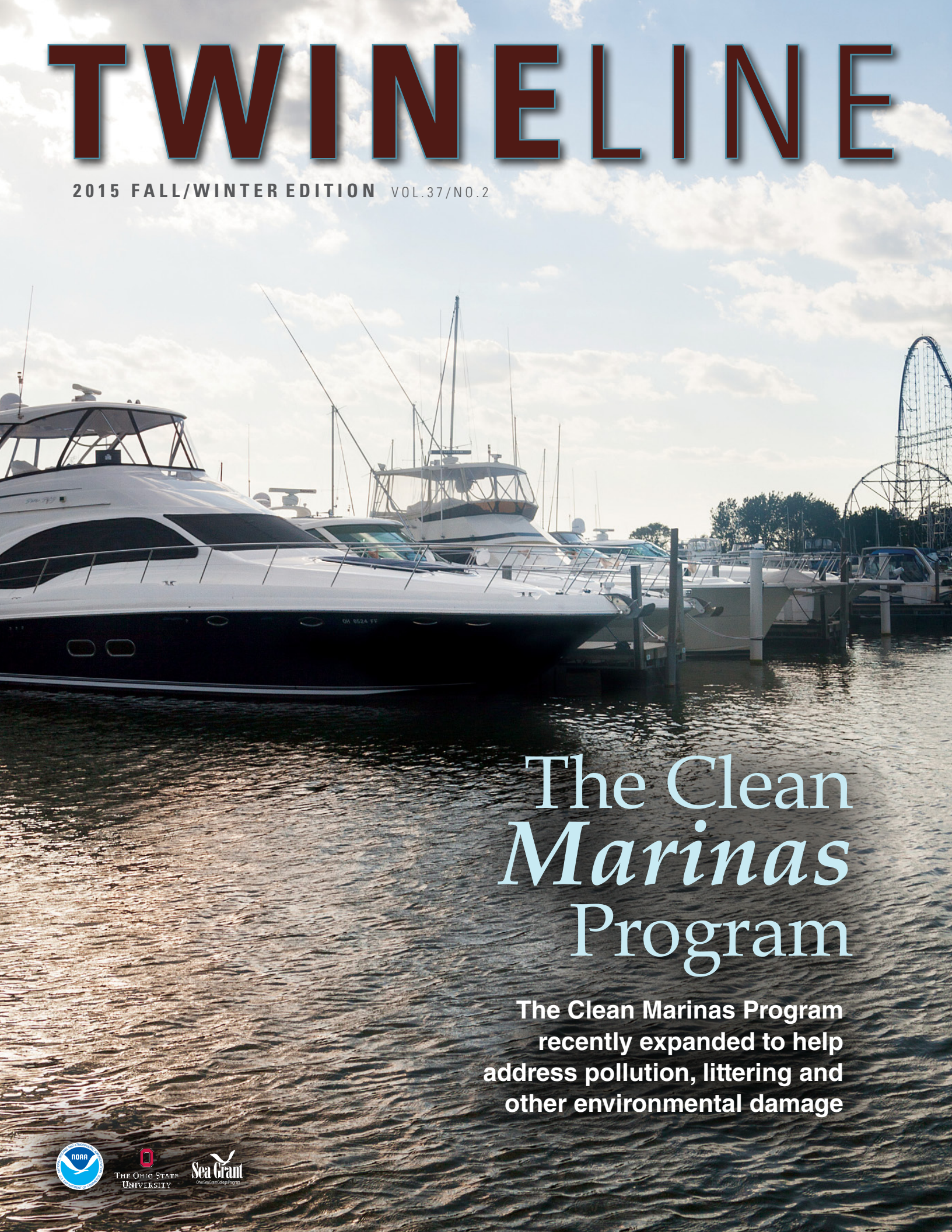
TWINELINE

2015 FALL/WINTER EDITION VOL.37/NO.2



The Clean *Marinas* Program

The Clean Marinas Program recently expanded to help address pollution, littering and other environmental damage

NOAA

The Ohio State University

Sea Grant
Ohio Sea Grant College Program

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2015 FALL/WINTER EDITION

GIVE THE GIFT OF STONE LAB

Have a Stone Lab alum in your life who could use some new casual wear this holiday season? You can still order items like T-shirts, hoodies and water bottles via the Stone Lab website at **stonelab.osu.edu/store**.

All merchandise proceeds benefit Stone Lab scholarships, which support nearly 40 Stone Lab students each summer.

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TWINELINE

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"The Clean Marinas Program is a voluntary, incentive-based certification program that recognizes marinas across Ohio for implementing best management practices that improve our air and water quality,"

— SARAH ORLANDO, PROGRAM MANAGER

The Ohio Clean Marinas Program EXPANDS

by Christina Dierkes, Ohio Sea Grant Communications

Boating plays an integral part in Ohio recreation. On Lake Erie, boaters can explore the coastline, visit the islands and fish for Walleye. And on inland lakes and rivers, paddling and pontoon opportunities give people a chance to experience Ohio's waterways up close. But with outdoor tourism come potential problems, such as oil and gas pollution, littering and other environmental damage.

Above: Cedar Point Marina in Sandusky is one of 47 Ohio Clean Marinas on Lake Erie. With the statewide program expansion, the Clean Marinas team hopes to expand that number to 60 by 2017.

The Ohio Clean Marinas Program, a partnership between Ohio Sea Grant, the Ohio Department of Natural Resources (ODNR) and the Lake Erie Marine Trades Association helps marinas address these issues and maintain the ecosystem on which their business relies most. A complementary Clean Boater program educates boaters that may not dock at marinas about steps they can take to protect their local waterways.

Previously only available to Lake Erie marinas and boaters in partnership with ODNR's Office of Coastal Management, in June 2015 the program expanded from the Lake Erie watershed into the rest of the state of Ohio, partnering with the ODNR Division of Watercraft.

"The Clean Marinas Program is a voluntary, incentive-based certification program that recognizes marinas across Ohio for implementing best management practices that improve our air and water quality," explained Program Manager Sarah Orlando. The non-regulatory program recognizes marinas that want to do the right thing for the environment and provides them with the education to do so. "We get some good quality people that are working with us on this program, who want to do something for the longevity of their business as it relates to a working waterfront, and who have an interest in ensuring water resources are protected for years to come," said Orlando.

Started in 2004, the Ohio Clean Marinas Program so far has certified 47 Lake Erie marinas as Clean Marinas, with another 39 marinas currently pledged to complete the certification process. With the expansion, the team hopes to have 60 certified Clean Marinas by 2017.

Orlando continues to work with marinas and boaters in the Lake Erie watershed to help them reduce their impact on the lake environment and preserve natural areas for future generations to enjoy. She also supervises two new employees who will help take Clean Marinas practices and certifications statewide.

Program Coordinator Heather Sheets is based in an ODNR Watercraft field office at Alum Creek State Park. Sheets works with Ohio marinas and boaters in the Ohio River watershed, beginning with a number of Ohio state parks and watershed conservancy district marinas that will help set a local example for private marinas throughout the state.

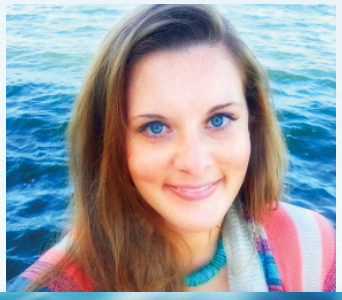
"I'm most excited about extending Ohio's program inland because most states' programs are focused around their coasts," said Sheets. "I think it would show Ohio's commitment to protecting all of our water both in the Lake Erie watershed and the Ohio River watershed. And personally, I'm excited to meet and talk with people who are committed to protecting the rivers or the lakes that they love."

