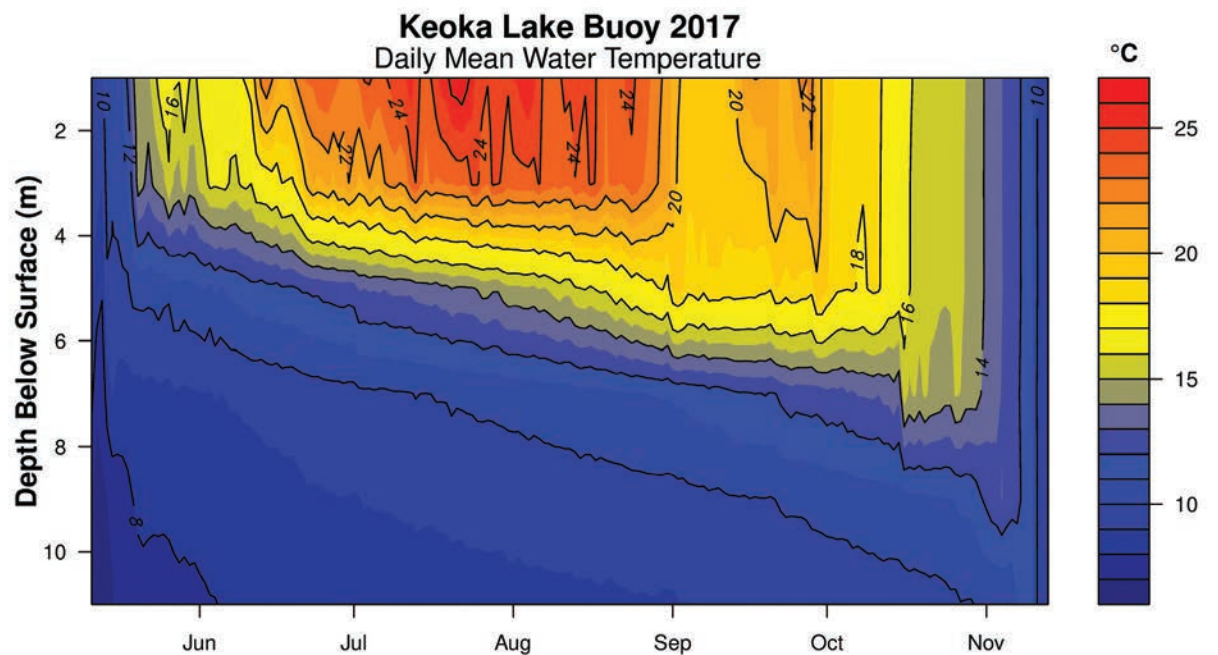
There are three layers in most stratified lakes: The epilimnion, the metalimnion, and the hypolimnion. The epilimnion is the top layer, which comprises most of the sunlit waters of the lake and is well mixed by the wind circulating the water and blending in air. The metalimnion contains the thermocline (though these two terms are interchangeable), which is a zone of rapidly changing temperature and density that separates the epilimnion from the hypolimnion. Finally, the hypolimnion is the bottom layer of water, which is generally dark and cold throughout the year.

Lake Fun for Everyone! by Peter Lowell

My family has roots on Highland Lake going back to the early 1900s. We do not head to the lake to vegetate or work, except for occasional projects necessary to maintain living conditions. Instead, the emphasis is on fun and especially finding new ways of having fun. The photo to the right is of my grandfather in 1912 off Ingalls Grove on what was probably the first paddleboard – a duplex even! Like many lake families, we have volumes of stories about antics, jokes, stupidity, and occasional risk taking in the quest to discover yet another way to enjoy the clear, blue waters.

The best memories are of simple things, especially those that fed childhood fantasies on a variety of renegade watercraft from pirate ships to hydroplanes. Below the water, snorkeling around islands or even into the swampy end of the lake can fuel great adventures, observations and learning about the watery environment and its creatures. On the land, camping on wooded shores or on deserted islands gets you as close to nature as possible.

In the seventies, things took a turn when motorized fun began to transform with bigger, more powerful, and new types of watercraft.



This heat map of Keoka Lake shows temperature from the top of the lake to the bottom throughout the spring, summer, and fall of 2017. Horizontal contour lines indicate stratified conditions.

The stability (resistance to mixing) and length of stratification are both determined by intrinsic characteristics like the size, shape, depth, and geographical location of the lake as well as factors that change over time like air temperature, occurrence of storms, ice-in and ice-out timing, and seasonal temperature changes.

Because warm water is less dense than cold water, waters at different temperatures tend not to mix. During spring and early summer, warmer air temperatures and strong solar radiation warm the surface of the lake. That heat diffuses and mixes throughout the water column at first, but

Continued on Page 13



The stand-up Kawasaki came on the scene in 1972 and was succeeded in 1988 by the sit-down Bombardier Sea-Doo. The Jet Ski's trajectory as a popular watercraft changed the nature of boating and, some feel, the traditional character of lake sports. Outboard motors went through their own transformation from their roots in the late 1800s. The first 100hp motor was introduced in 1962 and gained in popularity. In 1992, Mercury produced a 225hp and escalated in 2013 with a 1650hp colossus!

Meanwhile, the specialty boating market was burgeoning. Traditional water ski boats were joined by wakeboarding designs and boats designed to throw unprecedented wakes to propel wake surfers. Fishing boats morphed from small outboards to powerful, lightning-fast competitors. The toys we use for lake fun have gone from basic to huge and complicated.

Lake fun has become serious, expensive, and competitive! Those who prefer the “good old days” should probably accept the inevitable new trends, or live out their days in annoyance. Those engaged in the new “fun” must learn to use the lake with respect for others and protect sensitive

environments like bays, shorelines, and nesting sites. It is unlikely that the State of Maine will issue any new regulations given the constraints on enforcement and the popularity of the marine industry, so we need to learn to co-exist and assure that our fun does not ruin the lakes for others.

