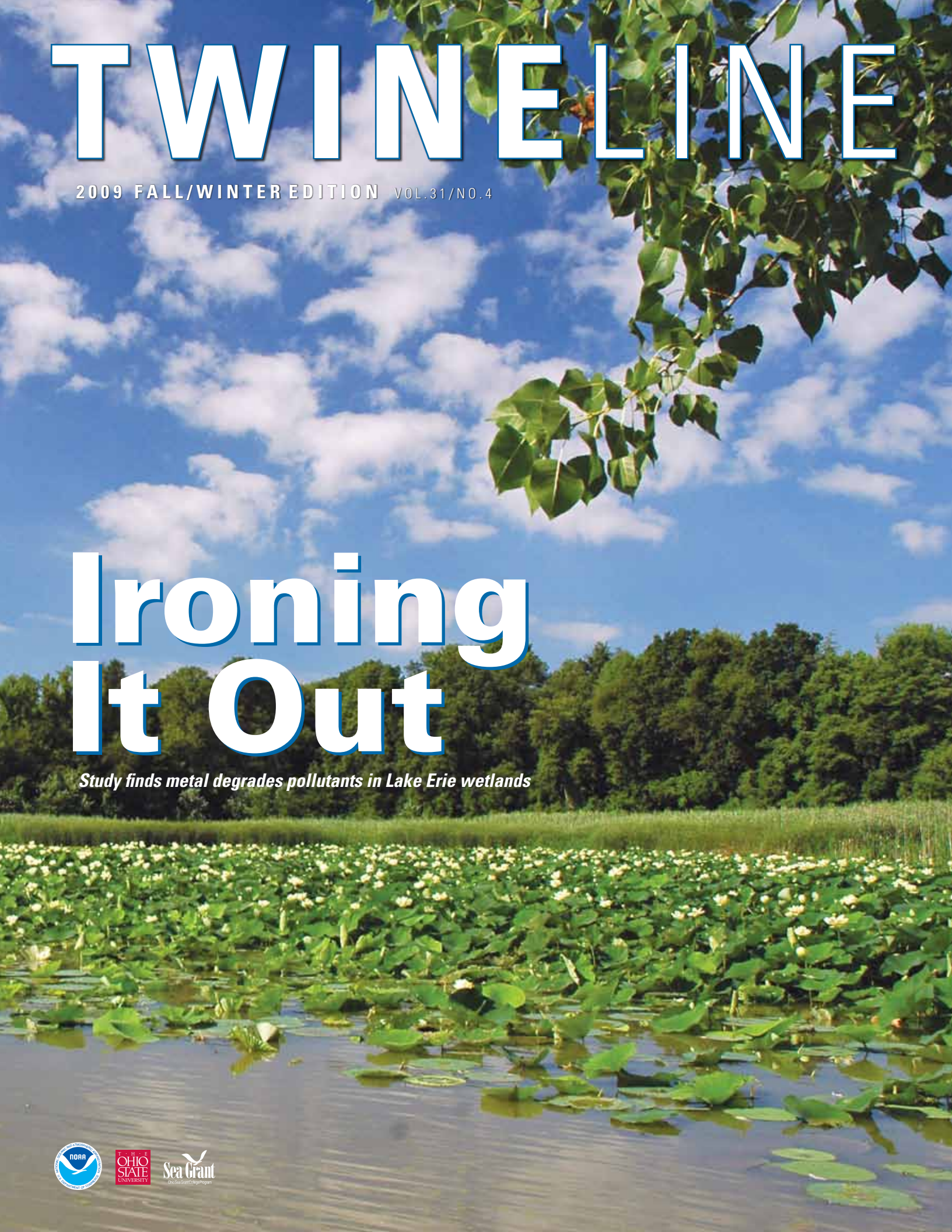


TWINELINE

2009 FALL/WINTER EDITION VOL.31/NO.4

Ironing It Out

Study finds metal degrades pollutants in Lake Erie wetlands

TABLE OF CONTENTS

2009 FALL/WINTER EDITION

On September 28 and 29, 2009, high winds traveling 30 to 40 miles per hour swept across Lake Erie's western basin. These sustained winds pushed the lake's water from Toledo up toward Buffalo, causing a water level drop of six to eight feet near Put-in-Bay and making it nearly possible to walk from Stone Laboratory's Bayview Office on South Bass Island to the Gibraltar Island shore.

Twine Line (ISSN 1064-6418) is published four times a year by the Ohio Sea Grant College Program at The Ohio State University, 1314 Kinnear Rd., Columbus, OH 43212-1156. Subscription price is $10.00 per year (four issues). The opinions expressed are those of the authors only. Please contact the office to obtain permission before reprinting articles or graphics. Ohio Sea Grant is a statewide program that supports greater knowledge and stewardship of Lake Erie and the Great Lakes. It is part of the NOAA Sea Grant College Program (NOAA grant NA16RG2252, project M/P-2), which includes 32 state programs. Support of Ohio Sea Grant is provided by National Sea Grant, the State of Ohio, The Ohio State University, Ohio State University Extension, and participating universities, agencies, and businesses.

Cover photo by Gene Wright, Old Woman Creek Old Woman Creek is one of the best examples of a natural freshwater estuary along Ohio's Lake Erie Coast. Important to both the environment and economy, freshwater estuaries protect Lake Erie by removing pollutants from streams and rivers, buffer coastal communities against flooding and erosion, and provide habitat for a wide array of wildlife.

OHIO SEA GRANT
The Ohio State University
1314 Kinnear Rd.
Columbus, OH
43212-1156
Phone: 614.292.8949
Fax: 614.292.4364
ohioseagrant.osu.edu

OHIO SEA GRANT STAFF
Dr. Jeffrey M. Reutter, Director
reutter.1@osu.edu

Dr. Rosanne W. Fortner, Education Coordinator
fortner.2@osu.edu

Jill Jentes Banicki, Assistant Director
jentes.1@osu.edu

Eugene Braig, Assistant Director
braig.1@osu.edu

Stacy Brannan, Associate Editor
brannan.16@osu.edu

Nancy Cruickshank, Publications Manager
cruickshank.3@osu.edu

George Oommen, System Engineer
oommen.6@osu.edu

Rick Shaffer, Business Manager
shaffer.25@osu.edu

John Tripp, Fiscal Associate
tripp.3@osu.edu

Greg Aylsworth, Designer
aylsworth.2@osu.edu

EXTENSION AGENTS
Frank R. Lichtkoppler, Lake & Ashtabula Counties
440.350.2582
lichtkoppler.1@osu.edu
Program Coordinator