Sheets will also help to expand the Ohio Shrinkwrap Recycling Program statewide. Boaters use plastic shrinkwrap to protect their vessels from the elements during harsh Ohio winters, and depending on size, each boat requires 20 to 30 pounds of shrinkwrap to be completely covered.

Since the beginning of the recycling program in 2006, Lake Erie marinas and greenhouses alone have recycled more than 2.2 million pounds of shrinkwrap, the equivalent of filling 47 buses full of plastic. The shrinkwrap was recycled into guardrail blocks, which have been used along 411 miles of road in Ohio and neighboring states.

Program Administrator Jenny Roar focuses on merging program efforts between the Lake Erie and the Ohio River watersheds. She is also working to improve the interaction and communication with the

Left: Certified Clean Marinas can fly a Clean Marinas flag, making it easy for boaters to identify which marinas are successfully participating in the program. **Above:** Boating plays an integral part in Ohio recreation, and Clean Marinas everywhere help to ensure that this vital economic resource is protected for future generations.



THE OHIO CLEAN MARINAS TEAM:
Sarah Orlando // Heather Sheets // Jenny Roar

(left to right) **Sarah Orlando** joined Ohio Sea Grant in 2011 after graduating from Texas A&M University at Galveston with a Master's degree in marine resources management. She holds an undergraduate degree in biology from Wittenberg University and spent time at Texas Sea Grant as an education associate during graduate school. **Heather Sheets** joins the Ohio Clean Marinas team from Burr Oak State Park, where she was a naturalist in the Southeast District. She holds a Wildlife Resource Management degree from Hocking College, degrees in anthropology and environmental studies from Ohio University, and a number of certifications in environmental education. **Jenny Roar** was an extension educator in Ashland County, where she worked with the SNAP-Ed program prior to joining the Ohio Clean Marinas team. Jenny holds an undergraduate degree in education from Ashland University and a Master's degree in environment and natural resources from The Ohio State University.

marina and boating community through leading efforts such as quarterly reports, newsletters, how-to videos and marina marketing materials. She is based in the ODNR Office of Coastal Management in Sandusky, along with Orlando.

"I'm looking forward to working with marina owners to promote their participation in this program so their boaters recognize the effort they are making to improve water quality," Roar said. "I'm also interested in expanding our existing partnerships with marina associations in addition to the state parks and state agencies that we haven't had any partnerships with previously."

Along Lake Erie, the Clean Marinas Program is a partnership between Ohio Sea Grant, the Ohio Department of Natural Resources and the Lake Erie Marine Trades Association (LEMTA). Ohio Sea Grant and ODNR both provide funds for staff and programming, while the LEMTA partnership helps provide industry insight and promotion of the program to marinas and boaters along the shore.

The Clean Marinas expansion, at its core, remains a partnership between Ohio Sea Grant and ODNR, with Sheets and Roar officially employed by the ODNR Division of Watercraft, while Orlando remains an Ohio Sea Grant employee, supported in part by the ODNR Office of Coastal Management through funding from the National Oceanic and Atmospheric Administration.

"Previously, due to our funding source, we were restricted to Ohio's Lake Erie watershed, and couldn't work with marinas or boaters outside of that area," said Orlando. "Our expansion now, in partnership with the ODNR Division of Watercraft, enables us to work both in the Lake Erie watershed and the Ohio River watershed, expanding our reach to the rest of Ohio."

The Clean Marinas team is also promoting the Clean Boater Program across their new outreach area, engaging boaters who may not dock at a marina or yacht club, or who may simply rent motorized boats or kayaks instead of owning them. The Clean Marinas staff have already partnered with the ODNR Division of Watercraft on various events such as the Ohio Women's Outdoor Adventures program, the Ohio State Fair and different Paddle Palooza events around the state and will continue to perform boater outreach as more opportunities in the Ohio River watershed come about.

"Because the Ohio River watershed expansion is new this year, I am working to build a list of events statewide involving marinas and boaters – paddlers, motorboats, personal watercraft – so any information on events that people want to share would be more than welcome," Sheets said. **TL**

The Clean Marinas

Certification Process

STEP 1 ›› Marina owners or managers attend an in-person Clean Marinas Program workshop, held at different locations throughout Ohio. The workshop provides extensive training on the best practices that are part of the program and helps marina staff develop the certification protocol that works best for their marina.

STEP 2 ›› Marina owners sign the Clean Marinas pledge, an informal agreement to work towards becoming a certified Clean Marina.

STEP 3 ›› A Clean Marinas Program staff member visits the marina for a pre-certification site visit, during which staff members use a Clean Marinas checklist to develop a customized list of recommendations and requirements for that marina's eventual certification.

STEP 4 ›› Marina owners and managers implement the certification checklist they developed with Clean Marinas staff, who are always available for questions or to recommend resources during the implementation process.

STEP 5 ›› Once the marina is ready for a certification visit, a Clean Marinas staff member, along with an outside reviewer, visits the marina and evaluates how well the marina has complied with the certification requirements. If that visit goes well, Clean Marinas certification is awarded that same day.

For more information about the Ohio Clean Marinas and Clean Boater Programs, email *ohiocleanmarinas@osu.edu*, and the appropriate coordinator for your watershed will get in touch with you.

If Not by Sea › Then by AIR

At Right: Ice ridges and weak spots can not only make working on the ice a treacherous endeavor, but also affect light penetration and therefore phytoplankton growth. The researchers were able to take samples in a variety of locations to determine the exact impact of these varying ice conditions.

by Christina Dierkes,
Ohio Sea Grant Communications

Small Grants Program Supports Alternative Sampling Methods for Winter Algae Research

(Credit: R. Michael McKay)

Ice cores from drilling through the surface ice were preserved for later analysis. Back in the lab, researchers measured rates of photosynthesis for those diatoms frozen in the ice, and used DNA analysis to identify specific species of phytoplankton.

Water sampling on Lake Erie in the summer is pretty simple: check for decent weather, find a boat, cruise to the sampling locations, take samples, bring them home. In winter, things get a bit more complicated: winter storms on Lake Erie can be frequent, so even if the lake isn't frozen, chances for sampling trips are likely limited. A frozen lake means needing to recruit an ice breaker to get to sampling locations, and sometimes, even those winter-ready ships aren't quite able to travel as freely as a research project may require.

This was the case for Dr. R. Michael McKay at Bowling Green State University during the winter of 2015. As part of ongoing research into winter algae populations in Lake Erie, McKay, his colleague Dr. George Bullerjahn and collaborators from Environment Canada have been collecting samples for analysis since 2007.

"In the past, we've been able to partner with both Canadian and U.S. Coast Guards and their ice breaking programs," McKay explained. "That cooperation has been very fruitful and allowed us to obtain samples during this time of year where it's quite difficult to get out to sample. However, given the ice thickness, there was limited Coast Guard activity on Lake Erie last winter."

During the heavy ice presence on Lake Erie in the winter of 2014, Environment Canada staff were able to charter a helicopter and still collect samples despite not being able to work from a Coast Guard ship. However, the agency's budget did not allow for the same process in 2015, so McKay contacted Ohio Sea Grant to see whether funding could be made available on the U.S. side of the lake.

The researchers were able to obtain funding through Ohio Sea Grant's Small Grants Program, which is open to applications year-round, to hire a helicopter service out of Lambertville, Mich. for a day of sampling on the Lake Erie ice.

For more information about this Ohio Sea Grant-funded project, contact *Dr. McKay at rmmckay@bgsu.edu.*

You may also be interested in "Ice Makers" in the Summer/Fall 2012 edition of *Twine Line*, available at *ohioseagrant.osu.edu/publications/twineline.*

"Because the helicopter operator was a little bit unsure about the safety of landing on the ice, he dropped down to let us off, and then he pulled back up and went back to Burke Lakefront Airport in Cleveland," McKay said, explaining the safety measures the researchers took while being out on the ice. "We also had two-way radio and cell phone communication at some locations on the lake, and so we were able to maintain contact with him to have him come back to pick us up. And had there been a problem, he would have been able to get up there in just a few minutes as well."