Here are some tips to encourage co-existence, resource protection, and acting within the law:

- Try to allow others quiet time early and late in the day. Voices and music travel almost unimpeded for long distances over water. Knowing that can save you from embarrassment too.
- Quick take-offs in shallow areas can re-suspend bottom sediments, releasing their nutrients to promote algae growth.
- Wakes are perhaps the greatest threat to fragile shorelines, docks, and even safety. You are legally responsible for your wake's damage and must travel at no-wake speed within 200 feet of the shore unless entering or leaving your dock. The bigger your wake, the further from shore you should be.
- Some fun sports cannot occur where wakes are present (slalom skiing, paddleboarding, and sculling). People fishing can be tossed around as they stand to cast. Be aware of who else is using the lake and give them the respect you would appreciate.
- If you see a loon nest or other aquatic wildlife, give them a wide berth. Get out the telephoto lens and stay well away.

Having fun on the water is a Maine tradition. We can nurture it by remembering that lakes are a fragile, public resource to be enjoyed and protected by us all.

What Makes a Lake Turn Green? by Amanda Pratt and Ben Peierls

The dreaded algae bloom - a thick green scum carpeting the water like astroturf. It's what lake stewards the world over are trying to prevent. But in order to prevent blooms from happening, we need to have an appreciation and understanding of how and why they happen. It starts with the fuel that sparks the rampant growth of algae: nutrients such as phosphorus and nitrogen.

Most lawn fertilizers are made with nitrogen, phosphorus, and potassium because these elements are needed by plants to grow. Bloom-forming algae are basically tiny aquatic plants, so they react to fertilizers in a similar way to land plants. And because they are so small, they are able to grow rapidly as long as they have nutrients (particularly phosphorus).

Nutrients don't just come from fertilizer, although lawn fertilizer can be a major source if it is not carefully applied. In terms of quantity, most of the phosphorus that enters a lake comes from stormwater. In Maine, erosion from roads, driveways, and ditches provide the biggest source of nutrients to our waters. Poorly maintained septic systems can also leach nutrients along with bacteria and pathogens. These are examples of human-induced nutrient loading, but there are plenty of natural sources as well, from natural soil erosion to animal waste. Absent human influence, lakes generally remain in equilibrium with the natural sources of nitrogen and phosphorus they receive. However, human activities can greatly increase nutrient loads, throwing off the delicate balance within the lake.

Imagine a lake watershed that is largely forested, with a few cabins dotting its shoreline. One day, a large stand of trees in the watershed is cut and cleared for development, leaving a swath of bare soil. Soon after, a large rainstorm moves through. The area where the trees were harvested was on a slope, and as the rains wash over the bare ground, soil particles are dislodged and travel down the hill, forming a muddy rivulet that joins a small stream and is deposited directly into the lake.

The tiny soil particles carry phosphorus, some of which is immediately taken up by algae within the lake, while some sinks to the bottom of the lake. This concentrated pulse of phosphorus drives rapid algae growth, unlike natural sources of phosphorus which tend to be more diffuse and are released slowly into the water, which means less phosphorus is available for algae growth at any one time. This can be likened to a blood sugar spike: simple sugars (lawn fertilizers) are going to increase your blood sugar (phosphorus levels) more than complex sugars (decomposing leaves) will.

In freshwater systems the active form of phosphorus - the one algae need to grow - is recycled rapidly and therefore very scarce. This means that any new phosphorus added to the system is taken up very quickly. In fact, we measure phosphorus in parts per billion - that's how little there is in the water. We worry less about nitrogen because, although it is more readily available, it cannot be utilized for growth without sufficient phosphorus present. By limiting phosphorus inputs, we stop algae from getting all the necessary materials needed for growth.

At LEA, we directly and indirectly measure both phosphorus and algae in



Algae Bloom on Lake Taihu, China. Photo courtesy of Dr. Hans Paerl, UNC Chapel Hill

our lakes using several methods. We measure total phosphorus and chlorophyll-a in the upper layer of each lake's water column. Chlorophyll-a is the green pigment in algae. Higher chlorophyll-a concentrations indicate higher levels of algae. We also use a fluorometer to measure chlorophyll fluorescence at discrete depths throughout the water column, which gives us an indicator of where algae are concentrated. While chlorophyll-a and fluorometry are proxies for algae concentration, that is only part of the story. Several local lake associations provide support for LEA to count and identify algae in select lakes. Knowing what kinds of algae are present in lakes over time allows us to assess water quality with a greater level of detail.

Some lakes, despite high nutrient levels, do not experience algae blooms. There are a huge array of factors that can affect how phosphorus impacts a lake ecosystem. The Maine DEP and researchers at the University of Maine in Orono are currently working on a Lake Vulnerability Index to try to rank lakes that are most at risk of algae blooms. Factors that affect lake vulnerability include lake area and volume, watershed area, watershed land use, lake sediment chemistry, dissolved organic carbon levels, stratification patterns, and flushing rate.

LEA staff are staying informed about the Vulnerability Index, especially as it can be applied to lakes in our service area. Along with our continuing testing and advanced data collection, the Index will provide insights into which of our lakes are most at risk of "turning green" and what we can do about it.

Prescription for Blooming Lakes

We are fortunate to have good water quality in the Lakes Region. For many lakes across the world, algae blooms are a disaster for health, aesthetics, and recreation. Treatments are often expensive and do not fully resolve algae problems. The table below shows options for treating lakes that experience significant algal blooms. Some treatments try to remove or reduce the algae directly, while others address the root cause of the problem by controlling or removing phosphorus (P) inputs from the watershed or sediments. Some treatments are not designed to restore a lake to a clear state, but may help to prevent problems in the first place.