Heather Elmer, Ohio Coastal Training Program
419.433.4601
heather.elmer@dnr.state.oh.us

Tory Gabriel, Fisheries Program Coordinator
440.808.5627
gabriel.78@osu.edu

John R. Hageman, Jr., Ottawa County
614.247.6500
hageman.2@osu.edu

Melinda Huntley, Tourism Director
419.609.0399
huntley@coastalohio.com

David O. Kelch, Erie & Lorain Counties
440.326.5851
kelch.3@osu.edu

Joe Lucente, Lucas County
419.213.4254
lucente.6@osu.edu

Matt Thomas, Stone Laboratory
419.285.1846
thomas.347@osu.edu

Colleen Wellington, Ohio Clean Marinas Coordinator
419.609.4120
wellington.28@osu.edu

Ironing It Out

Study finds metal degrades pollutants in Lake Erie wetlands

by Stacy Brannan, Ohio Sea Grant Communications

The wetland area in the park down the street from your house plays an important environmental role. It functions as a home for wildlife, a haven for plants and trees, and as a natural filter capable of catching and degrading some of the nasty chemical pollutants in the environment before they make their way into our waterways. All of these qualities, however, may be just the tip of the iceberg, according to Ohio Sea Grant researcher Dr. Yo Chin, Professor of Geology at Ohio State University. "Wetlands do a lot more than just filter," he says. "Beneath that layer of mud there are very complicated things going on."

For more than a decade, Chin's research has focused on the study of natural chemical processes in wetlands, including sunlight, that help to break down pollutants. In the Lake Erie area, where decades of farming have flushed countless chemicals into the watershed, it is important to find alternative, more economical ways to naturally remove pollution from our coastal communities.

The Pollution Problem

Chin's recent wetland research focused primarily on pentachloronitrobenzene (PCNB), an antifungal chemical now banned on most crops in the U.S. because of its cancer-causing tendencies in laboratory animals. At the peak of its use, farmers in the Great Lakes region were adding 2.5 to 6 pounds of PCNB per square mile directly into the soil. Because PCNB doesn't like water, it doesn't dissolve when it is flushed into waterways, instead remaining attached to sediment particles that settle into wetlands. Chin chose to focus on the fungicide for several reasons.

"We knew that PCNB reacts very quickly in lab tests, so we wouldn't have to wait around to get results," he explains. "We also knew exactly what it was going to react to—iron—so we could easily control that reaction to follow the appearance of its main byproduct, which is PCA, or pentachloroaniline."

Researchers have not yet performed toxicity studies on PCA, and many of its other characteristics are also unknown. However, they have found it is better to convert PCNB to PCA because bacteria that exist in the wetland environment are capable of breaking down aniline—an organic chemical compound in PCA—into simpler, less harmful components.

But Chin and his team soon found that knowing all of the elements of a reaction in a laboratory setting doesn't necessarily reflect real-world conditions.

To conduct their experiments, Chin and his group used a coring device to pull samples of sediment from Lake Erie's Old Woman Creek National Estuarine Research Reserve in Huron, Ohio—a 571-acre estuary that flows right into Lake Erie. The research team chose the site because of its vicinity to the lake, its laboratory facilities, and its high iron levels.

In sediment, most of the pollutant chemicals are contained in the water between individual sediment particles, called the pore water. Over more than a decade, Chin has perfected the process of extracting pore water, but it can take up to 20 hours and in this case could be frustrating for one specific reason: it had to be done without oxygen, since the main catalyst for the PCNB-to-PCA reaction is a form of iron scientists call Fe(II). Normally, iron is present as Fe(III), which is the form of iron commonly known as rust. In the absence of oxygen, the Fe(III) can gain an electron and become Fe(II), but if even the smallest bit of oxygen leaks into the pore water, the super-reactive Fe(II) will give up its electron and turn back into Fe(III).

"If oxygen touches the water, it instantly

Dr. Chin performed his toxicity tests at Old Woman Creek National Estuarine Research Reserve, a 571-acre estuary that flows right into Lake Erie.

"Wetlands are very complex places," says Dr. Yo Chin. "The natural balance of chemicals and the geological setting of each wetland can't be easily reproduced, so land use planners should think twice before razing one."

turns orange as the iron oxidizes, ruining the experiment, since there is no oxygen below the wetland surface," Chin interprets. "In these experiments, we're trying to recreate that environment as carefully as we can."

Certain bacteria use rust to breathe, creating Fe(II) molecules as a byproduct, the same way we breathe in oxygen and exhale carbon dioxide. That Fe(II) is essential in converting PCNB to PCA.

To extract the pore water from the sediment, they put the mud into specially designed pistons primed with non-reactive argon gas. Slowly, they pressurized the system, squeezing the pore water into syringes, then adding acid to stop the iron reaction and stabilize the system for up to a week. When the pore water was brought back to its natural pH for experimentation, the conversion from PCNB to PCA took only about two hours.

Field Work

With everything working like clockwork in the laboratory, Chin's graduate student Ale Hakala thought they should perform the same experiments to break down the fungicide in the field using pore water that hadn't been acid stabilized.

"One thing a lot of people weren't looking at was the rest of the organic matter," explains Hakala. "If you think of wetland sludge, all the leaves degrading and the animal waste, you have a lot of other organic matter that's present there naturally. We wanted to see what the presence of that matter might do to the reaction we were seeing in the laboratory system." It turned out that their results were far different.

"When we didn't manipulate the pH, nothing happened," Chin says. "We went back and did it again and still saw no reaction. After four days, it had only converted 10% of the PCNB to PCA." To determine what was going on, they examined the pore water's composition and found a lot of Fe(II) and also a little bit of rust, Fe(III)—puzzling, since there was no oxygen.

"We determined that certain compounds in the dissolved organic matter found in lake and river water are able to stabilize Fe(III), preventing the iron-breathing bacteria from turning it to Fe(II)," Chin explains. "When those compounds are present, you can have rust, even with no oxygen."

It is dissolved organic matter that gives freshwater its brownish-yellow color. The organic matter includes ligands, compounds that bind to a chemical molecule that are so complex scientists haven't been able to fully

To document how natural processes break down a fungicide, Ohio State University graduate student Ale Hakala used a special device to punch out cores of Old Woman Creek sediment for testing. The samples had to be kept in an oxygen-free environment to keep any Fe(II) in the sediment from oxidizing to rust, even as the pore water was extracted from the sediment—a process that can take up to 20 hours.

characterize them, making them something of a mystery.