Winter algae populations in Lake Erie consist mostly of diatoms, tiny brown algae surrounded by silicate shells. Like other plants, diatoms need sunlight to survive and grow, so they tend to attach to the underside of lake ice once it forms on the water surface. This means varying ice conditions over the years could have a big influence on summer food webs, which in part depend on these winter diatoms, making it important to understand how the diatoms contribute to other organisms' life cycles.

McKay and post-doctoral researcher Mark Rozmarynowycz used a handheld auger – similar to ones used by ice anglers – to drill through the lake ice, keeping the ice core intact for later analysis in the lab. They then collected environmental data like water temperature and dissolved oxygen, as well as light penetration through the ice and into the water column.

"By the time we reached about 3 meters in depth, the light was diminished 100-fold from the surface," McKay said. "It didn't pass any further than that into the water column."

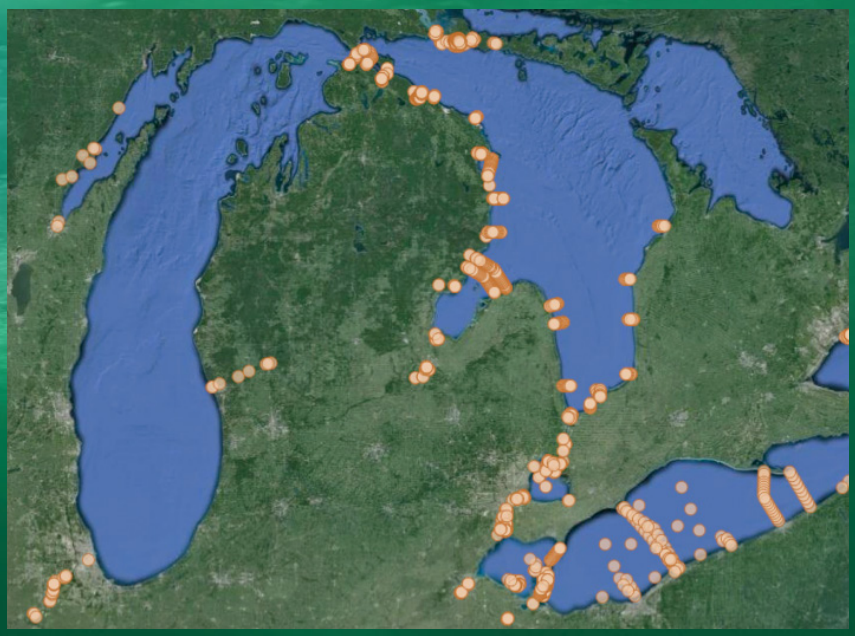
Light penetration is an important factor in winter algal growth because algae rely on sunlight for photosynthesis, without which the diatoms would essentially starve to death.

"One thing we did find with the winter of 2012, which had almost no ice, was that there was a major disruption in the phytoplankton community," McKay said. That may seem counterintuitive since phytoplankton is exposed to more light without ice on the surface of the lake and should therefore thrive. However, without ice, there is no barrier to prevent wind from mixing the diatoms throughout the water column, which keeps a lot of the phytoplankton quite literally in the dark.

That light limitation could become an increasing concern as more and more winters in the Great Lakes are defined as low-ice winters. With lower phytoplankton production come lower numbers of zooplankton, which in turn are an important food source for fish like Walleye and Yellow Perch that fuel Ohio's multi-million-dollar sport fishing industry.

"We think these winter diatom communities are really important for the integrity of the fisheries in the lake because they serve as important food sources for zooplankton," McKay explained. "And so when there is a disruption in this winter diatom community, the zooplankton are going to suffer and hence most likely the fish will suffer as well." **TL**

THE DROP OFF › Heavy ice on Lake Erie prevented McKay and his team from sampling with their usual Coast Guard partners in 2014. Instead, a helicopter brought two of the researchers to sampling sites on the ice north of Cleveland.



Right: The Great Lakes Acoustic Telemetry Observation System (GLATOS) covers large stretches of Lake Erie, where Vandergoot's research is focused. Each orange dot represents a receiver, which picks up and records the presence of tagged fish as they travel throughout the lake.

by Christina Dierkes,
Ohio Sea Grant Communications

RESEARCH EXPERIENCE

STONE LAB STUDENTS PARTICIPATE IN OHIO DIVISION OF WILDLIFE

fisheries research

For about six years, students in Stone Lab's Research Experience for Undergraduates (REU) Scholarship Program have participated in a multi-state Walleye movement and mortality study in Lake Erie. Using acoustic telemetry, researchers from the Ohio Department of Natural Resources (ODNR) and similar agencies across the region are tracking the movement of fish including Walleye, an important sportfish, to better understand how the fish travel throughout the lake during their life cycle.

In a contributing project funded by Ohio Sea Grant, ODNR researcher Dr. Chris Vandergoot is implanting acoustic trackers into Walleye spawning below a dam located in Ballville Township, just outside of Fremont, Ohio. The trackers in the fish, along with receivers placed throughout Lake Erie and neighboring lakes and streams, act much like the E-ZPass system in place on many U.S. turnpikes.

"Each of the receivers acts like a toll booth, and each fish with a transmitter in it is like a car," Vandergoot said. "So when you drive by an E-ZPass station on the highway, it records what time you were there, and in which direction you were heading. When a fish swims by these receivers, the system basically does the same thing; it logs when a fish was swimming by that receiver."

When combined with data on each individual fish – they're aged and sexed when the transmitters are implanted – researchers can determine where fish go between spawning seasons, whether they return to the same spawning location, and if they spawn every year or take "reproductive holidays" on occasion.

FIGURE 1

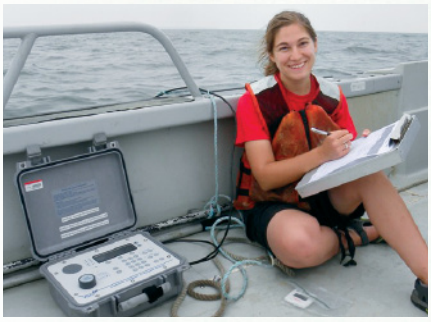


FIGURE 2

FIGURE 3

FIG 1: Students in Stone Lab's Research Experience for Undergraduates (REU) Scholarship Program have worked with the Ohio Department of Natural Resources on tracking fish in Lake Erie for about six years. Many have gone on to present the research at conferences, or to jobs in similar fields.
FIG 2: Transmitters are surgically implanted in Walleye while they congregate for spawning. While anglers are asked to return any transmitters found in their catch, the acoustic telemetry program provides many additional data points on the fish's life cycle than just reports of where that fish was eventually caught.
FIG 3: REU students may help with receiver data analysis, refining surgical procedures and collecting stored data from receivers in the lake. Sometimes, that involves kayaking with a laptop.

Dr. Vandergoot has also presented this research at Stone Lab's 2015 Guest Lecture series. The recording is available at ***go.osu.edu/SLglatos***

Receiver data is shared on the Great Lakes Acoustic Telemetry Observation System (GLATOS) website (***data.glos.us/glatos***), along with general information about the research projects and instructions for anglers who find a transmitter tag in their catch.

"For the first time we can actually follow fish and see what they're doing," said Vandergoot. "We're not relying upon anglers to turn in tags like we historically did."

Of course, the researchers aren't just digitally following fish around the lake for fun. "This is very cool science stuff, but at the end of the day this needs to be able to address management questions," Vandergoot said.