Duration: short: <1 month; medium: 1 season/year; long: multiple seasons/years
Application: rare: lasts many years; occasional: < once/year; seasonal: once/season; frequent: once or more per season; continuous: continuous application required
Cost: \$: ≤ \$500/acre/year; \$\$: \$500-1000/acre/year; \$\$\$: ≥ \$1000/acre/year

Treatment	Description	Duration/ Application	Cost	Effectiveness
Algaecides	Chemicals that kill algae (copper or hydrogen peroxide)	short/frequent-seasonal	\$-\$\$	Works
Artificial circulation	Bubblers or circulators that extend circulation depth or duration	short/continuous	\$\$-\$\$\$	Works (if applied critically)
Biomanipulation	Alterations of food chain to increase grazing of algae	medium/occasional	\$-\$\$\$	May work (beware)
Drawdown	Draining water for extended periods to expose sediments	medium/occasional	\$-\$\$\$	May work (beware)
Dredging	Removal of nutrient-enriched lake sediments	long/rare	\$\$\$	Probably works
Microbes and Enzymes	Bacteria or chemicals that can control algae/nutrients	N/A	N/A	Not recommended (lack of studies)
Oxygenation	Adding oxygen to deep water	short/continuous	\$\$-\$\$\$	Works
Public education	Outreach to stakeholders	N/A	N/A	Combine with other methods
Watershed management (prevention)	Prevention of development through purchase or easement	long/occasional	\$\$\$	Works if large enough area
Watershed management (BMP)	Reducing phosphorus inputs through erosion and runoff control	N/A	N/A	Unlikely to work as sole treatment
Watershed management (end of pipe)	Capture and treat phosphorus in runoff	long/continuous	\$\$-\$\$\$	Probably works
Phosphorus precipitants (aluminum)	Compounds like alum which remove excess phosphorus	variable/variable	\$-\$\$	Works
Phosphorus precipitants (calcium & iron)	Other metal salts to precipitate excess phosphorus	variable/variable	\$-\$\$	Probably works
Phosphorus precipitants (lanthanum, mixes)	Other compounds to precipitate phosphorus	N/A	N/A	Not recommended (lack of studies)

Based on "Lake Management Best Practices: Managing Algae Problems" by Dick Osgood and Harry Gibbons (2017, www.LakeAdvocates.org).

Unusual Lake Sightings by Alyson Smith and Amanda Pratt

What is that in the water?

Did you ever think that seeing gelatinous blobs would be a good thing? Slimy freshwater sponges and bryozoans are fascinating creatures that are sensitive to pollutants, so their presence can indicate high water quality.



Freshwater sponge
photo courtesy of Barry Denofrio

Freshwater sponges are non-moving organisms that live at the bottom of water bodies. They are invertebrates and do not have organs, but instead have specialized cells that help them filter water for food. Freshwater sponges grow on sturdy submerged objects in clean streams, lakes, and rivers. They obtain food from the flow of water through their bodies and from a mutually beneficial relationship with algae.



Bryozoan

Bryozoans are gelatinous creatures that live together in colonies that resemble amphibian egg masses. Bryozoans appear in late summer and are usually about the size of a football or smaller. They can be found in the shallow parts of lakes, ponds, rivers, and streams and attach themselves to sticks, mooring lines, or dock posts. Individual “zooids” feed by filtering algae and tiny creatures from the water.

The **American eel** is a catadromous fish, which means it spends most of its life in freshwater but migrates to the ocean to reproduce. Sexually immature adult “yellow” eels live in lakes and rivers and, after anywhere from three to twenty years, migrate downstream in the fall as “silver” eels to spawn in the ocean. The adults die, and eventually the juveniles, known as glass eels or elvers, find their way into rivers along the Atlantic coast. These eels can remain out of the water for long periods of



5 ft. American Eel caught in Highland Lake. Photo courtesy of Unc’L Lunkers.

time, which is an adaptation that allows them to slither around dams and other obstacles during their long journey.

Carnivorous plants? We have them! The **Northern Pitcher Plant** and **Common Sundew** inhabit nutritionally poor environments, such as the wetlands surrounding lakes and have resorted to capturing, killing, and consuming insects for extra nutrients. These plants usually grow in full sun on moist mats of sphagnum moss.



Common Sundew

Sundews have red, green, and yellow leaves with tiny tentacles that have a sticky substance on the tips, which look like water droplets. Once the insect lands on the tentacle, it is trapped. After the prey is trapped, it triggers the leaf to curl up, and the enzymes in the sticky goo begin the digestive process.



Bladderwort flowering in a bed of pitcher plants

Pitcher plants have modified (pitcher shaped) leaves filled with a liquid that breaks down and digests insects. The inner surface is covered with downward-pointing hairs, which make it difficult for prey to crawl out.



Bladderwort

Bladderwort is another carnivorous plant found in Maine that is free floating and often mistaken for invasive milfoil. It gets its name from the small clear bladders that are found all over the plant. These tiny sacs suck in unsuspecting zooplankton and digest them to augment photosynthesis.



Foam

We often get calls about **foam**, which is created when organic compounds found naturally in the water are mixed by wind and currents, causing bubbles to form. Large quantities of foam are found on windward shores, in coves, and in eddies. Natural foam has a somewhat earthy or fishy aroma. Detergent foam, in contrast, will have a noticeable perfume smell.



Ruppia Ball

Ruppia balls are generally round to oval in shape and can vary greatly in size, from only a few to several inches in diameter. These fascinating objects are formed from dead plant material and wave action, which causes thin plant stems to interweave themselves into a tight mass. They are named after a common plant that is known to form these aggregations, *Ruppia maritima*, or widgeon grass. They have been found on the shores of several lakes in the area. You can see one for yourself at LEA’s main office!

Many people don’t believe **freshwater jellyfish** (*Craspedacusta sowerbii*) exist until they see them with their own eyes. These half dollar-sized creatures appear from seemingly nowhere in the late summer and early fall, then disappear as quickly as they came. Not much is known about these mysterious jellies and why they appear in some lakes and not others. They don’t produce a noticeable sting and do not pose a danger to swimmers. They have been seen in Island Pond, Granger Pond, and Cold Rain Pond, among others in LEA’s service area.

So, keep your eyes peeled, and look for unusual Maine phenomena during your water adventures and **if you see something unusual, please send us a photo and note** and we might feature it in our next newsletter!



Freshwater Jellyfish

The Shape of Our Lakes by Ben Peierls and Alyson Smith

Some say size matters. We do too, but only when it comes to lakes. Shape matters as well and the combination of the two helps scientists understand and predict the response of lakes to natural and human-based stressors.

For instance, shallow lakes can have a lot of areas with enough light to support aquatic plants, which is important to know when looking for invasive species. Big lakes with deep water are more likely to periodically lose all bottom-water oxygen, thus promoting phosphorus release from the sediments, fueling algae growth. Nutrients can be flushed out of lakes, but it usually takes longer in bigger lakes. Lakes with lots of open water are more likely to be mixed by the wind, affecting the layers within the lake.