However, they do know that in nature, dissolved organic matter is most often attached to rust particles, and adding acid to the pore water causes it to drop all of the rust it is carrying. When the pH is then raised to its natural level in the lab, the existing iron starts to reconnect with the dissolved organic matter—but this time it is the Fe(II) that gets there first. The combination of dissolved organic matter and Fe(II) is super-reactive and quickly converts PCNB to PCA, explaining the two-hour turnaround Chin saw in the lab setting. Since the molecules weren't manipulated the same way in the field tests, most of the reactive ligands were still connected to rust particles, causing the slow conversion.

This discovery opened Chin's eyes. "Everything we've done, everything anyone has done with these pore waters, was based on manipulated compounds," he says. "In nature, the compounds aren't manipulated in that way, so the reaction takes a week instead of two hours. Doing it in the lab allows you to control things, but the take-home message here is that nature doesn't want to be controlled."

There is still a lot of work that needs to be done to determine just how effectively wetlands can degrade pollutants. For Chin, who continues to study and test other chemical compounds using the same process, it is a matter of finding ever more convincing evidence to encourage coastal planners to preserve or restore wetland areas.

"Wetlands are very complex places," he explains. "The natural balance of chemicals and the geological setting of each wetland can't be easily reproduced, so land use planners should think twice before razing one."

According to Hakala, it is particularly important to have wetlands with wide surface areas, which allow water to filter through over a period of days to a week. "That can take care of a lot of pesticides," she says. "It's significantly less expensive to maintain a wetland than it is to hire contractors to come in and use an expensive water treatment process to clean things up."

For more about this Sea Grant-funded research, contact Dr. Yo Chin at *yo@geology.ohio-state.edu*. **TL**

The Green Clean-Up Crew

Plants may offer solution for pulling pollutants out of soil

To raise the biggest cows with the most meat, farmers often administer hormones that wind up in manure. When that manure is used to fertilize nearby fields, the hormones can then wash through the soil and, subsequently, into the water supply. But what if simply planting a buffer strip filled with hormone-absorbing greenery could remediate the problem? Ohio Sea Grant researcher Dr. Yo Chin, Professor of Geology at Ohio State University, and his graduate student Marcy Card hope to determine if such a solution is viable.

The two are looking specifically at a form of estrogen called estradiol and an estrogen mimic called zeranol, both of which have been shown to give male fish female characteristics, even at low concentrations. Estrogen mimics are hormones that are not actually found in our bodies but are able to trick the cow's body into producing more meat. If Card can find specific plants that are able to absorb these chemicals and break them down—a process called phytoremediation—the pollutants could potentially be kept out of the water system. Early data look promising,

"Preliminary data show that a small group of poplar trees reduce the concentration of zeranol by 80% in just four days," Card explains. "That's in a hydroponics system with no soil. It will be different when some of the compound absorbs into soil, but the poplars are turning out to be really efficient at picking up the zeranol."

In addition to poplar trees, Chin and Card are planning to look at corn, switchgrass, and a yet-to-be-determined aquatic plant. "We'd like to see the chemicals progress from a crop plant into a riparian zone—the interface between land and a stream—and into an aquatic system," Card says. "The great thing about phytoremediation is that it can also remove a lot of the macronutrients, like phosphorus and nitrogen, that also cause problems. If a standard poplar is planted to treat soil that's contaminated with a specific compound, it will also take up a lot of other things. It will clean up a lot of the runoff that's passing through anyway."

Chin also hopes to determine if climate change will have any effect on the rates at which plants can absorb these pollutants. "If carbon dioxide is increased by 20%, 30%, or 40%, would that change cause the compounds to degrade more quickly?"

Answers to that question, as well as more information on the phytoremediation research, should be available in 2010.

For more about this Sea Grant-funded research, contact Dr. Yo Chin at *yo@geology.ohio-state.edu*. **TL**

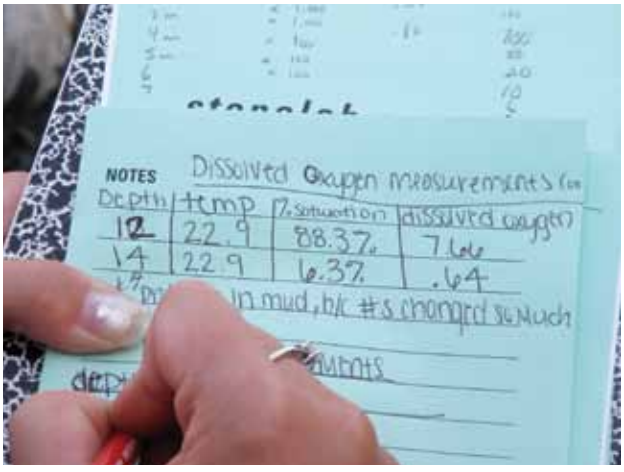
COSEE Goes Treasure Hunting Along Lake Erie

Story by Amanda Whitener, Great Lakes Science Center
Photos by Marti Martz, Pennsylvania Sea Grant

The hope of discovering hidden treasures on the Great Lakes drew 16 educators to the Lake Erie Exploration Workshop July 18–24, 2009—and what a cache we found!

COSEE (Centers for Ocean Sciences Education Excellence) Great Lakes brought classroom and informal educators from Pennsylvania, New York, Ohio, Michigan, South Carolina, and Wisconsin together to bond over our enthusiasm for Great Lakes science and discover ways we can work together to improve freshwater literacy among our audiences. Our trip originated in Erie, Pennsylvania, and we made numerous stops along the shore as we traveled west to Put-in-Bay, Ohio.

Our seven-day treasure hunt began as we descended upon the Tom Ridge Environmental Center, where we got to know each other and meet our instructors. We didn't waste any time getting into the main focus of our week's work—exploring Lake Erie through first-hand field experiences and learning from working scientists.



We investigated *E.coli* levels in Lake Erie water with Steve Mauro, microbiology professor with Mercyherst College. In his lab, Dr. Mauro and his students run water samples through an extremely fine filter to separate particles. The particles are placed in an incubating area to promote growth of bacteria into colonies. The number of colonies represents the levels of *E.coli* bacteria present in the water. These tests are used to determine swimming conditions at Presque Isle and other beaches. If tests indicate high levels of *E.coli*, beaches may be posted with warnings or even closed until bacteria concentrations return to safe levels.

