

TWINE

2014 FALL/WINTER EDITION VOL. 36/NO. 3

Algae Through The Ages

Ohio Sea Grant & Stone Lab
Consistently Work To Reduce
Harmful Algal Blooms in Lake Erie

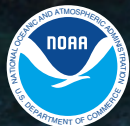


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ALGAE

THROUGH THE AGES

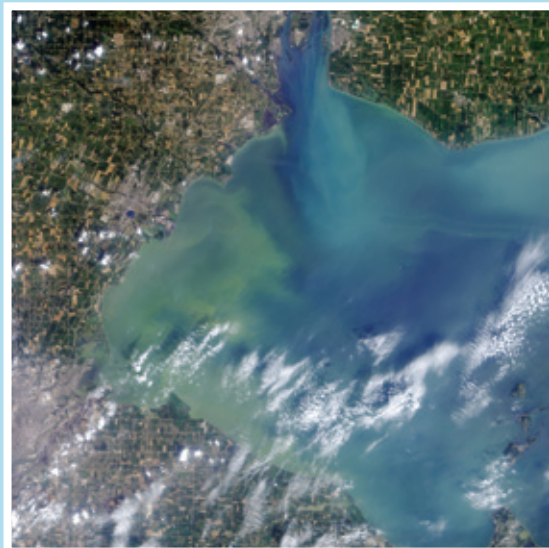
*Ohio Sea Grant & Stone Lab
Consistently Work To Reduce
Harmful Algal Blooms in Lake Erie*

When toxins from a harmful algal bloom (HAB) caused the City of Toledo to issue a “Do Not Drink Advisory” to 400,000 people, Ohio Sea Grant was on the case as soon as the phone started ringing.

While Stone Lab staff carried boxes of toxin analysis supplies to the City of Toledo offices, which were on the brink of running out, Ohio Sea Grant director Dr. Jeff Reutter and research coordinator Dr. Justin Chaffin were on the phone with the U.S. and Ohio Environmental Protection Agencies (EPA) as well as city officials from Toledo to help inform their management of the issue.

But August 2014 was far from the first time Ohio Sea Grant worked on the front lines to restore the health of Lake Erie. Nutrient loading, algal blooms and the dead zone – an area of low oxygen that develops in the central basin during the summer – have been an important part of Ohio Sea Grant’s work since 1971 when the Center for Lake Erie Area Research (CLEAR) was formed.

“Our efforts to bring Lake Erie back from its dead lake image to becoming the walleye capital of the world were a success,” remembers Reutter. “However, once decision makers felt that there was no longer an acute problem, funding and monitoring for further research were diverted to other focus areas.”



Above: Satellite imagery from NOAA shows the bloom in Lake Erie, right near the water intake for the City of Toledo. NOAA issues a weekly *Harmful Algal Bloom Bulletin* that keeps officials, businesses and the public apprised of conditions in the lake, and annually forecasts the expected severity of the bloom from Stone Lab.

PHOTO: NASA EARTH OBSERVATORY



Left: A collaboration with the Ohio EPA trains charter boat captains to take water samples during their regular trips onto Lake Erie, increasing the number of samples taken without much additional cost and helping agencies to monitor the health of the lake more closely.



Workshops and meetings at Stone Lab, Ohio Sea Grant's research and education facility on Lake Erie's Gibraltar Island, go into more depth and address nutrient management at the source; excess fertilizer including manure on farm fields, sewage treatment plants and combined sewer overflows, and faulty septic systems play a large role in contributing phosphorus to Lake Erie, but can also be managed through technology and a change in farming practices that still maintain productivity.

"To eliminate HABs in Lake Erie, we need to modify agricultural practices to greatly reduce nutrient runoff, but we also all need to reduce our personal nutrient contributions by using low phosphate cleaners, being sure septic tanks are working properly, eliminating phosphorus from lawn fertilizers, and working to lessen combined sewer overflows by improving sewage treatment plants and using rain barrels, rain gardens, and low-flow toilets and shower heads," explains Reutter.

HABs are an excessive growth of cyanobacteria, often called blue-green algae, which can produce toxins that damage the liver, nervous system and skin. "Cyanobacteria bloom when there is an excess of nutrients in very warm water," explains Chaffin. "In addition to nutrient loading, water temperature above about 65 degrees F is a key factor in the development of harmful algal blooms."

With higher temperatures due to a changing climate likely becoming the norm sooner rather than later, finding new ways to reduce other factors in the development of HABs has continued to be a critical part of Ohio Sea Grant's work. "We are also learning that nitrogen plays a large role determining the type of HAB present and its potential to produce toxins," Chaffin adds.

As part of that effort, Reutter contributes his expertise to a number of regional, national and international committees that work to address harmful algal blooms at the legislative level. He represented Ohio Sea Grant on the initial Ohio Phosphorus Task Force in 2009-2010, and returned to the Ohio Phosphorus Task Force II in 2012 to chair the Phosphorus Loadings and Targets Subcommittee. The group's final report in March 2013 recommended a significant reduction in phosphorus going into Lake Erie.

"Currently, our only true lever in eliminating HABs is to greatly reduce phosphorus loading, and the Ohio Phosphorus Task Force II report calls

T

hat change in priorities has come back to haunt Lake Erie again in the past two decades. Steadily increasing concentrations of phosphorus – a vital nutrient for agriculture crops that also fuels harmful algal blooms in the lake – have resulted in an increase in the occurrence and severity of algal blooms. The western basin, which receives runoff from the Maumee River watershed, the largest agricultural watershed feeding into the Great Lakes, is especially affected by phosphorus levels that have returned to what they were during the height of the problem in the 1970s.

While funding from the U.S. EPA for water quality monitoring ended in the mid-80s, students at Stone Lab continued to conduct an informal monitoring effort, and Ohio Sea Grant and Stone Lab began to prepare for the current situation in the mid-90s. "Changes in phosphorus loading were the reason we were a leader in the creation of the Lake Erie Millennium Network between the U.S. and Canada in 1998," Reutter remembers. "We also hosted numerous groups of elected officials, agriculture leaders, scientists and decision makers and spoke to many more around the state, region and country over the years, but it was hard to get them to understand the importance of the changes we were seeing."

Today, Ohio Sea Grant's work on reducing and preventing HABs ranges from the local to the international level. Reutter, Chaffin, Associate Director Dr. Christopher Winslow, and Ohio Sea Grant Extension specialists Tory Gabriel, Sarah Orlando and Joe Lucente are often called on to educate water treatment plant managers, farmers, charter boat captains, decision makers and elected officials on nutrient loading and algal problems in their jurisdictions.



MANAGEMENT AND OUTREACH

Ohio Sea Grant will be helping the Ohio Board of Regents with management and outreach for their \$2 million investment to coordinate the response of Ohio's colleges and universities to the harmful algal bloom problem. The Ohio State University College of Food, Agricultural, and Environmental Sciences has also invested \$1 million in this effort.

for a 40 percent reduction to eliminate or greatly reduce HABs in the western basin,” says Reutter. A big step in the right direction had just been taken earlier that year, when The Scotts Miracle-Gro Company eliminated phosphorus from its lawn care products.

From the state level, Ohio Sea Grant was able to expand its reach internationally as part of the team developing nutrient targets for each of the five Great Lakes under the U.S.-Canadian Great Lakes Water Quality Agreement. Reutter co-chairs the Objectives and Loadings Task Team for Annex 4, the Nutrient Annex of the agreement, along with Canadian representative Sandra George of Environment Canada.