Spawning site fidelity – whether fish return to their "home" stream or reef to spawn – is an important consideration when making management decisions concerning sportfish like Walleye in Lake Erie. For population modeling purposes, it is important for biologist to understand the origin of Lake Erie Walleye as well as where they go over the course of their lives.

Stone Lab REU students have participated in research related to GLATOS for about six years, examining everything from how to best anesthetize a fish for the transmitter implant surgery to how well fish survive after being released back into the lake or after the stress of a spawning season.

The REU program allows students to work one-on-one with professional Lake Erie scientists on an independent research project while taking a Stone Lab course. Selected students receive a full scholarship to Stone Lab, including room and board, and often go on to present their projects at academic conferences, giving them a head start on graduate school or science careers.

One of those students is Zach Steffensmeier, currently a junior in environmental science at Duquesne University in Pittsburgh. During the summer of 2015, he worked with Vandergoot on a Fisheries Management REU, analyzing transmitter data and assessing Walleye mortality during spawning seasons in 2013 and 2014. In addition, he was able to work with ODNR staff to collect receiver data in western Lake Erie.

"I heard about Stone Lab back in high school, and went for a weeklong aquatic biology class," he said. "I just loved being out there, and when I was looking for a summer job this past year, I thought it would be great to go back there. I also really wanted to do research, so this was the best opportunity for me."

In addition to gaining experience in hands-on research and delivering a scientific presentation, the REU also solidified Steffensmeier's goal to work in the same field in the future.

"I want to do something with fish, that's for sure," he said. "I enjoy being outside in the field for fieldwork, so I'm definitely interested in being a fisheries biologist, whether that's through the Ohio Department of Natural Resources, through EPA, or at a university as a professor."

And with recommendation letters from Stone Lab and Ohio Department of Natural Resources staff, he's well on his way to one of those careers.

The larger GLATOS project involves agencies in Ohio, Michigan, Ontario, New York and Pennsylvania, as well as the Great Lakes Fishery Commission and the United States Geological Survey's Lake Erie Biological Station, and funding from the Great Lakes Restoration Initiative (GLRI) and Ohio Sea Grant. Overall, close to $1 million in assets are involved in this fisheries management effort.

"These projects are very large, and no one funding source can pull these off," Vandergoot said. "But when you bring different collaborators together with all these different resources, we're able to do amazing things." **TL**

To learn more about Stone Lab's REU program, visit ***stonelab.osu.edu/reu***. Applications for the 2016 program are due February 18, 2016.

Teaching About MARINE DEBRIS

by Lisa Aurand Rice & Christina Dierkes, Ohio Sea Grant Communications

(Credit: NOAA)

OHIO SEA GRANT EDUCATORS WORK WITH NOAA ON AN IMPORTANT ENVIRONMENTAL SCIENCE TOPIC

Marine debris is a problem that's easy for most people to ignore on a daily basis – but it's not something you can ignore when it's tangled in your trawl net, inside the stomach of the fish you catch or under your microscope in the lab.

To help address the problem in the Great Lakes, staff from NOAA's Marine Debris Program have partnered with Ohio Sea Grant and Stone Lab on a variety of education and outreach programs that focus on preventing marine debris and minimizing its harm on the environment. Marine debris, especially plastics, has direct and indirect impacts on wildlife and the ecosystems of our oceans and other waterways.

"Marine debris is a global problem, not just an ocean problem," explained Sarah Lowe, Great Lakes Regional Coordinator for the NOAA Marine Debris Program. "Essentially the same types of debris are found in the Great Lakes: There are the general litter-type items, there are microplastics problems, and there's derelict fishing gear that we see in both places, so it's really one and the same issue."

Most plastic debris breaks down into smaller pieces, but does not fully degrade in the water. These microplastics particles, which include microbeads found in personal care products like facial scrubs, are the subject of much current research because little is known about what happens to them after they go down the drain or break down in open water.

"Microplastics can be ingested by wildlife," said Lowe. "It's been shown that fish have ingested microplastics and there's some beginning evidence of birds ingesting plastics as well. The question then becomes what is it doing in the organism once it's ingested?"

In addition to research, education about marine debris is an important focus for both the Marine Debris Program and Ohio Sea Grant. In partnership with The Ohio State University's Stone Lab on Lake Erie, the organizations held a free three-day workshop on marine debris for teachers and informal educators in June 2015.

The thirteen participants trawled for debris in Lake Erie and then spent time analyzing their trawling finds. With the help of lab microscopes and guidance from instructor Dr. Lorena Rios Mendoza from the University of Wisconsin-Superior, participants viewed microplastics up close.

The following day, during a fish dissection lab led by Sarah Orlando, Ohio Sea Grant Extension educator and Clean Marinas Program manager, they used the microscopes to compare fish gills with the microplastics, judging which plastics would be filtered out and which may be ingested. Fortunately, none of the fish dissected during the workshop showed evidence of having ingested microplastics, Orlando said.

The educators also participated in a beach clean-up at South Bass Island State Park with the Alliance for the Great Lakes and created monofilament fishing line recycle bins to take back to their communities.

The NOAA website at ***marinedebris.noaa.gov*** offers a number of resources for educators and the public to learn more about marine debris and educate others about prevention measures.

"I think it was a good introduction to the topic for a lot of the educators," said Lowe. "They really enjoyed the workshop and will take a lot of it back with them to use in the classroom."

Ohio Sea Grant Education & Outreach Assistant Sue Bixler said the workshop strengthened her knowledge of the subject and helped her come up with ideas for a few educational activities she's currently working on.

The educators who attended taught at levels from elementary school through high school, and there was even one community college teacher, Lowe said. In addition to the cost of the workshop, grant funding through the NOAA Marine Debris Program and Ohio Sea Grant also covered transportation for participants.

Educators in Ohio's Ninth Congressional District will also be able to involve their students in continued efforts to educate the public about Great Lakes marine debris by participating in a public service announcement contest launched by Congresswoman Marcy Kaptur's office. The competition is open to students in grades 9-12, and entries close on March 1, 2016. More information can be found at ***go.osu.edu/marinedebrisPSA***.

"The topic of marine debris has been a major component in the outreach and education efforts for Ohio Sea Grant and Stone Lab this past year, and we are very excited to be able to help co-sponsor this contest raising awareness of this important Lake Erie issue," said Dr. Kristin Stanford, Stone Lab's education and outreach manager.

To reach out to the general public about marine debris, NOAA and Stone Lab are collaborating on a display housed at Ohio Sea Grant's Aquatic Visitors Center at Put-in-Bay. The display, which is still under construction, shows debris that has been found on nearby Lake Erie beaches to make visitors aware of the kinds of things that cause problems near their vacation spot, and will also emphasize what people can do themselves to avoid contributing to the marine debris issue.

"We want to make sure that we're getting the message out there that prevention is key," said Lowe. "While we definitely encourage clean-ups for debris already in the environment, keeping it from getting there in the first place is the best solution." **TL**

▲ **Above:** Educators in a Stone Lab marine debris workshop trawled for debris in Lake Erie and analyzed their finds while still on the research vessel.

▶ **Right:** Back at Stone Lab, the educators learned about microplastics, which can sometimes be found in the gills and stomachs of fish and other aquatic organisms. These tiny plastic particles are produced when larger plastic pieces break down in the environment.

New Funded Projects

Ohio Sea Grant to Fund Nine New Research Projects

Every two years, Ohio Sea Grant issues a request for proposals to scientists across Ohio conducting projects that address critical issues facing Lake Erie and the Great Lakes. Below are the nine projects Ohio Sea Grant will fund between February 2016 and January 2018, totaling about $480,000 in support.