The rest of our time in Erie was spent learning about current research involving contaminant uptake in turtles and impacts that personal care products like soap, shampoo, and lotion have on our water supply. We also had the opportunity to watch "Mysteries of the Great Lakes," a powerful IMAX film about the history of the Great Lakes. The film focuses on the life of lake sturgeon, an ancient species of fish whose populations in the Great Lakes have declined drastically in the past 100 years. Through the intervention of concerned scientists in the United States and Canada, and release programs along Great Lakes tributaries, sturgeon are beginning to make a comeback. For most of us, these science experiences were enough to build an entire curriculum, but we still had five days of treasure hunting to do!

At our next stop, we explored coastal erosion in Painesville Township with Ohio Sea Grant Extension Educator Frank Lichtkoppler. We were amazed to see how rapidly the shoreline along the southeastern part of the lake is receding. After a first-hand look at erosion and how the township is using steel bulkheads, groins, and break walls to lessen its effects, we studied aerial photographs that documented shoreline erosion along the coast of northeast Ohio over the past 30 years. The images helped us to understand the critical need for shoreline protection.

In Huron, Ohio, we stopped at Old Woman Creek National Estuarine Research Reserve, the only freshwater estuary research reserve in the U.S. An estuary is a transition area where water from large body like an ocean or lake mixes with water from

its tributaries. Estuaries provide habitat for birds, fish, amphibians, and other wildlife. There we learned about the unique characteristics and biological communities this special ecosystem supports. During our visit, the mouth of the estuary was closed off from the lake, a rare occurrence that limits the mixing of lake and creek water in the estuary. This gave us the opportunity to walk the beach and notice the particles of beautiful red garnet mixed in with the sand. We realized that every inch of Lake Erie is host to immeasurable treasures. What would we find next?

Arriving at Stone Lab felt like discovering Lake Erie for the first time. We hunted for fossils on Kelleys Island, analyzed biological and physical lake data, and sang along to Great Lakes music. We learned about Lake Erie water snakes, snorkeled over two Lake Erie shipwrecks, studied the impact that phosphorus has on algae, and climbed to the top of Perry's Monument. A highlight for many of us was boarding a research vessel to conduct a fish trawl, then returning to Alligator Bar on Gibraltar Island to collect macroinvertebrates and other small organisms with seine nets. John Gannon of the International Joint Commission and David Jude from the University of Michigan helped us to identify our finds under microscopes and let us assist in fish dissections for their research.

Treasure hunters have very little time to rest when there is so much Lake Erie science to learn. By the last day, we were ready to show off our finds and share how we planned to use them with our respective education audiences. It was amazing to hear how many different lessons were planned from the information we gathered. We took time to reflect, said our goodbyes, and showered our thanks on our instructors, guest scientists, and peers for an unbelievable week.

As the Manager of Visitor Experiences at the Great Lakes Science Center on the shores of Lake Erie in Cleveland, I plan to use many of the hands-on experiences to develop activities for visitors that incorporate the lake. Our traveling exhibition, Water: H_20=Life, focuses on water around the world and is also an opportunity for us to better share the treasures of Lake Erie's story with our guests. **TL**

That Settles It

Model predicts fate of contaminants during remediation efforts

by Stacy Brannan, Ohio Sea Grant Communications

When sediment at the bottom of a river or lake is contaminated, organizations like the Ohio Environmental Protection Agency often consider two different clean-up solutions: capping the area or dredging out the contaminant. When sediment is capped, a thick layer of sand and gravel is poured on top of it, and then a layer of clay is added to provide a clean barrier between the pollutants and the water above. Dredging, however, requires scooping up the polluted mud, pulling all the water out of it—a process called dewatering—and putting it in a specialized landfill. In the planning process, it is hard to predict exactly how any type of sediment will react to being stirred up or squeezed down, and whether the very pollutants agencies are trying to remove will instead be spread around in the process. To help solve that problem, Ohio Sea Grant researchers Dr. Patrick Fox and Dr. John Lenhart of Ohio State University's Department of Civil and Environmental Engineering and Geodetic Science have created a computer model that takes into account a broad number of variables.

"If you were trying to simulate or predict what will happen, the existing models didn't work because they didn't account for the physical changes in the sediment as it consolidates," Lenhart says. "It can consolidate quite a bit, up to 60 or 70% as you induce pressure, dewater, or add additional sediment. We also wanted to see if the contaminants in the sediments moved at all during different processes."

To calibrate the model, the team used contaminated sediment cores pulled from the Ashtabula River in Ohio, the Fox River in Wisconsin, and the Calumet River in Indiana, as well as simulated clay-based sediment. The Calumet River sediment turned out to be the easiest to work with because it had significantly higher levels of polychlorinated biphenyls (PCBs), which made the results easier to measure.

Dr. Patrick Fox and Dr. John Lenhart determined that small particles of contaminated sediment are stirred into the environment during capping and dredging processes. In capping, the particles typically wind up in the capping layer, making them likely to enter the environment in a shorter timeframe. During dredging, the act of removing the sediment from the water widely disburses contaminants at low-level concentrations.

And what were those results? "In the end, we determined that you need to pay attention to the release of very small particles from the sediments," Lenhart explains. "Those tiny particles are able to get through filters and presses. They're very mobile, and they often have contaminants attached to them." This mobility causes problems in both types of remediation—capping or dredging.

When a cap is created, the small particles get stirred up and many wind up in the capping layer itself rather than isolating the contaminants below. "You're actually moving the contaminants two-thirds of the way through the cap, which means those contaminants are actually going to work their way through the capping layer much sooner than anticipated, or they might even go all the way through, depending on what the cap is made of," says Lenhart.

As for dredging, it turns out that in physically removing the sediment, you end up widely disbursing the contaminant at a low-level concentration because it's fairly difficult to completely contain the small particles. Some residual contamination is always left behind.

The ultimate choice between capping and dredging depends upon the needs of the community. For the Ashtabula River Partnership, which recently completed its effort to dredge the Ashtabula River, it was important to deepen a harbor that had become almost unusable for boats and industry. Other locations without those concerns may opt for the less expensive capping plan. The computer model created by Fox and Lenhart will allow agencies to input the characteristics of the contaminated sediment and determine exactly how it will behave, helping in the planning process.

"The model is really a tool that can be used in risk assessment, remediation plans, and engineering proposals," says Lenhart. "It can help communities figure out the best course of action."