His expertise also led to Reutter becoming one of the main sources of information for media and officials alike during the Toledo drinking water ban. Interviews with local, national and international media outlets alternated with calls from U.S. and State Representatives and Senators, all intent on finding out what had happened and how it could be prevented from happening again.

“It was a very busy few days,” remembers Reutter. “At one point Sunday night in the middle of the crisis, a crew from Good Morning America was sitting in my living room asking questions at 10:30 p.m., and while the number and frequency of calls has been greatly reduced, the problem is still clearly on everyone’s minds.”

Ohio Sea Grant also put together a collection of frequently asked questions for its website (go.osu.edu/toledohab) and hosted a webinar on harmful algal blooms that was attended by 150 people, with an additional 500 views on YouTube later on.

“We’re glad we were able to reach people quickly with this important information,” says Reutter. “Ohio Sea Grant and Stone Lab have been invested in studying harmful algal blooms and related issues since the beginning, and will continue to do so until the problem is resolved once again.”

In the aftermath of the drinking water ban, Stone Lab is continuing to monitor water quality in the western basin of Lake Erie, keeping an eye on everything from phosphorus concentrations to algae and toxin concentrations in the water. To help with this important work, Stone Lab’s Algae & Water Quality Laboratory was completely renovated and opened its doors again in the summer of 2013.

“Our renovated Research Building and our Water Quality Lab gives Sea Grant and Stone Lab researchers, as well as other scientists, immediate

“Ohio Sea Grant and Stone Lab have been invested in studying harmful algal blooms and related issues since the beginning, and will continue to do so until the problem is resolved once again.” — DR. JEFF REUTTER

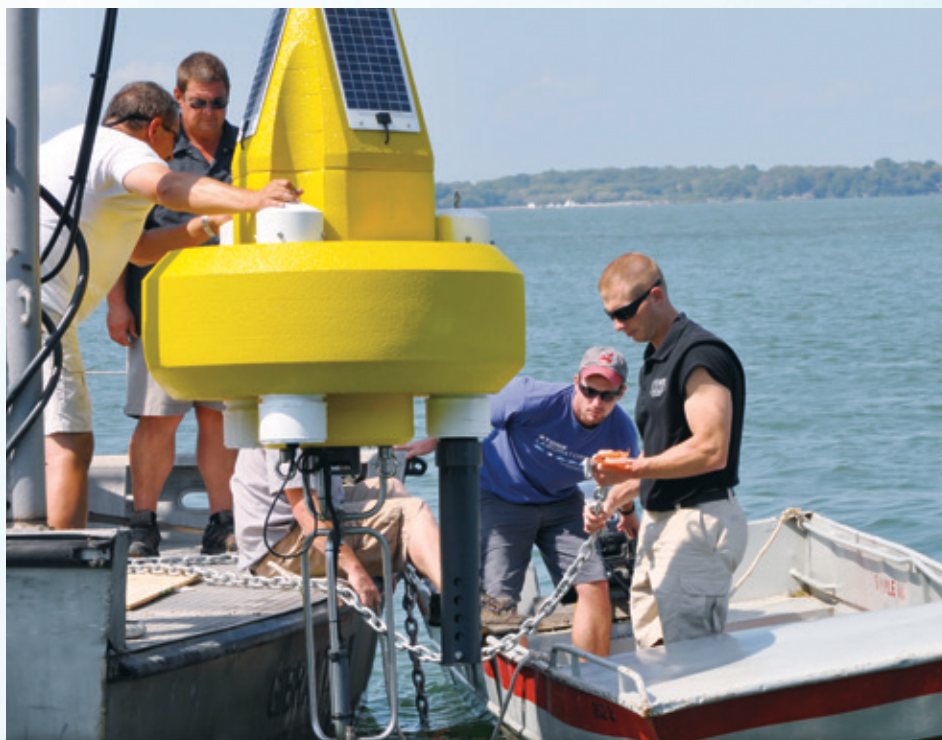
access to Lake Erie, our research vessels, and high quality research equipment to perform a wide range of water tests right by the lake, instead of having to send samples farther away,” says Chaffin. “This not only makes testing faster and more efficient, but also frees up funds for additional tests that otherwise may not be within someone’s budget.”

Renovation of the Water Quality Lab was supported by the Ohio State University Office of Research and Stone Lab, and equipment within the Lab was funded by these groups as well as the Friends of Stone Lab, Ohio Sea Grant, and the Ohio Environmental Education Fund (OEEF) within Ohio EPA. OEEF and Ohio EPA are also collaborating with Ohio Sea Grant on continued nutrient, algal and toxin research and monitoring. Together, they have recruited volunteers from among Lake Erie charter captains who collect water samples when they take customers out onto the lake, significantly increasing the number of samples taken without much additional cost.

To prevent an incidence like the Toledo events from reoccurring elsewhere – the city was without drinking water for 55 hours – Chaffin is performing algal toxin analyses for four public water supplies on the Lake Erie islands, as well as the Cities of Marblehead, Vermilion and Norwalk. Stone Lab has also responded to a number of emergency sampling requests from the Ohio EPA.

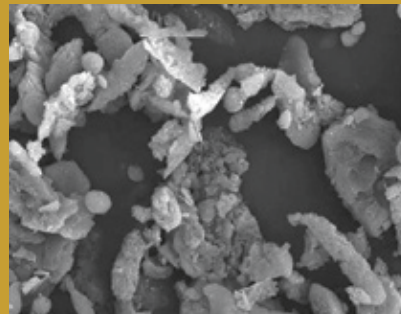
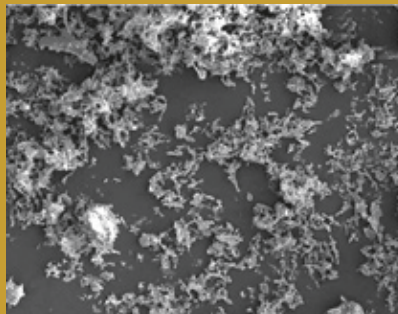
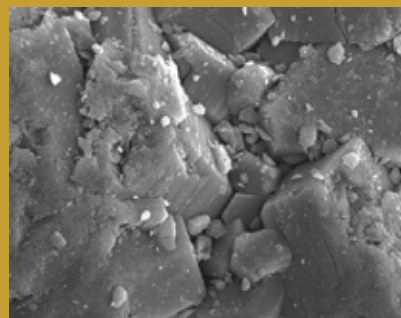
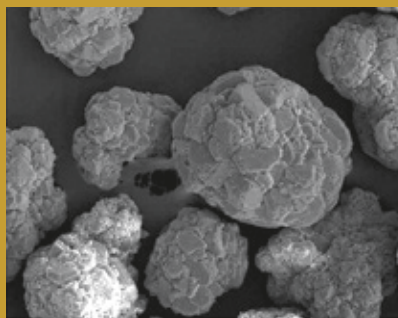
In addition to offering the services of the water quality lab, Ohio Sea Grant and OEPA also hosted two workshops for water treatment plant operators in mid-August to help them identify HABs and remove toxins from the water going through their facilities. These workshops will also be offered in 2015.