▶ GEORGE BULLERJAHN AND MICHAEL MCKAY
Bowling Green State University
What makes *Planktothrix* bloom? An examination of physiological ecology from a genomics perspective

▶ SUZANNE GRAY, JEREMY BRUSKOTTER AND EUGENE BRAIG
Ohio State University
Can fish see the bait on the hook? Linking effects of algal and sedimentary turbidity on fish vision to the Lake Erie recreational fishery through research and outreach

▶ CYNDEE GRUDEN AND KATHRYN ROUSSEAU
University of Toledo & American Rivers
Determining the role of urban runoff in harmful algal bloom formation in the western Lake Erie basin

▶ LAUREN KINSMAN-COSTELLO AND LAURA JOHNSON
Kent State University and Heidelberg University
Opening the black box of nutrient processing in a Great Lakes coastal wetland

▶ MARK MCCARTHY
Wright State University
Sediment nitrogen dynamics in the western basin of Lake Erie relative to cyanobacterial blooms

▶ SILVIA NEWELL
Wright State University
Characterizing ammonium dynamics affecting harmful cyanobacterial blooms in Lake Erie

▶ AUDREY SAWYER
Ohio State University
Quantifying the effects of surface water-groundwater interaction on dissolved phosphorus loads to Lake Erie

▶ YVONNE VADEBONCOEUR
Wright State University
From the headwaters to the littoral zone: using attached algae as indicators of ecosystem impairment in the Great Lakes

▶ FASONG YUAN
Cleveland State University
Anthropogenic phosphorus storage, bioavailability, and cycling in the Maumee Bay and western Lake Erie

Above: Research at Bowling Green State University will continue to examine the driving causes of algal blooms in Sandusky Bay, focusing on how different algal types process nutrients during growth and toxin production.

A DAY OF **STONE** LAB *field trips*

by Lisa Aurand Rice,
Ohio Sea Grant Communications

If you haven't been to Stone Lab for a science field trip, you're missing out. That's the wisdom that students who have visited the lab pass on to their peers, say Brian Niemeyer and Frances O'Flaherty, two teachers who brought their classes to Stone Lab on June 10, 2015. We tagged along with the students from Lincolnview Local Elementary School in Van Wert, Ohio and Utica High School in Utica, Ohio, as they spent the day learning about Lake Erie's ecosystem.

10:40 AM ▸ A gaggle of Lincolnview students dons boots, grabs nets and heads out to Alligator Bar, a rocky shoal at the southwest tip of Gibraltar, as part of the Invertebrate Collection Walk. They kick over rocks and scoop water through their nets, taking anything they catch to a field station assistant, who collects the invertebrates in a shallow pan. They're looking for "biological indicators" – organisms that thrive in specific types of environments – to show whether the water is clean or dirty.

11:10 AM ▸ Inside, another group of kids views plankton through microscopes. "It's neat for them to see the different microorganisms that are in the water," said Niemeyer, the fifth grade teacher who organized the trip. "For a lot of them it's a first time for that. And it's good for them to use those microscopes. They're of a much higher quality than the ones we use in fifth grade at Lincolnview.

12:03 PM ▸ Lincolnview students, recently returned from a Lake Erie Science Cruise, get a lesson on fish anatomy, identify the fish they caught during the cruise using a dichotomous key and then dissect the animals. "Some of them aren't as comfortable, but they divide them up into small groups. It allows the doers to do and the observers to observe," Niemeyer said.

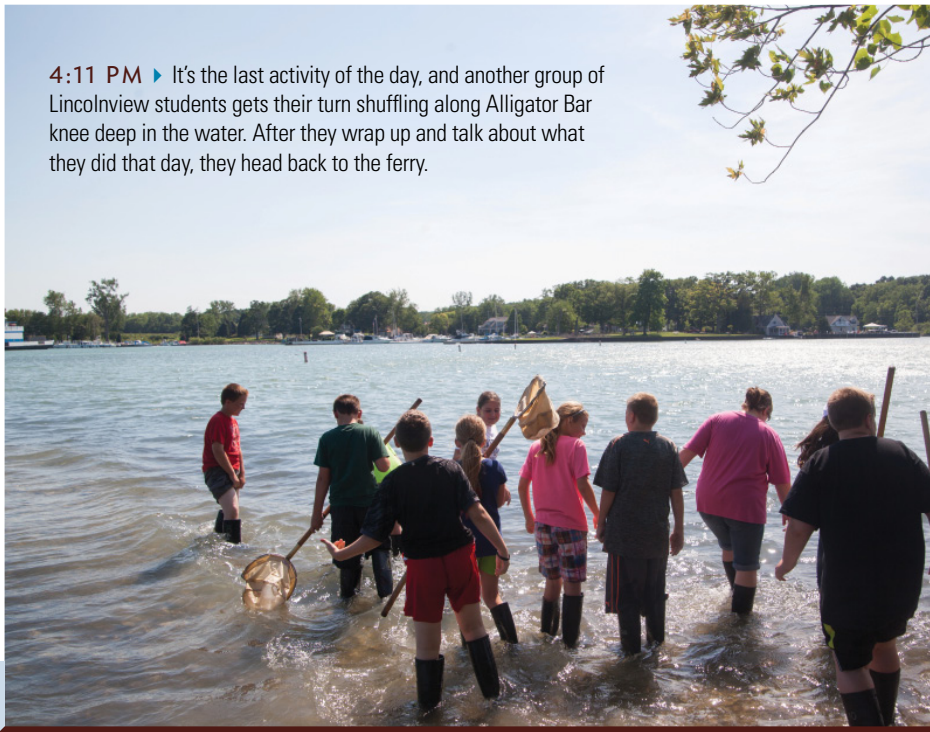
11:35 AM ▸ Ten students from Utica's science club arrive at the Aquatic Visitors Center. AVC Manager Shane Anderson talks to the students about the recent mayfly hatch and takes them inside for a tour of the building, which used to be a state fish hatchery run by the Ohio Department of Natural Resources. Students pass around jars showing preserved fish at various stages of development and view aquaria filled with live native fish. "He explained the jars where the fish spilled over after they hatched, and I had never heard that explained before," said club leader and science teacher Frances O'Flaherty. "It was really interesting."

1:32 PM ▸ Utica students collect data about the weather and water conditions during their Science Cruise. They use a Secchi disk to measure water transparency, an anemometer to measure wind speed, and an Ekman dredge to sample sediment and capture macroinvertebrates, among other activities.

3:09 PM ▸ During a Herpetology activity, Lincolnview students watch a slide show on various native reptiles and then get a chance to view many of them in cages and even handle a few of the friendliest snakes. "Some of the animals up there, they don't get to see anywhere else. This gives them an opportunity to do that safely and somewhat comfortably," Niemeyer said.

3:53 PM ▸ The glacial grooves at the southwestern tip of Gibraltar are a stop on the Island Geology Walk and Talk. Utica Science Club students examine the grooves as a field station assistant explains how they were created by a glacier scooping out the soft rock and leaving the harder rock behind.

4:11 PM ▸ It's the last activity of the day, and another group of Lincolnview students gets their turn shuffling along Alligator Bar knee deep in the water. After they wrap up and talk about what they did that day, they head back to the ferry.



5:00 PM ▸ The Utica High School Science Club students, who are staying overnight, head to the Dining Hall for dinner and then spend some time together before bunking in the Stone Lab dormitory overnight. The next day, they'll spend their own time doing fish dissection, invertebrate collection and handling the reptiles and amphibians in the herpetology lab before taking the 12:30 ferry back to the mainland.

In 2014, about 2,700 people participated in the field trip program. Both Neimeyer and O'Flaherty say they'll bring groups back to Stone Lab every year, if they're able to. For more information about the Stone Lab Science Field Trip Program, ***visit stonelab.osu.edu/tripsandtours***.