For more information about this Sea Grant-funded research, contact Dr. John Lenhart at ***lenhart.49@osu.edu*** or Dr. Patrick Fox at ***fox.407@osu.edu***. **T**L

Stone Lab's Crites Endowment Honors Respected Researcher, Teacher, Artist

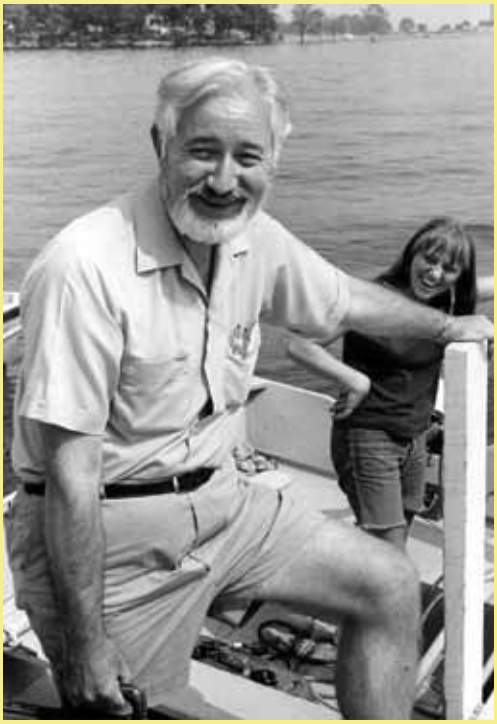
When Dr. John Crites retired in 1989, the best way Karen Jennings and Paul Stromberg could think to honor him was to create an endowment fund for research in his name at Stone Laboratory. Crites, a parasitologist who had served as Associate Director of Stone Lab for many years, spent decades studying the parasites of Lake Erie fish and birds. He believed that being an excellent researcher was the key to being a good teacher, and his students respected him for it.

"He always used a lot of his own research in his classes, and he was great at telling stories," says Friends of Stone Lab (FOSL) member Jennings, who herself was a student and teaching assistant for Crites. "It helped to really bring the coursework to life. We had wanted to create a research fund, and it really just made sense to honor Dr. Crites in that way."

To raise the initial money for the endowment, FOSL took advantage of another one of Crites' talents: drawing. "He was very good with pen and ink and with watercolor," says Jeff Reutter, Director of Ohio Sea Grant and Stone Lab. "We used some of his drawings to help generate the revenue that was needed for the fund."

"We always called him a Renaissance man," adds Jennings.

His former students, now scattered across the continent, came through, buying enough prints at $250 a piece to fully endow the fund. The money is now used to provide scholarships for Stone Lab's Research Experience for Undergraduates Scholarship Program, which gives college students a chance to live the life of a Lake Erie researcher for five or nine weeks each summer. Reutter, who took Crites' parasitology course in 1971, believes it's the best possible use for the fund.



Dr. John L. Crites

"He is one of the best research scientists I have ever met," Reutter says. "I think honoring him by granting scholarships to up-and-coming young researchers is a perfect match with his interests."

To donate to the John L. Crites Research Endowment, visit ***stonelab.osu.edu/fosl/give***. TL

Ohio Sea Grant to Fund Eight New Research Projects

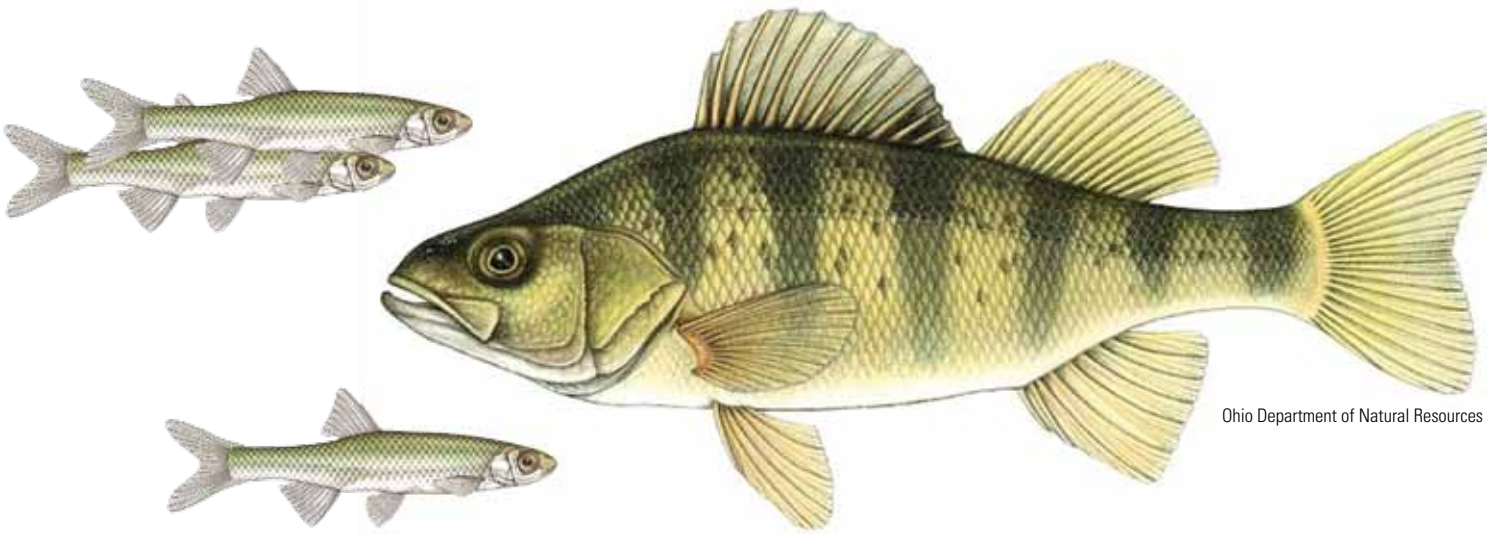
Every other year, Ohio Sea Grant issues a request for proposals (RFP) to scientists interested in receiving research grants to conduct projects that address critical issues facing Lake Erie, the Great Lakes, and coastal areas. A specific request was made for submissions from economic and social science disciplines in the 2009 RFP. A full list of all eight funded projects, which will take place between February 2010 and January 2014, can be found below.