“A week after one of the workshops this year, one of the participants worked with Dr. Chaffin and correctly identified a harmful algal bloom in the reservoir at the Norwalk water plant and averted what could have been a serious problem,” says Reutter. “Our hope is that other workshop students will be able to do the same for their facilities should the need arise.” **TL**



Above: A new buoy donated by Fondriest Environmental and upgraded with additional equipment through grant funding helps Stone Lab staff monitor water conditions, including harmful algal blooms, in Lake Erie’s western basin. The data is also visible to the public on Ohio Sea Grant’s website.

Right: Sonication significantly changes the size of sediment particles, which helps to release contaminants, but also means that dissolved pollutants need to be removed before they can re-attach to the increased surface area of the smaller particles.



ONGOING RESEARCH

AND DIRT GOES FLYING AT THE *speed of sound* >>

by Christina Dierkes, Ohio Sea Grant Communications

Wouldn't it be nice if you could just shout at the mess in your kitchen and have it disappear? While that's still a pipe dream, researchers at The Ohio State University are taking steps in the right direction, working to use sound waves to remove contaminants from Lake Erie sediment.

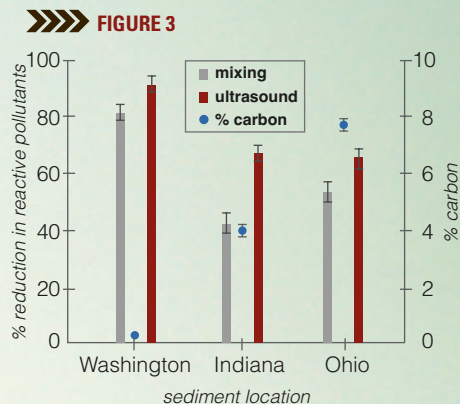
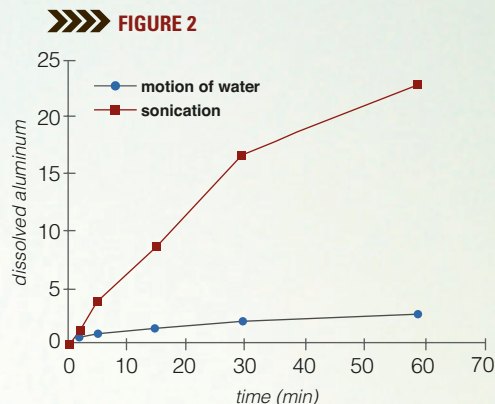
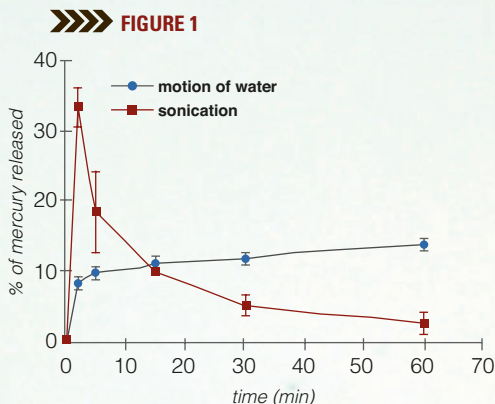
Dr. Linda Weavers and her team, funded in part by Ohio Sea Grant, aim to develop a device that can remove contamination, such as mercury, from river and lake sediments without having to dredge that sediment up first. When combined with a method to either remove that contamination or more permanently bind it to another material, this sonication technology could make remediation efforts like the recently completed Ashtabula River clean-up faster, easier and more cost-effective.

"What we are interested in and what most of the research in contamination is looking at is ultrasound, or sound just above what we can hear," Weavers says. "But we aren't using sound for imaging, which is what people normally think about with ultrasound. So we're at a frequency between where they image and what we can hear."

When this ultrasound is used in water, it creates a pressure wave that can be powerful enough to pull apart molecules and create cavitation bubbles – essentially, holes in the



When combined with a method to either remove contamination or more permanently bind it to another material, sonication technology could make remediation efforts like the recently completed Ashtabula River clean-up faster, easier and more cost-effective.



water that are filled by previously dissolved gases. Once the pressure wave passes, the bubble snaps back, much like a rubber band would. And just like a rubber band snaps back farther than its size at a relaxed state, the bubble tends to overcompensate, compressing the gases held within.

“When that happens, we get heating in that bubble,” Weavers explains. “Physicists have seen light emissions from those bubbles, and they’ve seen plasmas form inside those bubbles.” Plasma is one of the four states of matter, formed when a gas gets hot enough to transform into plasma. How hot is hot enough? Plasma torches are used in industrial welding, and the sun is essentially a large ball of plasma. Researchers have estimated temperatures of 10,000 Kelvin (17,500 degrees Fahrenheit) in the center of many of these bubbles, which means any contained contaminants would combust.

While that’s already a cool thing to study, Weavers and her team are also interested in another effect of the bubble snapping back: if a sediment particle is sitting at the edge of the bubble, the inrushing water creates a jet, acting a bit like a pressure washer and blasting off any surface contamination attached to the particle.

“With sediments, the effect that we’ve studied over the years is releasing contaminants off those surfaces,” says Weavers. “That allows for a complimentary technology to come in and capture the pollutants that we are releasing. That’s really the limiting step in remediation efforts, because the contaminants tend to stick so well and they’ve been there so long that it’s a really slow process to get them back off.”

Once the pollutants are removed from the sediment particles and more easily accessible, the question becomes how the contamination can be removed from the water. A previous collaboration with Dr. Richard Sayre, now at Iowa State University, looked into using genetically



FIG 1: Lab results showed that 2-5 minutes of sonication significantly increased the amount of dispersed mercury, compared to what is naturally dissolved in the water column by currents.

FIG 2: Sonication can create supersaturated solutions – in this case involving aluminum compounds – in which 150% more pollutants are pulled off the sediment particles and accessible for remediation than could be available otherwise.

FIG 3: The current stage of the project is examining how the addition of activated carbon could allow pollutants to be safely contained in place. The activated carbon binds contaminants like mercury tightly, making it unavailable for interaction with the rest of the ecosystem. Lab results have shown that ultrasound can increase the effectiveness of activated carbon by up to 20%, depending on pollution levels and type of sediment being treated.

engineered algae to bind mercury, so then the algae could be filtered out of the water and the mercury recovered.

“That was an engineering challenge to make that work well,” Weavers remembers. In the lab, the researchers set up the sonication system, put the algae in a porous dialysis bag that should allow transfer of mercury through the bag’s pores, and placed that set-up into the samples to be treated.

In that particular experiment, they found that their actual results were quite a bit off from what they had expected. It turned out that the pore size on the dialysis bag was too small to allow some of the mercury, which was mixed with organic matter – the same stuff that can turn lake water the color of ice tea sometimes – to cross through the bag and into the algae mix. “It became a matter of retooling our system and having a proper holder for our algae cells,” says Weavers.

Another option for remediation is to bind the pollutants even more tightly to an inactive compound like activated charcoal that makes them no longer available to the rest of the biological system. Other environmental engineering research has shown this to be a viable option in soils, but little testing has been done in aquatic systems.

“We saw good success with that experiment actually,” says Weavers. “We saw that if we just used ultrasound without any of this activated carbon, what we could do is make

the contaminants more available, say, for bioremediation, or more available to be captured by something that could be removed from the system. And if we added activated carbon, we ended up making the pollutants less available, which is what we wanted to do.” The activated carbon with the tightly attached contaminants could then remain in the sediment without causing more damage.