WEATHER PREPARATION

by Lisa Aurand Rice,
Ohio Sea Grant Communications

the calm after the storm

OHIO SEA GRANT EDUCATORS HELP PREPARE GREAT LAKES MARINAS FOR SEVERE STORM IMPACTS

Recovering from a dark and stormy night – or day – along the Lake Erie coast can be a challenging proposition. But Ohio Sea Grant Extension Educators Scott Hardy, Sarah Orlando and Joe Lucente are hoping to make it a bit easier.

Above: The aftermath of Superstorm Sandy on Lake Erie marinas was much more severe than expected. Ohio's current coastal storms outreach focuses on making sure marinas can be prepared should a similar weather event hit the Great Lakes in the future.

Facing Page: A changing Great Lakes climate is expected to worsen severe storms in the region, causing problems with everything from stormwater runoff and flooding to marina and other lakeshore infrastructure. Extension educator Scott Hardy will address these issues with Lake Erie shoreline businesses and residents.

Hardy's involvement in coastal storms-related work is twofold. He is overseeing 10 coastal storms projects funded through NOAA's Coastal Storms Program, managed by Ohio Sea Grant. In addition, his job itself is funded in part through a NOAA Coastal Storms Program grant.

"Storms can have a big impact on communities environmentally, economically and even from a safety standpoint," Hardy said. "I'm working on ways to help educate locals on the hazards associated with coastal storms and trying to conduct applied research that city officials, resource managers and planning departments can use."

His large-scale research project will measure vulnerability to coastal storms, flooding and erosion in all the municipalities of Lake County.

"I'm also trying to gauge their adaptability and their capacity for resilience and rank them," Hardy said. "Those that have very high vulnerability and very low resilience will be the target of an outreach and education program."

He envisions that program including an individualized written report outlining a plan for green infrastructure to counteract storm hazard threats and community outreach to teach citizens how to stay safe in their homes and on the water during storms.

The small grants projects Hardy is overseeing are aimed at enhancing community resilience, improving communication of risks associated with beach hazards and addressing impacts of stormwater on natural resources through best management practices. The projects end August 31, 2016.

Orlando and fellow extension educator Lucente are leading one of the projects that received funding through the small grants program.

"The goal … is to understand drivers for and barriers to (marinas) preparing for extreme weather hazards and to develop a tool that will help marina owners now and in the future," said Orlando, program manager for the Ohio Clean Marinas Program.

When the remains of Hurricane Sandy hit Lake Erie in October 2012, many marinas were unprepared for that level of severe weather – waves up to 20 feet high, compared to 1- to 3- foot waves on a typical day or 3 to 6 feet on a rough day.

"Some (communities) took months to recover. So those experiences we heard about through our normal relationships with marina owners, in combination with our projections for more frequent and severe storms, led us to pursue the grant," Orlando said.

So far, researchers working on the project have conducted three focus groups with marina owners to learn what challenges they face in developing and executing a plan for storm preparation. The goal of the project is to create a physical tool that marina owners can use to prepare for storms.

"(It would be) a binder or notebook that will have a condensed list of resources and information on what to do if a storm is coming their way and what information they should be providing their boaters to make sure they're prepared for coastal storms," Orlando said. "Basically a template that is customized for marinas in the Great Lakes to have on their shelf that can be ready to go if and when something like Superstorm Sandy happens again."

Storm awareness and coastal resilience are issues the East and Gulf coasts have been dealing with for years. With the expected increase in storms caused by climate change, it's time for communities in the Great Lakes states to make plans and create tools specifically for this region, Orlando said. **TL**

by Lisa Aurand Rice, Ohio Sea Grant Communications

Taking Care of Lake Erie's Eastern Shore

Ohio Sea Grant NEW EXTENSION EDUCATORS

If one – or both – of Ohio Sea Grant Extension's new educators looks familiar, it's because you may have seen them around before.

Both are originally from the Cleveland area – Lake County, to be exact. Jill Bartolotta, who is working out of the Painesville office, is filling the educator position left vacant after Frank Lichtkoppler's retirement in 2014.

Her role focuses on ecology, nutrient loading, harmful algal blooms, limnology and coastal processes. She has a bachelor's degree in wildlife conservation biology and outdoor education and a master's degree in integrated coastal ecosystem science, policy and management from the University of New Hampshire.

Ohio Sea Grant Interim Director Christopher Winslow says Bartolotta will have no problem filling Lichtkoppler's shoes.

"It's tough to see a seasoned extension agent retire, but we're extremely excited and confident that Jill will be able to pick up where Frank left off," Winslow says.

Until her hire at Ohio Sea Grant, Bartolotta was an education and public outreach intern for New Hampshire Sea Grant and a naturalist at the Great Bay National Estuarine Research Reserve Discovery Center in New Hampshire.

The months since she started have been filled with outreach and education events such as staffing a marine debris exhibit at Headlands BeachFest in Mentor, Ohio and presenting information on invasive species at the Lake County Fair. Bartolotta is also working on a NOAA grant proposal to address marina resiliency to climate hazards and is developing a high school field trip program to teach students about human impacts on Lake Erie. And she's continuing to build relationships with the eastern Ohio community.

"I am really excited and impressed by the amount of partnerships that are already developed in eastern Ohio and the amount of work that people are doing in regards to conservation, sustainable development and environmental education. Everyone I have met with or worked with is very passionate about Lake Erie and enjoy sharing their knowledge with others," Bartolotta says.

Extension educator Scott Hardy holds a bachelor's degree in environmental geography from Ohio University, a Master of Professional Studies degree in natural resources from Cornell University and a doctorate in environment and natural resources from The Ohio State University.

Previously, Hardy was assistant dean of undergraduate studies and an adjunct professor of earth, environmental and planetary sciences at Case Western Reserve University and a faculty member at McDaniel College in Westminster, Md.

"We are very excited about having (an Extension educator) based in Cleveland, especially given the numerous existing relationships that Scott has already established within that community," Winslow says.

Both educators attended the Great Lakes Sea Grant Network meeting in September along with Sarah Orlando, Joe Lucente and Extension Program Leader Tory Gabriel.

"It's been a lot of fun. Everything's been going smoothly," Hardy says. "I'm still getting my feet wet." **TL**

Jill Bartolotta

Scott Hardy

STONE LABORATORY Summer Courses 2016

Stone Lab offers one-day, two-day, one-week or five-week science courses as well as the five-week Research Experience for Undergraduates Scholarship Program. Any course can also be taken as a non-credit workshop (see requirements below). Detailed course descriptions can be found online at ***stonelab.osu.edu***.

Introductory Courses – 2 credits

Run Sunday-Saturday and are open to advanced high school and current college students.

June 12-18

ENR 2360	Ecology and Conservation of Birds
EARTHSC 1107	Field-Based Introduction to Oceanography
EEOB 1930	Introduction to Biological Studies – Aquatic Biology
KNSHP 1140.05	Lake Erie Sport Fishing

July 24-30

EEOB 1930	Introduction to Biological Studies – Aquatic Biology
EEOB 1920	Introduction to Biological Studies – Birds

July 31-August 6

EEOB 1930	Introduction to Biological Studies – Aquatic Biology
EEOB 1910	Introduction to Biological Studies – Local Plants
ENTMLGY 1260	Introductory Insect Field Biology

Upper-Level Courses

Open to college students who are studying biological sciences, education and natural resources as well as science teachers.