Asked to describe a lake's size and shape, some might use terms like wide or narrow, shallow or deep, regular or irregular shoreline. But to be more quantitative, size and shape is best described and measured using metrics like length, width, surface area, shoreline length, volume, and depth, particularly changes in depth over distance. With the advent of digital maps and geographic information systems (GIS), many of these parameters can be easily calculated. Volume estimates, however, still depend on accurate and extensive depth measurements, which are still lacking for many lakes.

In response to this need and with support from the Maine Community Foundation and numerous volunteers, we began a project last year to collect high-resolution depth data and create detailed bathymetric (or subsurface topographic) maps of lakes in our service area. The funding al-

lowed us to purchase three GPS-equipped, portable sonar devices (masquerading as fish finders) and software for converting the data into maps.

We also were able to hire an intern to collect data and work with volunteers last summer. Seven lakes were completely surveyed (Adams Pond, Bear Pond, Crystal Lake, Keoka Lake, Keyes Pond, Peabody Pond, and Woods Pond) and two others (Long Lake and Moose Pond) were partially surveyed. Over the winter, we have been busy finding the best way to turn the depth information into usable maps and accurate, reproducible volume estimates. We are collaborating with Maine DEP and others on best practices for this methodology. The raw data and resulting shape and size metrics will be invaluable for understanding how each lake functions and for predicting which lakes are more vulnerable to changes in water quality.

We recently received additional support from the Deering Fund of the Maine Community Foundation, and intern Jake Moulton is returning to work on the project. Our goal is to complete surveys on Long Lake and Moose Pond and to acquire data on 11 more lakes. We hope to engage more volunteers this summer. We also plan to have early season trainings for citizen scientists to conduct surveys on their home lakes using the sonar units.

If you are interested in helping acquire this data, please let us know by calling the Maine Lake Science Center at (207) 647-3318 or emailing alyson@leamaine.org. Getting depth data does not require a long time commitment and is easy, fun and rewarding.



Ava LaBarge releases a trout fry into the Songo River

School Trout Release

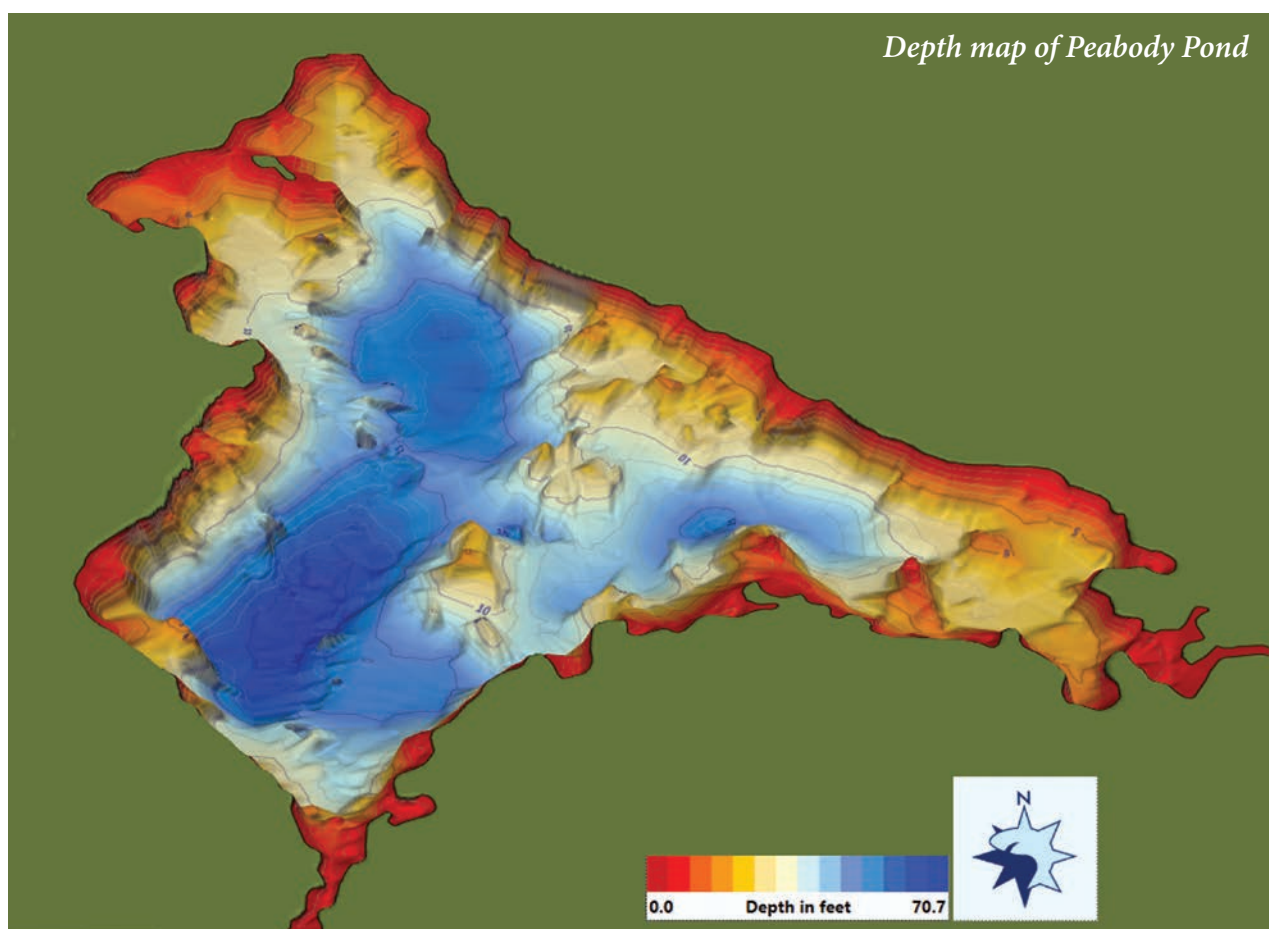
At the end of April, 6th graders from Lake Region Middle School released about 900 baby brook trout into the Songo River. In January they received eggs from the fish hatchery in Casco, which is run by the Department of Inland Fisheries and Wildlife. The release is part of a state-wide program that LEA helps to facilitate. Students learn about the importance of trout to the ecosystem and what kind of threats they face, as well as why we want to help by raising them from egg to fry in the safety of a tank.