Currently, Weavers and her graduate student are working on transferring their lab successes into the field. Because the cavitation bubbles only form very near the device that delivers the ultrasound, they are looking at what happens when the sound’s pressure wave travels farther away from the sonication device.

They suspect that the sound, while no longer creating cavitation bubbles, still affects the sediment and can make it more “porous” than before – in a way, the sound “shakes” the particles and allows other materials, like water or activated carbon, to enter the sediment instead of just interacting with surface material.

“If that pressure wave is going through, we can maybe pump water through the sediment and enhance fluid flow, which is important if we want to try to add amendments like activated carbon to the system,” Weavers explains. “That way, maybe we don’t have to till the subsurface in the system, for example.” And that reduced additional effort could make sonication a cheaper and less environmentally impactful option than traditional dredging. **TL**



THE GREAT LAKES' *guardian* ANGEL

by Christina Dierkes,
Ohio Sea Grant Communications



Every summer, one of the Great Lakes receives a visit from a white ship bearing the mark of the United States Environmental Protection Agency (EPA). The *Research Vessel (R/V) Lake Guardian* is tasked with monitoring the conditions in the Great Lakes, from water temperatures to aquatic organisms.

Once a year, the *Guardian*, as it's often called, also takes on a group of about 16 educators from around the Great Lakes region to allow them to learn about current Great Lakes research and bring that knowledge back to the students in their classroom. During the ship's 2014 cruise on Lake Erie, teachers from Ohio, Pennsylvania, Michigan, New York, Indiana, Illinois and Minnesota were part of the week-long experience, guided by researchers and Sea Grant educators from across the Great Lakes.

"Educators were immersed in an intense week of Lake Erie science," says Lyndsey Manzo, Ohio Sea Grant's Education Specialist, who organized the expedition along with Marti Martz from Pennsylvania Sea Grant. "The educators really stepped up and not only helped

the EPA collect meaningful data, but also acquired new scientific and pedagogical skills as well as interesting stories and ideas with which to inspire their students."

Fifth-grade science teacher Marcy Burns from Norwalk City Schools in Norwalk, Ohio applied for the *Lake Guardian's* Shipboard Science Workshop because she wanted to be able to pass that experience on to her students.

"I thought this would be another great opportunity to have my kids learn about the Great Lakes, because they're so close to us," Burns says. "Some of the kids haven't even seen Lake Erie before, and we're only 15 miles from the lake, so I wanted to incorporate Great Lakes into what I do."

The teachers got a chance to work with

Top and Above Right: The U.S. EPA's *Lake Guardian* serves as a hands-on professional development site for teachers. Educators from a number of local Sea Grant programs serve as instructors during these yearly Shipboard Science Workshops. PHOTO: EPA
Above: Teachers and crew members deploy a rosette sampler, which collects water samples at different depths. Data from these collections also made it back to the classroom, where students used the information to compare Lake Erie to their local bodies of water.

professional Lake Erie researchers on projects directly related to the health of the Great Lakes. David Murduck, a fifth-grade science teacher at Champion Local Schools in Warren, Ohio, got a chance to work with Ruth Briland, a doctoral student in The Ohio State University's Aquatic Ecology Lab, on studying spiny water fleas. This invasive invertebrate competes directly with larval fish for food, and may reduce the number of young plankton-eating fish that survive their first year.

"My favorite part was working directly with the scientists because as a science teacher, you teach about it, but you can lose touch with what a scientist really does," Murduck says. "The amount of time it takes to process all the data, you don't really realize that until you're doing it right alongside one of the scientists."

The one-week tour on the *Lake Guardian* started in Cleveland at the Great Lakes Science Center, and first moved to the eastern Lake Erie basin, where teachers got a chance to take water samples from 210 feet below the lake surface, the deepest spot in Lake Erie.

"I thought it was really interesting to see the temperature differences in the lake," says Burns of seeing evidence of the thermocline, a sharp delineation of different temperatures below the water's surface. "Another noteworthy thing for me was the computer technology that is used aboard the ship to determine where those temperature changes and the different dissolved oxygen changes occur."

Differences in dissolved oxygen in the water can indicate the presence of a dead zone in the lake, where oxygen levels are too low for organisms to survive. A dead zone tends to develop in the central basin of Lake Erie during the summer, when temperature differences in the water column prevent oxygen-rich surface waters from mixing into lower layers.

Teachers also stopped at Presque Isle State Park in Pennsylvania to learn nearshore sampling techniques, and then moved back into the central basin to compare water samples from that region of the lake to those taken earlier in the eastern basin.

"We found that those samples were really different than what we had found in the eastern

basin, which emphasizes the fact that each of those basins is a different ecosystem," Burns says.

Of course, the week also included a stop at Stone Lab, Ohio Sea Grant's research and teaching facility on western Lake Erie. At the lab, educators learned about the Lake Erie Watersnake, as well as the work going on in Stone Lab's recently renovated water quality lab.

But the most important parts of the summer experience didn't happen until teachers were able to get back to their students. Murduck was able to borrow a Hydrolab probe from the Environmental Protection Agency as part of his school district's day-long science-focused field trip program.

"We tested all the conditions of a large lake on my trip, and then during the field trip, we compared that data with information from Swine Creek, which runs into the Grand River and then into Lake Erie, of course," Murduck says. "We got to use that piece of equipment, which I would have never had the opportunity to use otherwise. And it

fit in directly with our classroom study of macroinvertebrates and stream health."

Students in Burns' class will apply what she learned on the *Lake Guardian* to an ongoing creek study that is part of the Global Learning and Observations to Benefit the Environment (GLOBE) program, a worldwide hands-on science and education program that allows students to contribute data to real-life research projects at NASA, NOAA and elsewhere.

"My kids have study sites at the creeks in Norwalk, and we're continuing that research, but now we're tying it into learning about the Great Lakes as well," says Burns. "And so we're making that connection between our local creek and the lake, and how what goes into our creek and into the Huron River affects Lake Erie." **TL**

Right: Teachers participated in original research projects, helping scientists from a number of universities and agencies study Lake Erie and its inhabitants.

Below: Partnerships with the U.S. EPA and the Great Lakes Sea Grant Network allowed educators to use some of the sampling equipment they handled on the *Guardian* with their students back in the classroom.



The educators on the trip also maintained a short blog of their experience, including some video tours of the *Lake Guardian*. The blog can be found at go.osu.edu/lakeguardian.

A CAREER OF *service*

*Clean Ashtabula River the crowning jewel in Lichtkoppler's
33-year career with Ohio Sea Grant Extension*



by Lisa Aurand Rice, Ohio Sea Grant Communications

It was just the latest in a long string of career successes for Frank Lichtkoppler. After more than two decades of work, the U.S. Environmental Protection Agency announced in September that all the cleanup work required to remove the Ashtabula River on Lake Erie from its list of Great Lakes Areas of Concern had been completed.

Lichtkoppler, the Ohio Sea Grant Extension agent and program leader, retired at the end of September after 33 years with Ohio Sea Grant and two prior years as an extension agent, for a total of 35 years of service.

Lichtkoppler was a major player in the river cleanup project, which spanned nearly his entire career and took \$75 million in funding from the state of Ohio, the federal government

and private sector businesses, says Ohio Sea Grant Director Jeff Reutter, who praised Lichtkoppler's unceasing dedication to the cause.

"It wouldn't have happened without this really long-term commitment by the Ashtabula River Partnership, and there were very few people who were with it the whole time," Reutter says. "Frank is one of those key people, often serving as the secretary for the group, the facilitator for the group, the person that organized it and called it together, always trying to deflect leadership, but often serving as the glue to hold it together and keep it moving."