Five-Week Courses – June 19-July 23, 4 credits

EEOB 5420	Aquatic Ecosystems – Ecology of Inland Waters (TRS)
EEOB 3420	Behavioral Ecology (MWF)
EEOB 3410	Ecology (TRS)
EEOB 3310	Evolution (MWF)
EEOB 5940	Field Zoology (TRS)
EEOB 5930	Ichthyology (MWF)

One-Week Courses – 2 credits

June 12-18

EEOB 5910	Field Herpetology

July 24-30

EEOB 4950	Field Ecology

July 31-August 6

EEOB 5210	Spider Biology

Other Courses

Thursdays June 16-August 4, 1 credit

ENR 5699	Current Topics in Environment and Engineering (Guest/Research Lecture)

June 26, .5 credit

EEOB 5970	Larval Fish Identification Workshop

August 4-19, 2 credits

EEOB 3189	Field Course: Environmental Science on the Flagship *Brig Niagara*

August 8-9 or August 10-11, .5 credit

EEOB 5950	Algae Identification Workshop

Non-Credit Workshops

One- to three-day courses open to the public. Participants must be at least 18 years of age and have completed high school.

June 25
Fish Aging Workshop

June 26
Larval Fish Identification Workshop

July 9
Fisheries Fundamentals Workshop

August 8-9 or August 10-11
Algae Identification Workshop

August 8-9 or August 10-11
Dealing with Cyanobacteria, Algal Toxins and Taste & Odor Compounds

August 15-17
Aquatic Invasive Species – Hazard Analysis and Critical Control Point (AIS-HACCP)

August 19-21
Outdoor Photography Workshop

September 23-25
Lake Erie Sport Fishing Workshop

September 24-25
Fish-Sampling Techniques Workshop

Courses for Educators – 2 credits

One week. Open to education students and both formal and informal educators.

July 16-22

EARTHSC 5189.05	Field Geology for Educators: Geologic Setting of Lake Erie

July 24-30

ENR 5194	Group Studies: Water and Wildlife Training for Educators
EEOB 4950	Field Ecology

July 31-August 6

EEOB 4920	Ornithology for Teachers

REU Program

Stone Lab's five-week Research Experience for Undergraduates (REU) Scholarship Program must be paired with one of the five-week upper-level courses. Students spend non-class days working with research supervisors, collecting data, analyzing discoveries and preparing a final presentation.

- Ecology of the round goby: analysis of the condition of this Western Lake Erie Basin invader (Ichthyology)
- Ecology and conservation issues in northern Ohio crayfish (Ecology)
- Survival of birds inhabiting the Lake Erie Islands (Ornithology)
- Fish investigations to inform fisheries management (Fisheries Research/ Management)
- Exploration of Lake Erie nutrient loading, hypoxic events (the "dead zone") and harmful algal blooms (Limnology)

Tuition Assistance and Jobs

All students taking for-credit courses are eligible for scholarship funds. The average award for high school students in 2015 was around $600, while undergraduate students were awarded an average of about $1,200. Students enrolled in five-week courses can also apply for part-time jobs at Stone Lab to cover the cost of room and meals.

Course credits are based on the Ohio State University semester credit system and are transferable to most colleges and universities.

By Lisa Aurand Rice,
Ohio Sea Grant Communications

STONE LAB

A GOOD DIEHL

Summer 2015 is one Zachary Diehl will never forget.

The Ohio State University senior spent seven weeks at Stone Laboratory – taking three classes for a total of eight credits – and changing his life in the process.

"I got to meet some fantastic people that I still stay in contact with. I got to really have some real personal connections with faculty that were teaching on the island, and I got some hands-on experience with things that you hear about in the classroom but don't always understand fully because you're just hearing about them," Diehl said.

Diehl, who is double majoring in evolution, ecology and organismal biology (EEOB) and plant cellular molecular biology, grew up in Columbus and earned an associate's degree from Columbus State Community College before transferring to Ohio State.

Because he still needed several science credits for his double major, Diehl's academic advisor suggested he consider taking courses at Stone Lab. Stone Lab, Diehl said, seemed like an ideal experience for someone with his interests, but as a first-generation college student who is paying his own way through college, he knew he wouldn't be able to go if he didn't get financial assistance.

A scholarship paved the way for Diehl to take ecology, field ecology and spider biology.

"The scholarship made a huge difference for me being able to take classes at Stone Lab. Being a student who doesn't have financial support from his parents and pays his own way through college, without the scholarship, it's not something I would have been able to do," he said.

The spider biology course, in particular, made a big impression on Diehl. Dr. Richard Bradley had each student conduct a research project during the week-long class.

"I learned how to conduct a research project from beginning to end. This is a skill that is universal and can be applied to many of the career choices that I am considering today." ZACH DIEHL

"He was incredibly helpful," Diehl said. "I'd come up with a couple ideas of things I was interested in, and he steered me through the options and what potential problems I might find."

Diehl ended up studying the cardiovascular rates of spiders before and after they consumed prey. Over the course of the week, he measured the heart rates of 25 different spiders before and after meals.

"You can see their hearts beating through their exoskeletons," Diehl said.

Because the spiders were nocturnal, he didn't get a lot of sleep that week. But it was worth it, Diehl said.

In addition to his double majors, Diehl is minoring in public health and is thinking of going back to school to become a physician's assistant. But no matter what field he ends up in, the skills he learned at Stone Lab – especially attention to detail and the experience conducting his own research project – will be an incredible asset, he said. **FOSL**

Friends Of Stone Laboratory

Dear friends,

I know I've said this before, but Lake Erie and the islands are such a paradise! And this is surely also one of the reasons that island classes and activities at Stone Lab continue to be so popular.

The Friends of Stone Lab have always had a love for the lake and the lab, and have jumped at any opportunity to help out. Our traditional service activities are the Spring Work Weekend, the September Open House, and the IHOP in October, but this year we tried something new. Lab Manager Matt Thomas asked if a few of the FOSL members would be willing to come up for a day between the various class sessions to help our cleaning crew during the hectic turnover days. Robin Glauser and the field station assistants usually clean and prep all rooms in the 24-hour window between noon Saturday, when classes end, and noon Sunday, when students arrive for the subsequent session.

So it's FOSL to the rescue! Matt gave us dates for the five transition days, and we recruited "transition teams" of volunteers willing to help out. That's really not very hard because our members are always looking for any excuse to come up to the lab, even if it involves some unglamorous work! Thanks to Pete Ferron, Anna Giordano and Ben Piazza for a great effort!

If anyone is interested in getting on a team next year, email me at scott.1005@osu.edu, or email or call any of the staff. It's a GREAT way to enjoy the magic of the islands while providing some much-appreciated help!

Sincerely,
Ken Scott, FOSL President

State Science Day Friends of Stone Lab (FOSL) Scholarship

Stamatina Tolias, a senior at Carrol High School in Dayton, spent most of her week in Stone Lab's Introduction to Biology – Aquatic Biology course in the water.

Almost every day was spent taking water quality samples from Lake Erie and nearby streams, ponds and rivers.

"I learned the foundations of an aquatic environment," said Tolias, who was one of four recipients of a State Science Day Friends of Stone Lab scholarship who attended courses at Stone Lab in 2015.

The course earned Tolias two undergraduate semester credit hours from The Ohio State University and gave her a leg up in the research that earned her a scholarship from FOSL.

Tolias's project, presented at last year's State Science Day, focused on anti-corrosive coatings for stainless steel. Tolias said she was interested in the scholarship because of potential applications for the sol-gel coatings she created for the project.

"One of my coatings is extremely successful and low cost, and you could potentially optimize them to have anti-corrosive capabilities against the growth of algae," Tolias said.

"It really helps with my research because now I understand what's living there, what they feed off of and what sustains life in those specific aquatic environments. There's always the factor of toxicity and how the organisms will be affected. … If you change one thing, it creates a chain reaction."

Since 1996, FOSL has awarded scholarships to 175 top high school students participating in State Science Day to allow them to experience hands-on science at Stone Lab.

"If Ohio Sea Grant and OSU's Stone Lab can reward early research successes with more exposure to immersive learning, there is a high likelihood that the scholarship recipient will continue to follow a science and research career path," Ohio Sea Grant and Stone Lab Interim Director Chris Winslow said.