Students went through three different stations to help them determine if the Songo River is a healthy place to release their fish. At the three stations students collected different types of data. Water quality data, namely dissolved oxygen, turbidity, pH, and temperature were collected. A qualitative assessment was made by observing the banks of the river and looking at human impacts. The last station was an assessment of the aquatic insects living in the river. Some insects are more sensitive to pollution than others. The presence of mayflies and caddisflies confirmed that the water was free of pollution.

The stations were run by a combination of LEA staff and volunteers. At the end of the activities all the students decided that the river was a good place to release the trout. Realistically, most of the trout won't make it to adulthood. Predation from bigger fish and other carnivores keeps the population down. The students are aware of the problems facing the fish they have raised, and they feel good knowing that they were able to help them through their vulnerable egg stage.



LEA educator Mary Jewett with a group of 6th graders



Call for LEA Board Members

The Lakes Environmental Association is governed by a Board of Directors responsible for setting policy, planning for the future, and ensuring the financial soundness of the Association.

If you are interested in serving on the Board, or if you would like to recommend someone for a Board position, please contact Anne Wold at binkawold@gmail.com. Interested individuals will be contacted for additional information,

given an overview of LEA programs, introduced to staff, and interviewed.

Our goal is to attract qualified candidates with a variety of skills, expertise, and backgrounds. To achieve this goal, we need your help!

Less Loved Lake Wildlife by Mary Jewett

What is the most beloved animal associated with lakes? Loons, right? Loons are gorgeous and captivating, but hundreds of articles have been written about them. Instead, I would like to spotlight some well-known, but less loved species.

What is the most reviled animal associated with lakes? We could take a poll, but I already know most people will say leeches. These blood sucking creatures play a part in the ecosystem just like all aquatic bugs. They provide food for fish, turtles, larger insects, ducks and, interestingly, loons. Despite the fear some people have of leeches, they are relatively harmless to humans. Many people might take objection to that statement, but one leech doesn't have the capacity to suck enough blood to injure a person. A small fish or dragonfly larva is a different story though. Leeches are both an important predator and prey species in the lake ecosystem. Swimming in clear, rocky or sandy areas can help you avoid leeches, since they like to hang out in the muck as protec-



Male Mallard Duck

tion from predators. Having leeches in your lake is not a reason to stay out of the water. But do keep some salt handy just in case.

Who hates duck itch? If you don't know what it is, duck itch (or swimmer's itch) is a rash that can develop after swimming in an area with a lot of waterfowl. The itch is caused by a parasite that lives inside ducks and other waterfowl. Just like the leech bite, duck itch is mostly harmless. It can be very uncomfortable but the parasites can't live in humans so they die after first contact. Still, that's not a great comfort when you are covered in an itchy rash. There are a few of solutions to this problem. 1. Don't swim in an area with a lot of ducks and 2. If you do swim in an area with waterfowl present, briskly rub your skin down with a towel after swimming. This will remove the parasites before they dig in and form a rash. 3. Don't feed ducks. One of the reasons ducks congregate in large numbers, especially at beaches, is because people feed them. Foods people commonly feed to ducks, such as bread, are actually very bad for them. Do yourself and the ducks a favor by letting them forage for their own food. Mallard ducks are the most common and visible duck species that we have in Maine. They are beautiful and also play a role in the ecosystem. They eat aquatic insects (like leeches) and provide food for larger predators like foxes, raccoons, and our next unloved species, the snapping turtle.

While seeing a snapping turtle from a distance can be a cool experience, you wouldn't want to



Baby Snapping Turtle

come across one on a moonlit swim. Frankly, snapping turtles can be dangerous, in the same way a snake can be dangerous. If approached, either purposely or accidentally, they have a wicked bite that can cause serious damage. Bites are rare and usually happen because someone is messing with a snapper. It's best to just leave them alone. If you do come across one in the road, I suggest trying to move it with a shovel. Smaller turtles can be handled by grabbing the back of the shell with both hands, but this wouldn't work with a large snapping turtle because they are just too heavy. Never grab a turtle by the tail as that can cause injury. No matter how (subjectively) ugly snapping turtles may be, they are also amazing creatures. Not much data exists about how long snapping turtles live in the wild but most studies say at least 40, possibly as much as 90 years. Once they reach maturity they can eat just about anything else in the lake, including ducks, fish and other turtles. Oh, and human toes of course.

Lake Stratification

Continued from Page 9

eventually the temperature gradient becomes too steep and the lake stratifies. In addition to water density, the heat capacity of water is responsible for allowing deeper lakes to stratify for entire summers (rather than constantly mixing). This is because water holds onto heat, and it takes a large amount of energy to increase or decrease water temperature, so although it may be cold at night, the water holds enough heat that it doesn't experience as large of a temperature drop as the air does.

The temperature and density difference between the epilimnion and hypolimnion mean that not only does water have a hard time moving from one layer to the other, so does anything suspended or dissolved in that water: dissolved oxygen and algae generally stay within the epilimnion, and phosphorus that may be released by sediments stays in the hypolimnion.

This lack of exchange between the top and bottom layers is one of the things that makes stratification so important within lakes. The bottom waters slowly lose dissolved oxygen over the course of the summer through decomposition and other processes, and this oxygen cannot be replenished, leading to hypoxia (low oxygen levels) and even anoxia (no oxygen). When this happens, phosphorus may be released from the sediments, which could contribute to an algae bloom. Anoxia also negatively affects coldwater

fish. These fish, as the name suggests, require cold water temperatures to survive; however, they also require adequate oxygen levels. This means they must live near the bottom of the lake in the summer. If dissolved oxygen levels get too low, they get stressed and may stop growing, or may even die if there is no suitable habitat available.