Lichtkoppler's interest in the environment started when he was very young. "I wanted to be a Smokey the Bear ranger," says Lichtkoppler, who grew up in the Cincinnati area. Initially, he was interested in becoming a naturalist, but that particular aspect of environmental science didn't prove to be his strength.

"I couldn't memorize all that stuff. They all looked like small, chirpy birds to me," Lichtkoppler says.

After earning his bachelor's degree in natural resources at The Ohio State University, he spent a few years in the Peace Corps in India working on a fisheries project, which grew his interest in that aspect of environmental management.

After returning from India, Lichtkoppler got a job as a 4-H extension agent in the Atlanta area. He married his wife, Kathleen, a teacher, and attended graduate school at Auburn University, earning a master's degree in aquaculture and water quality.

He began working for Ohio Sea Grant Extension in 1981. The position offered Lichtkoppler the unique opportunity to make a difference in the community where he lived, he says. He attributes his accomplishments to the many years he spent in the role.

"I think longevity's been an issue," he says. "You have to stick around long enough to get something done. That work doesn't happen overnight."

An early project that showed Lichtkoppler's tenacity was the issue of sand dredging and dumping in the Fairport area, Reutter says. In the mid-1980s, the sand that drifted from Mentor Headlands Beach to the breakwalls at Fairport Harbor was being dredged and dumped in the open lake. That clean sand was a valuable resource that was being wasted, Reutter says. In addition, the beach on the eastern side of the harbor was eroding because of the sand's diversion.

"(Frank) convinced the U.S. Army Corps of Engineers to bring the sand back into shore on the east side of Fairport, reducing the amount of erosion and preventing the loss of a valuable



Above: Frank Lichtkoppler, left, pictured with other extension agents in this photo from the 1980s, joined Ohio Sea Grant as an extension agent in 1981 and retired as an extension program leader in September 2014. Lichtkoppler says many of his accomplishments as an extension agent can be attributed to the amount of time he spent in the role.

Left: Lichtkoppler, second from left, leads a fish dissection during the 2003 Great Lakes Fishery Leadership Institute, a three-day workshop in fisheries management which he helped create and organize.



Above: The Ashtabula River's industrial past led to its listing as an Area of Concern. That designation was removed in September 2014, due to efforts of a large partnership that included Ohio Sea Grant. **Right:** Displays along the shoreline chronicle a twenty-year clean-up effort led by the Ashtabula River Partnership, of which Lichtkoppler was a key member.



resource,” Reutter says. “It’s simply maintaining what should be occurring naturally.”

That success led to a change in policy about sand and shoreline management all along the Lake Erie coastline.

“When you create a policy, that’s not just going to impact the local area in Fairport, but it’s an important policy all along the shoreline,” Reutter says.

One of Lichtkoppler’s strengths lies in gathering information – both scientific facts and public opinion – and presenting it to public officials, allowing them to make informed decisions about public policy based on both economic and environmental impact. Lichtkoppler saw his role as that of a facilitator and a neutral information broker.

“I said, ‘Here’s the data. You guys can decide what you want to do from that data,’” he says. “We’ve been a source of information on Lake Erie and the Great Lakes to folks who need information.”

One example of this took place in the 1990s, when 450 acres of wetlands and lagoons in Mentor, Ohio were in danger of being

lost to development. Lichtkoppler put together information to show community leaders the land’s value as a nature preserve.

“It made a strong enough impression that city officials took the issue to the public to vote on, and the residents of the community voted to tax themselves to buy all that land and keep it as a wildlife preserve and public area within the city of Mentor,” Reutter says.

Today, the Mentor Lagoons wetlands are some of the last remaining riverine marshes along the shore of Lake Erie. The nature preserve has more than three miles of hiking and biking trails and contains an area of coastal dunes and beach that supports two species of plants on Ohio’s threatened list.

Lichtkoppler says he plans to spend more time with his family, including his wife, Kathleen, and to sleep in more often.

“I don’t want to do anything,” Lichtkoppler says with his characteristic humor. “I haven’t planned my life, so why should I start planning now?” **TL**



Updated Erosion Fact Sheets

Ohio Sea Grant has published updates to two of its fact sheets: *Lake Erie Shore Erosion* and *Beaches Are Shore Protection*. Both publications were written by retired Extension program leader Frank Lichtkoppler and include valuable information for coastal property owners, as well as for members of the public concerned with the health of Lake Erie and its beaches.

Lake Erie Shore Erosion covers the basic concepts behind erosion, from gradual wave erosion on the shoreline to mass wasting or bluff slumping where shoreline ridges drop toward or into the lake in a single chunk. *Beaches Are Shore Protection* expands on this information by offering solutions and points of consideration for those managing shorelines or adjacent properties.



The free fact sheets can be downloaded as PDF files directly from the Ohio Sea Grant website.

Lake Erie Shore Erosion: go.osu.edu/LEshore

Beaches Are Shore Protection: go.osu.edu/LEbeach

SHORT & sweet

Half-day AVC Adventures take place of full-day field trips during summer months

Stone Lab's Lake Erie Science Field Trips in the spring and fall have been a staple treat for elementary, middle and high school science classes from all over Ohio and the Midwest.

But groups that meet during June, July and August – such as Girl Scout and Boy Scout Troops, summer camps and summer school programs – have been out of luck in past years. The more than 200 students attending the lab's 25 college-level courses don't leave room for tour groups to visit the island.

There has always been interest in summer trips and tours for younger students, says Kelsey Dick, Aquatic Visitors Center (AVC) supervisor. To fill that gap, the AVC Adventures program was piloted in 2013 and launched in 2014 as an alternative to school-year field trips to Gibraltar Island itself.

The four-hour AVC Adventures trips are offered on Mondays and Tuesdays for up to 30 people at the Aquatic Visitors Center, which is located just west of downtown Put-in-Bay. In 2015, AVC Adventure field trips will be offered from May 11 through September 29. The program is suited best for fifth through twelfth graders, but fourth graders may participate in trips that do not involve boating.

The groups can pick three, hour-long activities from five available options. The programs generally start with AVC Tour & Fishing Fun, Dick says.

The AVC building was formerly the State Fish Hatchery until the hatchery closed in the 1980s. It was converted to an educational center in 1992, and Ohio Sea Grant took over its management in 2009, leasing the building at a minimal cost from the Ohio Department of Natural Resources, Division of Wildlife and partnering with the division to offer top-notch science experiences and teach children how to fish. "We walk through the building and talk about the different reasons why we need hatcheries and why they're important," Dick says. "We have a lot of displays about the ecology of Lake Erie."

Aquaria and the fish runs inside the building showcase common Lake Erie inhabitants. Then students learn how to fish and spend some time fishing off the dock at the AVC. Fishing equipment and bait is donated by the Division of Wildlife as part of its partnership with Ohio Sea Grant.

"We always do pretty well (with fishing) because of the invasive goby," Dick says. The invasive fish tends to be the most commonly caught species at the dock.

Other activities that can be selected include the Erie Island Cruise, which includes a fish trawl; a Birds for Beginners walk around Terwilligers Pond to spot and identify birds, including the bald eagles that nest there; a Water Quality Walk, during which students

sample macroinvertebrates and learn how they're used as indicators of water quality; the Reptiles & Amphibians class, which gives students a hands-on look at animals found in the area; and the Ins and Outs of Lake Erie Fish class.