Tolias's classmate and close friend, Elise Paietta, was also awarded a Stone Lab scholarship based on her project about fruit fly genetics and attended the same class. Other State Science Day scholarship recipients attending Stone Lab courses in 2015 were James Bingman from Bowling Green High School in Bowling Green, a 2014 winner, and Bennett Yunker from Tippecanoe High School in Tipp City, who was one of 14 students awarded Stone Lab scholarships at the 2015 State Science Day, held May 16. **FOSL**

FOSL

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.

F.T. STONE LABORATORY FIELD STATION

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Dates to Remember

February 10, 2016
Stone Lab Winter Program

September 10, 2016
Stone Lab Open House

The 2015 FOSL scholarship recipients:

Timothy Andrews, *Tippecanoe High School, Tipp City*

Alyssa Armstrong, *Canfield High School, Canfield*

Alan Fong, *Sylvania Southview High School, Sylvania*

Grace Fuchs, *Rutherford B Hayes High School, Delaware*

Emily Gootzeit, *Tippecanoe High School, Tipp City*

Anastasia Johnson, *Canfield High School, Canfield*

Ashley King, *Hudson High School, Hudson*

Claire Kinnear, *Hudson High School, Hudson*

William Kunesh, *Archbishop Alter, Kettering*

Julian Liber, *Sylvania Southview High School, Sylvania*

Kyle Peck, *Geneva High School, Geneva*

Keara Weiss, *Mentor High School, Mentor*

Bennett Yunker, *Tippecanoe High School, Tipp City*

Frances Zwick, *Louisville High School, Louisville*

Friends of Stone Lab Open House September 2015

The 2015 Stone Lab Open House was held on September 12. More than 635 guests visited Gibraltar Island and the South Bass Island Lighthouse to learn about Lake Erie science and history from the 29 volunteers and 24 staff members ready to take questions.

Open House activities included the usual Gibraltar Island and Aquatic Visitors Center tours, along with snake exhibits, an opportunity to look at Lake Erie plankton under microscopes and a chance to step inside historic Cooke Castle. Visitors at the South Bass Island Lighthouse were treated to butterfly garden talks as well as a lighthouse tour.

"It rained Friday night when the Boy Scouts were setting up their tents at Perry's Monument," remembers Sue Bixler, Stone Lab education & outreach assistant, "but there was no rain on Saturday, and moderate winds created a wavy ride over for the guests on the research boats." **FOSL**

Save the Date: The next Stone Lab Open House will be held on September 10, 2016.

BUCKEYE FOSL CONNECTS STONE LAB STUDENTS AT OHIO STATE

Stone Lab alumni at The Ohio State University have reenergized the Buckeye Friends of Stone Lab, a student group that gives Ohio State students a chance to stay connected to the lab before graduation. Fall activities included a service trip to Stone Lab to help close down the Aquatic Visitors Center (AVC) for the winter, as well as a pumpkin carving social at the Ohio Sea Grant office.

Buckeye FOSL Leadership

Madelyn Strahan, President

Elaine Stingel, Vice President

Ellen Warfield, Treasurer

Ziwei Jin, Service Chair

Scott Glassmeyer, Events & Fundraising Chair

Erin Monaco, Advisor

Kristen Fussell, Advisor

For more information about Buckeye FOSL, please contact the Stone Lab Columbus office.

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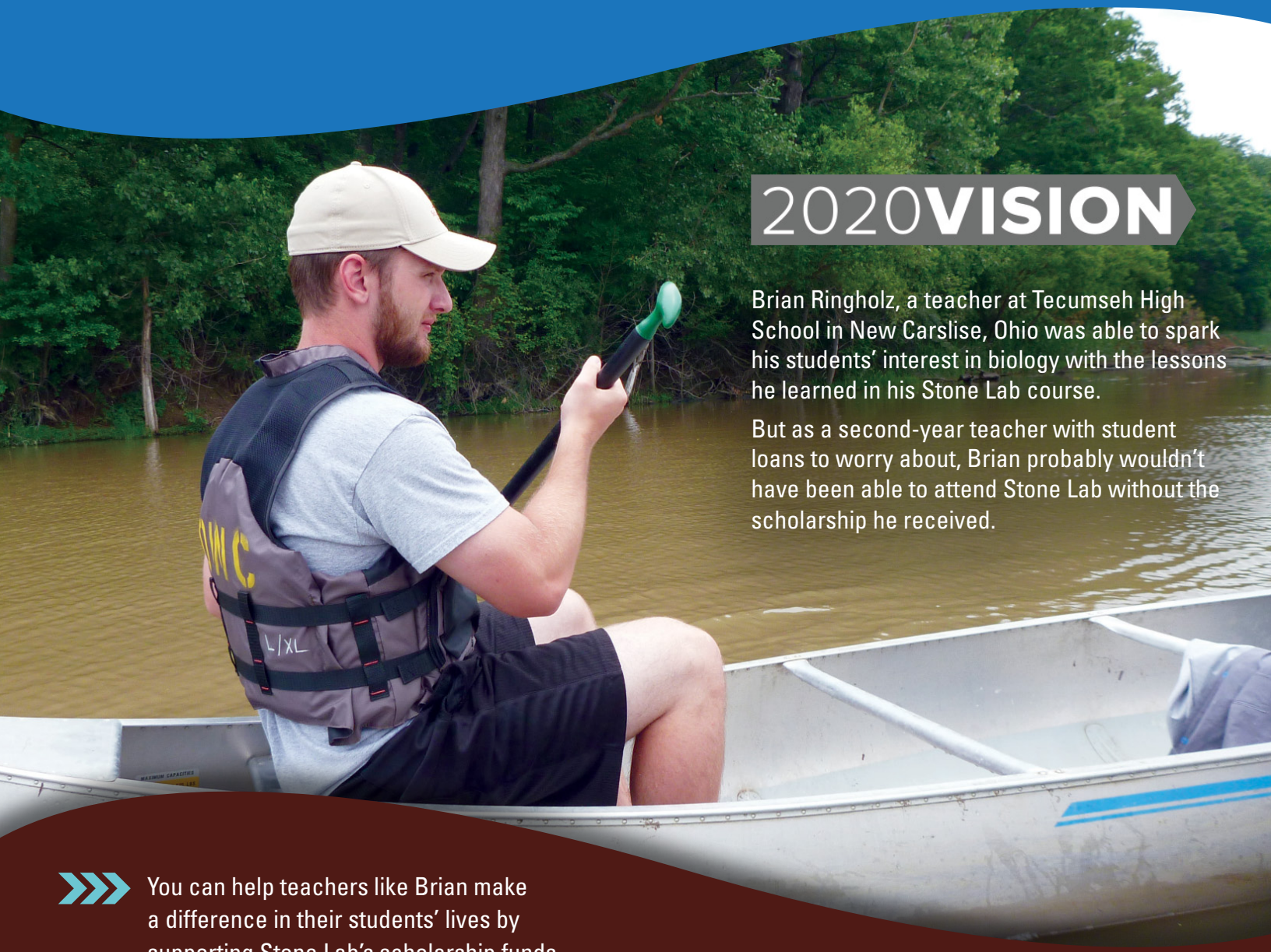

2020VISION

Brian Ringholz, a teacher at Tecumseh High School in New Carslise, Ohio was able to spark his students' interest in biology with the lessons he learned in his Stone Lab course.

But as a second-year teacher with student loans to worry about, Brian probably wouldn't have been able to attend Stone Lab without the scholarship he received.

You can help teachers like Brian make a difference in their students' lives by supporting Stone Lab's scholarship funds at ***go.osu.edu/stonelabgift15.***