The length of stratification is also an important factor that helps determine water quality. Most of the lakes and ponds LEA tests stratify in late April or May and mix anywhere from September to early November, depending on the size and depth of the lake. If the lake mixes early or suddenly, perhaps because of a large storm, there may be a dramatic increase in surface phosphorus levels or a rapid drop in oxygen levels. This could lead to more algae growth and even warm-water fish kills. On the other hand, if the lake remains stratified for an extended period of time, this increases the risk of anoxic conditions because it lengthens the amount of time the bottom waters remain cut off from the air. Increased algae levels are sometimes seen in the fall when the lake mixes; however fall mixing is typically more gradual (allowing the lake to "acclimate" to changing nutrient levels) and the colder temperatures do not favor bloom-forming algae.

LEA has been able to learn a great deal about individual lakes' stratification patterns through the deployment of in-lake sensors. Our high-resolution temperature monitoring program allows us to deploy sensors soon after lakes are ice-free. These sensors are located at 2-meter in-

tervals and each one takes a temperature reading every 15 minutes, 24 hours a day for the duration of deployment, which lasts until the lakes have fully mixed. This results in 96 profiles a day and over 15,000 profiles per season – much better detail and time coverage than the manually collected profiles we collect only 8 times per year as part of routine water quality monitoring.

Lakes in our geographical region are on the edge of significant changes to stratification patterns. As mentioned, ice-out date and seasonal weather patterns can greatly affect the duration of stratification. As we see increasingly earlier ice out in the spring and consistently warmer fall temperatures due to climate change, the ice-free season becomes longer. Eventually, we may see little to no full ice cover on our lakes in some years. This would allow lakes to continuously mix over the winter, warming water temperatures gradually and resulting in warmer average water temperatures. This could potentially lead to the disruption of coldwater fish habitat, low oxygen conditions affecting more of the water column, and an increase in surface phosphorus levels.

Threats to our lakes such as these are why LEA has invested in high-resolution monitoring and increased our lake research through the Maine Lake Science Center. We hope to be able to avoid dramatic changes to water quality by understanding the mechanisms that lead to these changes. We also believe in the importance of collecting long-term data, which allows us to analyze patterns and predict changes before they happen.

Water Testing Program Update

In recent years, LEA's water testing program has grown into two distinct parts: the comprehensive, routine monitoring we've been doing for decades that includes clarity, oxygen, temperature, chlorophyll, and phosphorus readings, and the newer "advanced testing" that started in 2013.

Our routine monitoring program consists of bi-monthly summer sampling. The data collected is used to assess long-term water quality changes in our lakes. Our advanced testing program continues to evolve as we add to our ever-expanding knowledge of the Lakes Region's unique lakes and ponds. With the development of the Maine Lake Science Center, we have been able to acquire equipment and resources that allowed for this expansion in our testing program. Local lake associations have also helped us broaden testing on their lakes each year with their financial support.

In 2017, our advanced testing accomplishments included deploying two high-resolution multi-parameter monitoring buoys (one on Highland Lake, one on Long Lake), counting 56 *Gloeotrichia* samples from 22 lakes, setting up 16 continuous temperature monitoring buoys on 12 lakes, analyzing 60 algae samples from 12 lakes, and collecting 48 fluorometer profiles



2017 Water Testing Interns Kayla Gray, Chloe Wendler, Grace Kimzey, Isabella Davis, and Jake Moulton.

on 22 lakes. Several sonde profiles were also collected. We hope to add the following to our advanced testing programs in 2018: permanent mounting of algae samples, adding continuous temperature monitoring on Bear Pond, piloting a citizen science *Gloeotrichia* monitoring program on Moose Pond, and increasing the use of our multi-parameter sonde and field fluorometer. As always, we are looking forward

to a full and productive water testing season! Of course, we couldn't do all that we do without our hard-working summer interns. This year, we have Kayla Gray and Jake Moulton returning for their second years, with Jake again working part time on the bathymetry project. New this summer will be Olivia Mills and Kirsten Stemmler. If you see LEA staff or interns on your lake this summer, be sure to say hello!

Woolly Adelgid on Sebago's Shores by Colin Holme

A new invader that could negatively impact water quality is quickly making its way into our area. It is not an invasive aquatic plant like milfoil but instead a tiny terrestrial insect called Hemlock Woolly Adelgid. This aphid-like insect can kill off whole stands of Hemlock trees, which make up an important part of our shoreline buffers. While the state is working to slow down the advancement of this noxious invader, there are several things landowners can do (see below) to help prevent its spread throughout the Lake Region.

Hemlocks are a long-lived, slow growing tree and the only shade tolerant conifer in Maine. These characteristics allow the tree to wait patiently in the understory for an opportunity to take off and fill gaps created when other trees die. They can tolerate moist soils and young trees can be easily pruned into a hedge. Although the wood of the Hemlock is naturally rot resistant, it is not a commercially viable tree species.

Today, Hemlock is one of the most dominant trees in the riparian zone and groves of this beautiful species provide habitat for deer, bear and porcupine as well as many other species. But the Hemlock Woolly Adelgid can kill large swaths of these trees as it has already done in southern New England and New York. It has been on the coast of Maine for around ten years and the Maine Forest Service has been actively and aggressively trying to control the spread but it has now got a foothold around the shores of Sebago.

Last fall, the forest service treated a large patch on Frye Island near the public works with the insecticide Dinotefuran. They treated by spraying the bark of the trees with a wand sprayer. They did not work near the water and their primary goal was to help prevent the introduction of the insect by large fire trucks and other vehicles that routinely move in and out of the area.

Use of insecticides comes with risk and a thorough evaluation of the pros, cons, and alternatives should always be considered. The insecticide used on Frye Island is in a class of pesticides called neonicotinoids, which are highly toxic to many insects and moderately toxic to mammals. In the sun, it has a short half-life and quickly disappears but in ground it can last for over 3 years. It needs to be applied when the trees are actively photosynthesizing but when other insects, particularly bees, are not around. It is a tricky business and very controlled and targeted applications are best. Only licensed pesticide applicators are allowed to use these products commercially and it is illegal to use any insecticide in a way that is not described on the product's label.

What can you do?