- **Joseph R. Holomuzki**, Ohio State University. Feb. 2010–Jan. 2012. Trophic structure responses to vegetational changes and herbicides in a Great Lakes coastal wetland (Co-funded by Old Woman Creek NERR)
- **Ethan J. Kubatko**, Ohio State University. Feb. 2010–Jan. 2013. Development and validation of a high-resolution nearshore model for Lake Erie
- **Mark Partridge & Elena Irwin**, Ohio State University. Feb. 2010–Jan. 2013. Leveraging natural amenities for sustainable development in the Great Lakes region
- **Richard Slemons & Robert Gates**, Ohio State University. Feb. 2011–Jan. 2013. Environmental tolerance of type A influenza virus isolated from wild waterfowl in Ohio
- **Carol A. Stepien**, University of Toledo. Feb. 2011–Jan. 2014. Development and implementation of a new molecular test for active VHS infection in fish
- **Harold W. Walker & John J. Lenhart**, Ohio State University. Feb. 2011–Jan. 2013. The role of sediment in controlling the fate and toxicity of microcystin
- **Linda K. Weavers**, Ohio State University. Feb. 2011–Jan. 2013. Bench-scale evaluation of *in situ* ultrasonic remediation of contaminated sediments
- **Philip F. Xie**, Bowling Green State University. Feb. 2010–Jan. 2011. Socio-economic impacts of bird watching along the Great Lakes

Bait and Switch

VHS-induced bait choices tested by OCAFS members

by Stacy Brannan, Ohio Sea Grant Communications



Ohio Department of Natural Resources

Recently, when yellow perch fishermen have stopped by their favorite bait shop on the way out for a day on Lake Erie, they've discovered a "Sold Out" sign over the tank of emerald shiners—the preferred bait fish for yellow perch. The shortage is directly related to the arrival and spread of the fish disease viral hemorrhagic septicemia (VHS) in the Great Lakes region since 2006. The federal government and various state governments have issued restrictions to limit the transport of susceptible fish, making it illegal to move some bait fish across state lines, privately or commercially, even within the same body of water.

Since most bait fish sold in Ohio have traditionally come from commercial trappers in New York, shortages of live emerald shiners have hit Ohio fishermen, as well as fishing businesses, hard. Those businesses have started trapping the shiners themselves in an attempt to relieve the market stress, but fishermen have also started to get more creative.

"Some anglers, when there's a shortage, switch to artificial shiner imitations," says Curt Wagner, Fisheries Biologist for the Ohio Department of Natural Resources and member of the Ohio Chapter of the American Fisheries Society (OCAFS). "Particularly popular are biodegradable, rubberish bait packed in this stinky liquid. It's supposed to have the look, the scent, and the appeal of the real thing for yellow perch." However, no one was sure that the artificial baits were as effective as the real thing, so Wagner put together a study for OCAFS members during their annual summer meeting. Since the meeting was to be held at Stone Laboratory, he applied for and received grant funding from Ohio Sea Grant for NOAA shiptime aboard the *Gibraltar III* research boat.

The weekend of the OCAFS meeting, 13 anglers set out to a spot between Lake Erie's Rattlesnake and Middle Bass islands, prepared to test four different types of emerald shiner baits: live, frozen, brine-preserved, and artificial. "In advance, we assigned a random rotation of bait types so that each angler fished each of the four baits for 30 minutes and not everyone was fishing the same bait at the same time," Wagner explains. "We would blow a whistle and everyone would switch to a different bait type. We wanted to get a fair, side-by-side comparison."

Using identical fishing rigs, each participant was instructed to fish all four baits the same way, letting it go all the way to the lake floor, then cranking it up one or two times to get it a little bit off the bottom.

Their findings were surprising: out of a total of 59 perch caught within the two-hour timeframe, 27 were caught using live bait, 18 on frozen shiners, 14 on brine-preserved shiners, and none on artificial. From a management perspective, the data indicate a potential need for Ohio businesses to begin to cultivate emerald shiners to keep up with demand. However, Eugene Braig, Assistant Director of Ohio Sea Grant who took part in the study, believes that anglers should simply start planning ahead for their bait needs.

"Emerald shiners are available in Ohio waters in the spring each year, so it may be a good idea to stock up early in the season and preserve them so you have enough to get you through fall," Braig says. **TL**

Sea Grant Academy Brings New Agents Up to Speed

Brand-new Sea Grant agents typically have new employee training through their home university's Extention program, but that training doesn't cover topics specific to Sea Grant. To fill that gap, the National Sea Grant office created Sea Grant Academy, which this year brought together approximately 30 Sea Grant agents from across the country, each of whom had been with the program for five years or less.

Agents Matt Thomas, Tory Gabriel, and Colleen Wellington represented Ohio Sea Grant, traveling first to Washington, D.C., in February and then to Florida in October for week-long sessions.

"The first week was geared toward making us more aware of how Sea Grant is structured and how it functions," says Wellington. "Being in D.C. gave us the opportunity to meet people in the National Sea Grant office and in NOAA."

The training also touched on PowerPoint presentation skills and program creation. Each agent was given an assignment to create a logic model—a written plan for developing, implementing, and evaluating a project—to share at the gathering in October.

"Some people used a logic model for projects that were already happening, just to make better sense of what they're doing and how to move forward," explains Wellington. "I used the fish habitat project that I will be submitting for approval soon. We then presented the logic models in Florida, giving a quick presentation and getting the chance to critique other people's presentations."

It was also an opportunity for new agents to network and learn about other Sea Grant programs, creating connections that could be beneficial in future endeavors. "The Academy provided a wealth of important information, but the most valuable part for me was the networking with other Sea Grant agents from all over the country," Gabriel shares. "Getting to know how other programs function and the types of projects other agents are working on sparks new ideas on what direction to take your own projects and programs. Plus, it allowed us to develop a national network that we can utilize for the rest of our careers." **TL**

Webinar Explains Cap-and-Trade Complexities

The phrase "cap and trade" gets thrown around frequently on news programs and in political speeches, but what does it really mean? Many people connect it to climate change, but the details about the proposed energy trading system and how the pending Waxman-Markey and Kerry-Boxer bills currently before Congress might affect the Buckeye State are less clear. Hoping to unravel the mystery, the Ohio State University Extension Climate Change Team hosted a webinar, "Climate Change and Ohio's Economy: Implications of Cap and Trade for Ohioans," featuring presentations from Ohio State's leading experts. The team is made up of representatives from departments throughout Ohio State, including Ohio Sea Grant.

To set the tone for the webinar, Ellen Mosley-Thompson, Director of the Byrd Polar Research Center at Ohio State, explained the global impact of rising temperatures, illustrated best in photos depicting Mt. Kilimanjaro, which has lost 85% of its ice field since 1912. Tom Blaine of Ohio State University Extension outlined predictions that Ohio's climate zone will shift, resembling that of current day Missouri by 2050. Realistically, this would mean mild, rainy winters with more ice storms and no ice cover on Lake Erie, causing problems for cold water fish species that rely on ice for successful reproduction.