"We learn about the anatomical structures of the fish and fish identification," Dick says. "We give them different species and work together in groups. ... The kids get to do their own dissection. We've already talked about the lesson and then they get to see what we've been learning about."

Collecting macroinvertebrates during the water quality walk and holding snakes in the reptiles and amphibians class are among the most popular activities, she said.

"The kids love herpetology. They love sending pictures home to their parents of them holding snakes."

Though the field trips have only been offered for a few summers, staff members have already seen how successful they can be at encouraging an interest in science in the young people who attend.

"We have a wide variety of students coming through. Some of them have never been fishing before or held a fish," Dick says. "It's a really neat experience, especially with the younger kids. It's cool to be the first person to introduce them to that." **TL**

AVC Adventures cost \$55 per person and do not include lunch. To schedule an AVC Adventure or school year field trip, visit stonelab.osu.edu/tripsandtours.

getting an early start on

by Lisa Aurand Rice,
Ohio Sea Grant Communications

SCIENCE

Rachel McLaughlin didn't know anyone else in her school – or even in all of Springfield, Ohio – that was as interested in insects as she was. Rachel has been collecting bugs of all sorts for five years, a rather unusual hobby among the teenagers she was acquainted with.

But now the Shawnee High School senior knows at least another 5 students who also have insect collections. Creating a collection was a requirement for students in the Introduction to Insect Biology class Rachel took at Stone Laboratory in June 2014.

She had been a self-taught insect collector, but the course gave her both the book smarts and the practice she needed to take her collection to the next level.

"If you don't have the fieldwork and you don't get out there, the (information) won't stick," Rachel says. "You learn different ways to catch the insect and get it in the jar. Until you start doing it, you won't understand how to catch them and how to handle them and tell them apart."

Among the 25 college-level courses taught at Stone Lab each summer are several introductory courses that are open to advanced high school students, typically juniors and seniors. Students get a taste of what undergraduate coursework will be like while earning college credit and exploring their interest in science.

"It's much more hands-on than a regular high school classroom or even an introductory-level college class," says Stone Lab Research Coordinator Dr. Justin Chaffin, who teaches Introduction to Biological Studies. "The firsthand experience really helps students understand the material better."

Baldwin Wallace University senior Marissa Ganzfried, from Worthington, Ohio, first learned

about Stone Lab's classes from her older brother, who attended one there himself. She spent a week at the lab after her freshman and junior years in high school, taking Introduction to Aquatic Biology and Introduction to Insect Biology.

"As soon as I entered high school, my mom suggested going up (to Stone Lab), and I agreed completely," Ganzfried says. "In high school, you're sitting in classes and reading books and maybe doing a lab in a laboratory, but at Stone Lab, you're not tied down to those textbooks. It's the hands-on experience. Being able to feel it, see it and hold it increases the learning potential you have outside of the classroom."

The aquatic biology course took her out on Lake Erie and to creeks and rivers in the Sandusky area, spending time on the lab's

research vessels, collecting specimens and doing some dredging and seining. The insect biology course was similar. Students traveled to North, Middle and South Bass Islands to create their insect collections. The experiences helped Ganzfried decide to major in biology.

"I wasn't sure what type of science I was interested in," Ganzfried says. "Aquatic biology was a great introduction. I was always interested in science, but Stone Lab fostered that interest more. It made me curious about what was out there and what field I could go into."

She returned to the lab in 2012 for five weeks after her freshman year of college, taking Field Zoology and working on a fish curation project with the Research Experience for Undergraduates Scholarship Program. She even worked at the Stone Lab/Ohio Sea Grant Columbus office for a summer. Now she's considering applying to master's degree programs in entomology or aquatic biology/fisheries, and she credits that in part to her classes at the lab, beginning with the two she took while in high school.

"It's a great outdoor education and experience," she says. "I think it's important for students to see that there are so many different types of field research and science research and you're not just limited to being in a laboratory." **TL**

"It's the hands-on experience. Being able to feel it, see it and hold it increases the learning potential you have outside of the classroom."

— RACHEL McLAUGHLIN



Clockwise from right: Baldwin Wallace University senior Marissa Ganzfried, left, has spent time at the lab during three summers, including twice while she was in high school. High school student and insect enthusiast Rachel McLaughlin took this photo of a monarch caterpillar during her time at the lab. McLaughlin, second from right, connected with other teens who have similar interests during her time at Stone Lab.



GIVING BACK

FORMER STONE LAB STUDENTS CREATE
PLANNED GIFTS TO SUPPORT THE LAB



by Dr. Jeff Reutter, Ohio Sea Grant & Stone Lab Director,
and Christina Dierkes, Ohio Sea Grant Communications



Stone Lab students always maintain a special connection to their time on the island. Many will return as Friends of Stone Lab to help with annual events, or they support the lab through donations. And then there are a few alumni who go the extra mile and include Stone Lab in their estate, contributing to Lake Erie research and education long after they themselves are gone.

DR. PAUL AND JOAN STROMBERG

Paul and Joan have made Stone Lab a beneficiary in their estate to create the Paul C. and Joan L. Stromberg Endowment Fund. Once established, the fund will provide scholarships to graduate students completing research projects at Stone Lab, or it will benefit undergraduate researchers in the absence of graduate students.

Paul first came to Stone Lab as an undergrad in 1966, sampling mussels for parasites as part of his work with Dr. John L. Crites in the zoology department at The Ohio State University. He returned in the summer of 1967 and as a graduate research



Above: A number of Stone Lab alumni return at least once a year to show off the island to visitors at the Friends of Stone Lab Open House.

Top Right: For many Stone Lab alumni, that first glimpse of Gibraltar Island is one they never forget.

associate from 1969-73, when he received his Ph.D. In addition, he was a post-doc at Stone Lab in 1974.

"I was thrilled to see the lab for the first time and will never forget that first glimpse of Gibraltar as the Miller Ferry rounded Peach Point," Paul remembers. "I was hooked at that moment."

"Paul was an excellent example of the gifted, dedicated and hard-working graduate students working with Dr. Crites at Stone Lab," says Ohio Sea Grant and Stone Lab director Dr. Jeff Reutter.

While Paul was doing research on Gibraltar Island, Joan worked in a number of island businesses, and she managed the Stone Lab bookstore in 1972. The two had met in college, married in 1970, and even got to live in Bayview, the current Stone Lab administration building, in 1974.

Their planned gift came about because they want to give future student researchers at Stone Lab the same opportunities they had.

"John Crites was the most important mentor in my life. His example of generosity, commitment to teaching and students and of giving back is what prompted this gift," says Paul, who also completed a veterinary medicine degree at Ohio State. "His connection to Stone Lab and our exceptional experience cemented it as a unique place for students and a valuable resource for Ohio State. The bequest is a small way we can pay back and help to ensure it will continue to provide opportunity for students to reap the benefits of working and studying there."

"This generous gift from Paul and Joan is greatly appreciated and will help student researchers forever," Reutter acknowledges. "I hope many other former faculty members and students will consider following their wonderful example."

“Stone Lab experiences occur 24/7 for both professors and students, so it is crucial to support the instructional efforts in the classroom.”