Hemlock Woolly Adelgid is often spread by cars and people. If a person or vehicle brushes up against an infested tree, these little bugs can hitch a ride and easily move to another Hemlock. To prevent this, the Forest Service recommends pruning back the branches of all Hemlock trees along roads and trails. Cutting back healthy, non-infested branches is a way to reduce your property's susceptibility to the invader. If your trees already have the insect, branches should be cut and left on the ground.



Hemlock Woolly Adelgid appears as small whitish-gray balls at the base of the Hemlock needles

They should not be moved as this may spread the infestation. Once on the ground, it is unlikely the insect will climb back up into a tree. If you do have the Adelgid, tree work should be done outside of the season when the insects are actively moving (March through July in Maine). Another vector for this species is birds. To help prevent infestations from spreading via birds, bird feeders should only be used in the winter months and taken down in March. At a minimum, feeders should be far away from any Hemlock trees as birds usually grab seeds and fly back to nearby trees for cover.

To identify Hemlock Woolly Adelgid, look for small, fuzzy, whitish-grey balls on the underside of the needles where they meet the stem.

If you are interested in finding out more, stop by LEA's main office for a fact card or check out what the Maine Forest Service has compiled at: http://www.maine.gov/dacf/mfs/forest_health/insects/hemlock_woolly_adelgid.htm

Maine Lake Science Center Campaign Finish Line in Sight!

It was a warm winter day in February of 2013 when the LEA Board first visited the future home of the Maine Lake Science Center. The concept of the Center had emerged a couple of years earlier, and one possible site had been extensively researched, but the owner's offer was withdrawn. The Flint property offered connections to Pondicherry Park and 18 acres of woodlands, but the structure was questionable. The decision to renovate the log cabin and garage was not easy, but once that was decided, the Campaign was defined. The goal was to raise enough in contributions or in-kind donations to purchase the property, re-construct the building, fully outfit it (including a lake lab), and provide staffing through 2020 – LEA's 50th Anniversary.

Initially \$1.2 million was determined to be adequate, but the usual construction surprises and new items that were essential led to the final goal of \$1,450,000. The Campaign started in 2014 with a real sense of urgency that Maine's lakes needed help before more succumb to noxious algae blooms. A mix of excitement and concern fueled the project.

Now, four years in, LEA is approaching its goal with the Center in full operation. The new Phil Chute Memorial Lake Lab is outfitted and overseen by Dr. Ben Peierls, the center's Research Director. Five researcher retreats have led to the development of the Maine Lake Protection and Research Collaborative, a framework that is harnessing Maine's colleges, universities, conservation organizations, agencies and consultants to forge a common effort to study and preserve water quality. Dozens of state and local groups have used the Center's conference facilities, and interns and researchers have stayed in the residential quarters.

LEA is hoping to raise the remaining funds (now less than \$75,000) by the end of the summer and you can help. If you have not already contributed, please consider making a gift or a two-year pledge by sending a donation to the LEA Maine Lake Science Center Fund. You could be the one who completes the five-year Campaign to create and operate this remarkable addition to comprehensive lake protection.



*Dr. Ben Peierls
in the MLSC lab.*



Watershed Educator Retreat at the Science Center

The Maine Lakes Collaborative by Peter Lowell

Imagine what could happen if state agencies, lake associations, conservation groups, consultants and academic researchers all got together to help Maine's lakes. Now imagine having them all work on a common action plan. There's great news! This really is happening. Three years ago, LEA developed the Tipping Point Strategy, which Linda Bacon of the Maine DEP refined for presentation at our 2017 researcher retreat. This document and plan, The Maine Lake Protection and Research Collaborative, became the state's blueprint for protecting lakes into the future.

The "Collaborative" identifies 47 defined tasks involving 36 partners. Its work is allocated to three teams: Lake Science, Education and Communication, and Policy. Everyone who participates is linked by an email based list where news, events, ideas, information, and notices are posted and shared. This is an open process that welcomes new groups, experts, and researchers as it evolves. Many of the events, services, and resources offered are channeled through regional hubs in Belgrade (BRCA/7 Lakes Alliance), Edgecomb (Midcoast Conservancy), and Bridgton (LEA).

Last fall, the Collaborative shifted into action mode with help from the Elmina Sewall Foundation, an anonymous family foundation, and a Patagonia environmental grant. Since then, and with guidance from several other organizations, LEA has made large strides forward and has stepped up to lead the three work teams.

LEA hosted an Education Team Watershed Retreat with twenty professionals from around the state. The purpose was to explore existing environmental lake education programming, share resources, define program needs and gaps, develop goals, and discuss holding courses at the Maine Lake Science Center and other regional hubs. LEA staff synthesized outcomes of the retreat into action items in preparation for follow-up workshops this summer. Specific next steps include: Formalizing a statewide network of lake educators, developing a list of priority topics and programming, working with partners to fill program gaps, advancing opportunities for regionalizing and standardizing course offerings, identifying field trip opportunities statewide, identifying teaching resource and transportation

needs, and developing marketing and evaluation plans for course offerings.

The Lake Science Team initiated a program to expand the capability of organizations monitoring lakes across the state and increase data collection on waterbodies not routinely sampled. To help accomplish this goal, monitoring packages for regional lake hubs were created. These bundles included funding for half the cost of an intern for the upcoming field season, a string of in-lake temperature sensors, lake-bottom sediment analysis, and a new optical dissolved oxygen meter. In accepting funding and equipment, each organization agreed to obtain data on under-sampled waterbodies.

Specialized packages were also provided to other organizations based on their specific needs. The Volunteer Lake Monitoring Program/Lake Stewards of Maine received funds to augment their training and certification capacity. The Rangeley Lakes Heritage Trust purchased a watershed model to enhance their education curriculum. The 30 Mile River Watershed Association received funding for half the cost of a summer intern, and the Cobbossee Watershed District received funds to analyze bottom sediments on three lakes to determine susceptibility to internal phosphorus loading. LEA also committed to advanced sonde profiling on Highland Lake in Windham in order to assess and understand the recent algae blooms on the lake. Additionally, we will be helping the Acton Wakefield Watershed Alliance collect bottom sediment samples on two of their water bodies to determine phosphorus resuspension susceptibility.