In current federal cap-and-trade proposals, a cap would be set to limit total carbon dioxide emissions nationally. Businesses with higher emissions than the cap allows would then be able to buy credits from companies that have decreased their emissions or, alternately, purchase carbon offsets

in the form of reforested land and buffer zones along waterways. Ohio would be economically hard hit in these plans, largely because 99.4% of its electricity is generated from coal, making the state third in coal use behind Texas and Indiana. Since most of the carbon dioxide reduction requirements will come from power generation, Tim Haab, Professor in the Department of Agricultural, Environmental, and Development Economics (AEDE) at Ohio State, explained that it is imperative for Ohio to begin to invest in alternative energy sources.

Brent Sohngen, Professor in AEDE at Ohio State, hopes those participating were able to get a good grasp of the issues. "The webinar presenters really wanted to convey several sides to the climate change story," he explains. "We hope that the scientific presentations illustrated the serious nature of the scientific endeavor and that participants now better understand one of the tools widely recommended for climate change policy—namely cap-and-trade systems. We also hope that participants recognize that there are benefits and costs of any policy on climate change."

To watch and hear all presentations from the webinar, visit ***ohiowatersheds.osu.edu/climate/webinar.php***. **TL**

STONE LABORATORY
2010 SUMMER COURSES

Earn college credit on Ohio State University's Island Campus on Lake Erie

Introductory Courses for All Majors

Open to college and advanced high school students.
1-week courses, 3 quarter credits

- **ENR 230:** Ecology and Conservation of Birds (June 13–19)
- **EDU PAES 140.05:** Lake Erie Sport Fishing (June 13–19)
- **ENTOMOL 126:** Introductory Insect Biology (June 20–26)
- **EEOB 125:** Introductory Aquatic Biology (June 27–July 3)
- **EARTHSCI 107:** Introduction to Oceanography (July 4–10)
- **EEOB 125:** Introductory Aquatic Biology (July 11–17)
- **EEOB 125:** Introductory Aquatic Biology (July 25–31)

Upper-Level Courses

Open to undergraduate and graduate students in biological sciences, education, and natural resources, as well as to science teachers.
1-week courses, 3 quarter credits

- **EEOB 622:** Field Herpetology (June 13–19)
- **EEOB 513:** Field Ecology (July 25–31)
- **EEOB 692:** Ichthyoplankton Identification Workshop (June 27)

5-week courses, 5 quarter credits

Term 1: June 20–July 21

- **EEOB 400:** Evolution
- **EEOB 503.03:** Introduction to Ecology (6 credits)
- **EEOB 621:** Ichthyology
- **EEOB 651:** Field Zoology
- **ENR 799:** Current Topics in Environment and Engineering, 1 credit (Three Thursday evening seminars)

Term 2: July 22–August 21

- **EEOB 440:** Introductory Ethology
- **ENTOMOL 612:** Aquatic Entomology
- **EEOB 652:** Limnology
- **EEOB 653:** Fish Ecology
- **ENR 799:** Current Topics in Environment and Engineering, 1 credit (Three Thursday evening seminars)

For applications, go to stonelab.osu.edu or call 614.292.8949

Non-Credit Workshops

Open to the public and college students as non-credit courses. Participants must be at least 18 years of age.

- **Plankton Identification** (June 10–11)
- **Lake Erie Sport Fishing** (June 11–13)
- **Making Distinctive Photographs of Nature** (June 25–27)
- **Algae Identification** (August 2–3)
- **Algae Identification** (August 4–5)
- **Dealing with Algal Toxins** (August 9–10)
- **Fish Sampling Techniques** (October 2–3)

Science Courses for Educators

Open to classroom teachers and education majors with a junior rank or above by summer 2010.
1-week courses, 3 quarter credits

- **ENR 614:** Ocean and Great Lakes Literacy (June 13–19)
- **ENR 690:** Teaching with Google Earth and Google Ocean (June 20–26)
- **EARTHSCI 584:** Oceanography for Teachers (June 27–July 3)
- **EEOB 785:** Stream Ecology for Teachers (July 4–10)
- **EEOB 511:** Local Flora for Teachers (July 11–17)
- **EARTHSCI 583.03:** Geologic Setting of Lake Erie (July 18–24)
- **EEOB 513:** Field Ecology (July 25–31)

REU Program

Live the life of a professional researcher this summer! In Stone Lab's Research Experience for Undergraduates Scholarship Program, students spend five or nine weeks working alongside top scientists to learn how to conduct in-the-field research. Choose from one of several focus areas, including:

- **Entomology, the study of insects**
- **Limnology, the study of inland waters**
- **Ornithology, the study of birds**
- **Fisheries management**
- **Biological collections curation**

Scholarships and Jobs

All students taking for-credit courses are eligible for scholarship funds, which typically range from $100 to $2,500. Students enrolled in five-week courses can also apply for Stone Lab's part-time positions. For more information, visit ***stonelab.osu.edu/costs/aid***.

Student Research Experience Crosses Borders, Tops Summer

by Stacy Brannan, Ohio Sea Grant Communications

While many undergraduate students were spending their summer working behind an ice cream counter or lounging at the pool, David Fullard was on a U.S. Geological Survey (USGS) boat collecting fish on Lake Erie. David, a senior Environmental Policy and Management major at Ohio State University, spent six weeks working with Martin Stapanian of the USGS to gather data about Lake Erie's cold water fish as part of an annual study that tracks the population of three fish species in the eastern basin. His hands-on research opportunity came thanks to Stone Lab's Research Experience for Undergraduates Scholarship Program.

"My first term assignment was in the Stone Lab research building, analyzing otoliths to determine ages of previously caught whitefish," David explains. "Otoliths are bones in a fish's ears that grow rings, kind of like a tree. If you count the rings, you can tell how old the fish was when it died."

To age one of the 180 pairs of otoliths he'd been given to process, he used a diamond-tipped Dremel to cut it in half, then wet sanded it with 600 grit sandpaper to make the rings easier to read. "About 50 pairs had already been cut and aged by a professional, so I could use them as a comparison," he reveals. "I spent a lot of time looking under the microscope and making phone calls to the guys at the USGS. The project is something like a census, tracking the age of the population."

The second part of his project, however, got him out in the field, setting gill nets in Lake Erie's eastern basin as part of an annual multi-agency survey of whitefish, lake trout, and burbot. It was an opportunity to spend seven days on a boat, working alongside researchers from the USGS and the Ontario Ministry of Natural Resources (OMNR), getting real, first-hand research experience.