— KAREN A. JENNINGS

KAREN A. JENNINGS

Karen was a student at Stone Lab in 1964 and 1975, and those experiences led her to an early career at the Ohio Biological Survey. In addition, the relationships she built with her classmates and professors fueled her passion for environmental issues and science education, and created lifelong friendships that resulted from summers filled with hard work and hard play.

In 1982, Karen was instrumental in the creation of the Friends of Stone Lab (FOSL), a group of Stone Lab alumni that supports programs, creates opportunities for former students and faculty to stay connected, and gives new students a chance to make their own Stone Lab memories. She served as FOSL's president in 1982-84 and 1998-99, and in 2002, started the annual Buckeye Island Hop to encourage other Ohio State alumni groups to take advantage of the opportunities offered at Stone Lab. Karen was inducted into the Stone Lab Hall of Fame in 2007.

Karen's gift will establish two related funds: the Karen A. Jennings Facility and Instructional Support Fund, which will provide immediate support, and the Karen A. Jennings Facility and Instructional Endowed Support Fund, which focuses on long-term support. Both funds will help build or renovate faculty and staff housing at Stone Lab, purchase scientific equipment and offset transportation costs for educational programs, and improve other Stone Lab facilities used for education.

“Stone Lab experiences occur 24/7 for both professors and students, so it is crucial to support the instructional efforts in the classroom,” Karen says. “The increasing cost of fuel impacts the frequency and location for instructional field trip experiences. And physical facilities are expensive to maintain in an island environment. Although much work is being done, the list of renovation and maintenance needs is very long, and significant work will be needed again in 30 years.”



DRS. TOM AND BETH HALL

In addition to supporting Stone Lab through frequent volunteer work, Tom and Beth have chosen to include the Ohio Sea Grant & Stone Lab Annual Fund in their estate. This gift provides the greatest possible flexibility and allows Stone Lab to use their support wherever it is needed the most.

Tom was a student at Stone Lab in 1972, and has found his time there to be life-altering. Four years of undergraduate work had not turned into the career path he had hoped for, but he did gain admission into the zoology graduate program at The Ohio State University. And when combined with that academic success, contacts made at Stone Lab were instrumental in his acceptance to the Ohio State College of Medicine the following summer.

“This led to a rewarding career first in emergency medicine and now as a medical director for Anthem Insurance,” Tom remembers. “More importantly, I met my wife Beth, a fellow medical school classmate, and we have had a wonderful marriage and family life for nearly 40 years. For me it was truly ‘But for Stone Lab...’” Tom says.

Declaring their planned gift allowed Tom and Beth to show their support to others who may also be considering similar options. “Of course, we plan to provide further support during our lifetimes as well,” Tom adds. “We understand how important the education and research at Stone Lab are to ensuring that our grandchildren will live in a world with clean air, clean water, and the sweet sound of birds singing.” **TL**

Above: In addition to summer college courses, gifts to Stone Lab support year-round science programs for kids and adults, as well as educational tours and renovations to the historic facilities.



Make your tax-deductible donation at stonelab.osu.edu/fosl/give.



Climate Exploration Series



GLACIERS, MOUNTAINS & PEOPLE

Wednesday, November 12, 2014
6-9 p.m.

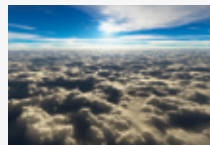
Blacklick Woods Metro Park,
Beech-Maple Lodge
6975 E. Livingston Ave.
Reynoldsburg, OH 43068



THREE MILLION YEAR OLD POLAR PLANTS AND WHAT THEY TELL US OF OUR CLIMATE'S PAST

Wednesday, November 19, 2014
7-8:45 p.m.

Franklin Park Conservatory
1777 E Broad St.
Columbus, OH 43203
go.osu.edu/plants



EARTH'S THERMOSTAT: OUR SOLAR FURNACE AND GAS CEILING

Tuesday, January 27, 2014 or
Wednesday, January 28, 2014
7-8:15 p.m.

Ohio State University Planetarium,
Smith Laboratory
100 W 18th Ave.
Columbus, OH 43210

ABOUT THE SERIES

Ohio State's Byrd Polar Research Center, Ohio Sea Grant and 4-H have collaborated with many public and nonprofit organizations around central Ohio to share climate information through the creation of a new webinar series, Climate Explorations, and a new informal education curriculum to be used by 4-H. The curriculum, which includes Great Lakes climate information, will be teacher-tested and rolled out to classrooms in 2015. More than 50,000 Ohio students annually will benefit from this effort.

For more about this project funded by an OSU Extension CARES grant, visit bprc.osu.edu/climateexplorations or call 614-688-8279.



Recordings of previous events are available at go.osu.edu/natsec, go.osu.edu/modeling and go.osu.edu/dollars.



Alumni Survey

STONE LAB WANTS TO Hear from You

Online survey ► go.osu.edu/letusknow

Are you a former Stone Lab student who's now working in the sciences? Did your time on Gibraltar Island help to shape your future in some way? We want to know about it!

Ohio Sea Grant and Stone Lab are asking Stone Lab alumni of all ages to complete a short survey to give us an idea of how the Stone Lab experience can impact students beyond a summer on the island.

Your answers can remain anonymous, or you can give us permission to contact you for future *Twine Line* articles, student profiles, and Stone Lab information materials. Future students always want to know what to expect from their Stone Lab summer, and who better to tell them than someone who's been there?



By Lisa Aurand Rice,
Ohio Sea Grant Communications

Cycles of SCIENCE

Hilary Thompson never dreamed that a bus ride would be one of the things that led her to Greenland in summer 2014, where she researched methane cycling.

Hilary, who graduated from The Ohio State University in 2012 with a degree in Evolution, Ecology & Organismal Biology, had heard about summer courses at Stone Lab from an academic advisor, but it wasn't until she spotted an ad on the Campus Area Bus Service that it really piqued her interest.

"I started looking at the classes and read about the Research Experience for Undergraduates program," says Hilary, who is from Strongsville, Ohio. "I loved doing field work and stuff, so I figured I might as well apply for this and see if I get it."

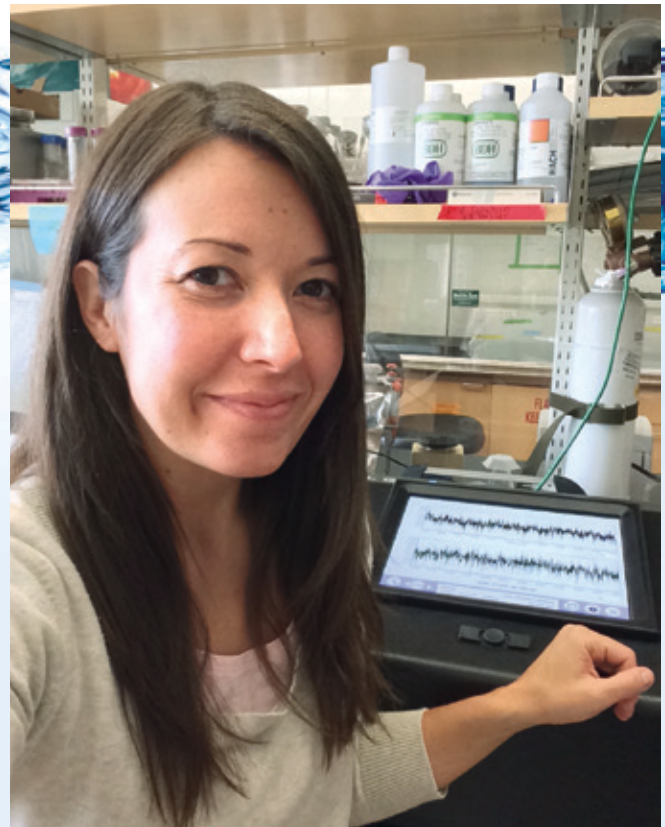
Though she applied for a limnology position, studying water quality, she landed a spot in ichthyology instead and was soon on her way to Gibraltar in summer 2011.