The Lake Policy Team initiated a series of spring workshops to define opportunities and barriers to lake protection. The discussions revealed new ideas for legislation, ordinance upgrades, education, messaging, and voluntary action incentives. Sessions at the Midcoast Conservancy, Maine Audubon, Belgrade, and LEA's Maine Lake Science Center were well attended and are stirring interest among organizations statewide.

Organizations throughout Maine are now using the Collaborative as a reference document. It is exciting to see the connections and sharing that are taking place. Maine's lakes are sure to benefit from this work. In fact, they already are!

An Overview of LEA Membership

When you give LEA a donation, your one-year membership begins. The month before your donation date anniversary, LEA will send a letter advising that your membership is about to expire and expressing our hope that you will renew. Four to five months after you become a member we will send out our Annual Special Appeal. This appeal is in support of something specific and changes every year. By becoming a member and donating to the Special Appeal you are helping LEA maintain the superb water quality that this area is known for.

There are many benefits to membership - make the most of it!

- Free admission and early sign up for most of our LEA events, workshops and environmental education classes
- LEA newsletter mailed to you twice a year
- Technical assistance for landowners: Have you ever wondered how to keep your driveway from eroding into the lake? Which plants would grow best on your property? All members are entitled to a free consultation!
- Knowledge that your donation will help keep our lakes free of algae blooms and invasive plants by supporting innovative water monitoring, comprehensive milfoil control, community collaborations, and experiential-based educational programming for all ages

We make it easy to give! LEA welcomes gifts by check or credit card, by mail, phone, or online at www.mainelakes.org. If you wish to mail

your gift, make your check payable to "Lakes Environmental Association" and send it to 230 Main Street, Bridgton, Maine 04009. You can also set up recurring monthly donations that fit any budget by getting in touch with us or emailing jenny@leamaine.org. This is a convenient way to make sure your membership never lapses. Or feel free to renew your membership in person at our Main Street office where you can check out our invasive plant tanks and field guide library.

A special thank you goes out to the families who made a bequest provision for LEA in their estate planning this year. Whether giving through your will, living trust, life insurance policy, or qualified retirement plan, you should make your designation for "Lakes Environmental Association, a charitable and environmental organization in Bridgton, Maine." Stock and mutual fund donations are another welcome way to support LEA. Such donations are handled through our Vanguard account. If you are making a gift of mutual funds or securities through a financial institution, please contact LEA to help you through the process.

We want to know our members so that we can serve you better. If you are a new member, please let us know your connection to the area and the waterbody that you most love. Make sure that you provide us with your winter and summer mailing address, email address, and tell us if you are related to or affiliated with families that are members. LEA never shares information with anyone outside our organization. Your support is much appreciated!

LEA Honor Roll

LEA wants to honor its most significant benefactors, but we need your help to do it.

LEA is built around the generosity of our members. Over the years we have received gifts of every sort that have helped pay our staff, cover costs, and grow programs. We genuinely appreciate every donation that is given to us.

Over time, some families and individuals have taken their LEA support to another level. This generosity has allowed LEA to succeed in its mission and enjoy achievements other lake organizations around the state could only dream of.

Member generosity takes many forms: annual giving, large one-time gifts, estate planning using testamentary gifts, and lifetime planned giving (such as through charitable remainder trusts or similar tax advantaged means) have all become an integral part of LEA's funding. Each gift helps us create a legacy of clean and beautiful lakes.

The LEA board has determined that its most generous benefactors should be publicly recognized. The recognition will be a listing (the "Honor Roll") of these extraordinary donors, the list to be periodically published in our newsletter. But we have two obstacles to providing this recognition:

1. We need to know if any major donor prefers not to be recognized; and
2. We need to identify members who have included LEA in their estate or gift planning, but have not informed LEA of these plans.

To address item 1, we have added a check box in our membership donation form inquiring whether donors wish to remain unnamed. We also plan to contact large donors directly to inquire about any preference for anonymity and to make sure we list them accurately.

Connect with Us!

There are many ways for you to interact with LEA and keep up on what we are doing as an organization year-round. Watch our summer water testing interns as they work or our educators as they teach the wonders of our watershed. Stay connected with us by liking us on Facebook and following us on Instagram (@lakesenvironmental). Don't forget to check our website, mainelakes.org, for the latest water testing results on your favorite lake. You will also find our current events calendar, information on invasive plants, news of the Maine Lake Science Center and more! Please don't hesitate to call us at our Main Street office if you have any questions at 207-647-8580.



Looking for a unique way to give to LEA? Stop into your local TD Bank and ask about the Affinity Program. Here's how it works: If you have an existing checking account TD Bank will donate \$10 to LEA. For opening a new checking account TD Bank will donate \$50 to LEA. For a new or existing savings account TD Bank will donate a percentage of the average balance to LEA. This all happens at no cost to you! Simply give them the LEA code: AF307.



Another way to support LEA at no cost to you is by shopping with AmazonSmile and selecting LEA as the beneficiary. They will donate a percentage of each sale to LEA. This is an easy way to support us while buying the things you need anyway.



To address item 2, we need each member who has included LEA in their estate or gift planning to let us know of the planning. No details need be provided other than that the planning has taken place. Please feel free to contact Colin Holme (207-647-8580 or colin@leamaine.org) about the Honor Roll.

Are you an LEA member? Please help us protect our lakes!

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. You can also join or renew at www.mainelakes.org.

Name _____

Winter Address _____

Summer MAILING Address _____

Favorite Lake _____

Year Round Phone _____

Email _____

Would you like to receive emails on LEA outings, events, and educational offerings? Yes No

I am interested in information on estate planning and planned giving:

Donation Information

\$1000 Benefactor

\$500 Patron

\$250 Sponsor

\$150 Lake Sponsor

\$100 Family

\$50 Individual

\$_____ Other Amount

I would like to make an additional donation to the:

Maine Lake Science Center \$_____

Mifoil Fund \$_____

Environmental Education Fund \$_____

Anonymous Gift (We occasionally acknowledge our donors publicly. Check this box if you would like your donation to remain anonymous.)

Check enclosed. Charge my credit card \$_____

Credit Card # _____ Expiration Date ____ / ____

CVC _____ Signature _____