"We'd set the net in the evening, and then in the morning we'd go and pick the net, gathering all the fish we caught," David says. "We'd put the net in a bucket, and at the end of the day, we'd go to the OMNR office, and they would help us process the fish—weighing them, checking the contents of their stomachs, determining their sex. Once I'd watched enough times, I actually got to process some fish myself."

The most interesting aspect of his summer experience, however, was getting the chance to see how different agencies can work together to achieve a common goal, especially as it relates to a shared resource like Lake Erie. It's something he'd like to pursue in his future career.

"I used to be a Fisheries Science major, but I just got so interested in the interconnectivity of so many different agencies and all this different research," he says. "Working in the aquaculture lab made me realize that there are a lot of regulations that need to be made to limit damage to the environment. I figured that if I did this policy track and with all of my fisheries experience, it'll put me in the right place to help manage these different problems that we have."

It's an interest that is very needed in the scientific and policy-making communities, according to Eugene Braig, Assistant Director of Ohio Sea Grant and Stone Lab. "It is really easy to immerse ourselves in our pet biological interests: fish, forests, birds, the Great Lakes, watersheds ... they're all inherently exciting to those who work with them. But David has risen to an appreciation of their value as common resources and is working with equal passion toward understanding and augmenting the complex policies of resource management. It's a rare and valuable thing." **FOSL**

Friends Of Stone Laboratory

Dear friends,

It is an exciting time for the Friends of Stone Lab! We are on the verge of completing two very important endowments as of this writing.

The first endowment is the Blankenship Memorial Endowment initiated by FOSL Treasurer Lydia Bailey in memory of her father. It aims to provide funding for education, research, and outreach and focuses on providing scholarships to students from Appalachia to attend Stone Lab.

The second endowment is the Tuition Reduction Fund, initiated by Dr. Doug Kane during his 2005-06 FOSL presidency. It aims to reduce tuition costs for **all** *students attending Stone Lab. This will be important for many students in the future, especially as tuition costs continue to rise.*

To encourage your donation to these endowments this season, the FOSL Board of Directors has decided to **match funds that you donate to either fund by the end of 2009**. *We hope you will consider donating so the endowments can be completed and can begin to generate much needed revenue to help Stone Lab and the students.*

You should have received a letter from us recently. Remember, you may donate anytime at **http://stonelab.osu/fosl/give** *or by mail. We look forward to your continued support!*

Sincerely,

Lisa Bircher *lisa.bircher@epschools.k12.oh.us*
FOSL President

12th Annual Open House

Stone Laboratory once again opened its doors wide on September 12 for the annual Open House, which was by far the most successful one we have ever held. More than 1,000 visitors came to Gibraltar during the event, with the two Stone Lab vessels running continuously, carrying full passenger loads each trip. Approximately $2,000 was raised through donations, sales of merchandise, and some new FOSL memberships. Several hundred visitors also took advantage of the Open House at the South Bass Island Lighthouse.

Following the Open House, FOSL held the annual members meeting at the Waldock Gazebo. This gathering is always a fun way to unwind from the hectic pace of the day and catch up on the latest Stone Lab news. There are always many high points and many people to thank for the success of the year's activities. The remainder of the day allows for new and old friends to chat over dinner and then to cheer on their favorite "pirates" during the traditional Carp Cup rowboat race. The evening ended with many people watching the Ohio State football game together in the Stone Lab conference room. **FOSL**

Buckeye Island Hop

Approximately 36 people from four Ohio State University friends and alumni groups pitched in to spruce up Stone Laboratory during the annual Buckeye Island Hop, held this year on October 2–4, 2009. Representatives of FOSL, the Ohio State College of Biological Sciences Alumni Society, the Columbiana County Alumni Club, and the Greater Cleveland Alumni Club completed work projects, enjoyed good food and good company, and even tuned into the Buckeye Football game against Indiana thanks to a donated satellite dish.

The group accomplished a lot of work, installing 17 cabinets to house the Stone Lab fish collection, cutting brush to give visitors an unobstructed view of Lake Erie, cleaning the classroom building, and power washing the Harborview Dormitory. Other participants cleaned and shrink wrapped a boat for winter storage, replaced a balcony on Cooke Castle, and even traveled to South Bass Island to put down mulch at the Lake Erie Islands Historical Society and the Jane Coates Trail.

All of that effort was rewarded on Saturday evening with a wine tasting and dinner, as well as a presentation from recently retired Ohio State Sea Grant Extension Educator Fred Snyder, who spoke about his 30-year career. **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

The Ohio State University
PO Box 119, Put-in-Bay, OH 43456
419.285.1800, 614.247.6500, Fax 614.247.6578
stonelab.osu.edu

Dates to Remember:

Stone Lab REU Deadline—February 24
Winter Program and Silent Auction—March 2
Stone Lab Scholarship Deadline—March 16

A Hub of Activity

The Stone Lab faculty and staff use their many talents to ensure that the summer educational programs are always of the highest order. Anyone who has ever attended classes at Stone Lab knows how hectic it can sometimes get. In addition to these "normal" activities, there are always a number of other outreach and educational opportunities taking place. This past summer once again saw the lab hosting many events and groups, including: U.S. State Department-sponsored environmental groups from Tunisia and Algeria; the Bowling Green State University School of Journalism; 4-H Sea Camp; the Ohio Master Gardener Club; an Elgin, Illinois, high school workshop group; seminars for Ohio legislators hosted by Senator Mark Wagoner and Representative Dennis Murray; Coastal County Commissioners Day; and a regional conference of Mid-West State Departments of Agriculture.

The traditional Thursday evening lectures continued to be very popular. Wednesday tours of Gibraltar Island were also a consistent draw for the general public. This summer also saw expanded tour opportunities at the South Bass Island Lighthouse and the operation of the Aquatic Visitors Center at the old ODNR fish hatchery. There are always a lot of activities and opportunities that give Stone Lab a chance to educate and influence professionals and the general public about Lake Erie and environmental issues. **FOSL**

Ohio Sea Grant and Stone Laboratory
The Ohio State University
1314 Kinnear Road
Columbus, OH 43212-1156

Non-Profit Org.
U.S. Postage
P A I D
Permit No. 711
Columbus, OH

Stuff Your Christmas Stocking with Stone Lab Gear and Help Send a Student to Lake Erie Next Summer

Check out all the Stone Lab goodies at stonelab.osu.edu/store