The experience turned out to be transformative for Hilary, who worked with two other REU students studying various aspects of the lives of invasive round gobies under Dr. Tom Simon of Indiana University. Hilary studied the gobies' diets, while the other two studied their sizes and ages.

Dr. Simon gave the students their starting points and challenged them to come up with their proposals and tasked them with the research.

"He was great at being there just for guidance if we needed it," Hilary says. "He said, 'Go learn, go try things out on your own and see what you come up with.'"

She and the other students had to try different methods for catching the gobies. After the fish were caught, Hilary spent much of her time as an REU in the lab, dissecting round goby stomachs and identifying the contents – the macroinvertebrates that the gobies eat. Once the field and lab work was complete, she used statistical methods to analyze her data,



▲ Hilary Thompson says her time at Stone Lab changed everything for her.

comparing the diet of each fish to the habitat in which it was caught.

"The REU experience was really amazing. You get that feeling of what it would be like to be doing this as your lifetime goal. For me, it really made me realize this is where it's at. This is what I want to do," Hilary says.

Before her experience at Stone Lab, Hilary had never considered going on to graduate school. But after participating in in-the-field research and talking with others working and teaching at the lab, she knew that was the path she wanted to take.

When classes started again at Ohio State that fall, Hilary sought out a position working at an undergraduate laboratory under Dr. Bill Mitsch and continued working with Dr. Simon, writing and publishing a paper based on her REU project.

After earning her bachelor's degree, she connected with Dr. Jeff White from Indiana University Bloomington and is now working toward a master's degree. She's studying biogeochemistry – the biological and chemical cycles within systems and how those relate to geological features. Research for her thesis took place in Greenland, where she examined methane cycling in lake systems.

Hilary says her time at Stone Lab changed everything for her.

"I owe the lab so much for where I am today," she says. "I never would have chosen this course for my life if it hadn't been for the lab. It was an amazing experience." **FOSL**

Friends Of Stone Laboratory

Dear friends,

First things first, I need to introduce myself. My name is Ken Scott and I am the new President of FOSL. Sheila Lewicki, our immediate Past President, served for two outstanding years and has continued the magnificent tradition of past FOSL presidents, the list of which reads like a Who's Who of Stone Lab luminaries! The Past President is still a member of the FOSL Board so we will not be losing Sheila, but her life will soon be moving in new directions as she is now a brand new RN – congratulations Sheila!!

For the past two years I have been the FOSL Vice President, and I was a Board Member for two years before that. Prior to that I was, hopefully like many of you, an active volunteer with FOSL. I am an alumnus of the OSU College of Engineering and have operated a consulting business, specializing in acoustics and noise control, for the last 25 years. Notwithstanding, Jeff likes to brag (?) that I am probably the first FOSL President to have never taken a course at Stone Lab!

I mentioned that to someone recently and they did a double take and just kind of stared at me, so I guess it's a rarity. But taking several courses at the lab is definitely on my bucket list and hopefully before my term expires I will be able to join most of you in reminiscing about my time as a student "on the island"!

*Sincerely,
Ken Scott, FOSL President*



The Magic of the Islands

by Ken Scott, FOSL President

Top: The *Brig Niagara* and a massive flotilla of private boats, as viewed from Lookout Point on Gibraltar Island.

Above: Sam shows off his naval regalia before making his way to the Battle of Lake Erie.

I mentioned in my Letter that I had never taken a course at Stone Lab, but in speaking to many of you who have, there seems to be a recurrent theme, namely the "magic" of the island! It certainly seems that once you come here, and discover Gibraltar and the Bass Islands, you're hooked and you want to keep coming back. I know in my early days as a volunteer I was always fascinated that it took four modes of transport to get me from Columbus to Gibraltar: auto, ferry, shuttle and (usually) a little utility boat. Then when you're on the island it seems that the rest of the world is light years away!!

Recently, thoughts of last year's experiences on the islands, celebrating the Bicentennial of the Battle of Lake Erie, came back to me. As a Buckeye football fan and a band enthusiast, I must say that the spectacular arrival of the marching band, on a Miller Ferry, was a highlight for all time!! Many of us knew that the band would be arriving on a ferry at the downtown docks, but the looks on the faces of the unsuspecting boaters at the town docks, when the ferry pulled into the bay with the band playing the fight song, was priceless!

The Friends of Stone Laboratory (FOSL) began in 1981 as a support group to “bring Stone Laboratory into the 21st century with the best possible facilities, equipment, and professors, and make this an unequaled learning experience available to all outstanding students.” Members of the Friends provide a way for former students to support the facility by raising awareness and funds for scholarships, research, and equipment.

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 Kelly Dress, Business Office Manager (dress.3@osu.edu)
 Dr. Justin Chaffin, Research Coordinator (chaffin.46@osu.edu)

FOSL

Dates to Remember

Early 2015	Stone Lab Winter Program
September 12, 2015	Stone Lab Open House
October 2-4, 2015	Buckeye Island HOP



The next morning we were up early as rumors had spread that our own Sam Narotski would be making an appearance in full 1812 military regalia! Sure enough, just as the sky was beginning to lighten, down the hill came Sam, looking every bit the Naval Officer he was portraying. After a few final uniform checks, Sam climbed into one of the boats, and off he went bravely crossing alligator bar in search of adventure on the high seas. Well, sort of...

But the day was just beginning. From Lookout Point you could see the tall ships beginning to appear out of the mist – still more magic! I think there were something like 15 ships in all, split between British and American that had come to reenact the Battle of Lake Erie. All of the OSU research boats participated in the huge flotilla that accompanied the tall ships into “battle.” But of course the crown jewel was the *Brig Niagara*. I was with a group on Gibraltar’s Lookout Point, and we were able to observe

the *Niagara*, and the other “American” ships, as they pulled out of Put-in-Bay harbor, rounded Gibraltar, and headed out toward Rattlesnake Island to begin the battle.

The memories of that weekend will stay with me for a very long time! Yes, it was an exceptional weekend, but my point is that ANY weekend at Stone Lab will become exceptional in its own way. It’s all part of the magic and it’s why I, and so many of you, love to visit the lab, and why we choose to support Stone Lab and Sea Grant with our time and money. If you’re a “regular” you know exactly what I’m talking about but if you have yet to experience this thrill what are you waiting for? The island is shutting down for winter now, but starting early next spring there will be lots of volunteer opportunities. I hope to see you soon and together we can enjoy the magic of the islands!!



Above: The arrival of The Ohio State University Marching Band at Gibraltar Island was a highlight of the event.



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stonelab.osu.edu/fosl/give today!

Every year, about 25% of Stone Lab students receive scholarships to help them attend classes at the lab, and those scholarships are supported in large part by gifts from donors like you.

Your contribution could help introduce a high school student to Lake Erie science, help a college student take their first outdoor science class, or support a student researcher in completing their first published project.

Every little bit helps Ohio Sea Grant & Stone Lab in training the next generation of Lake Erie leaders.

