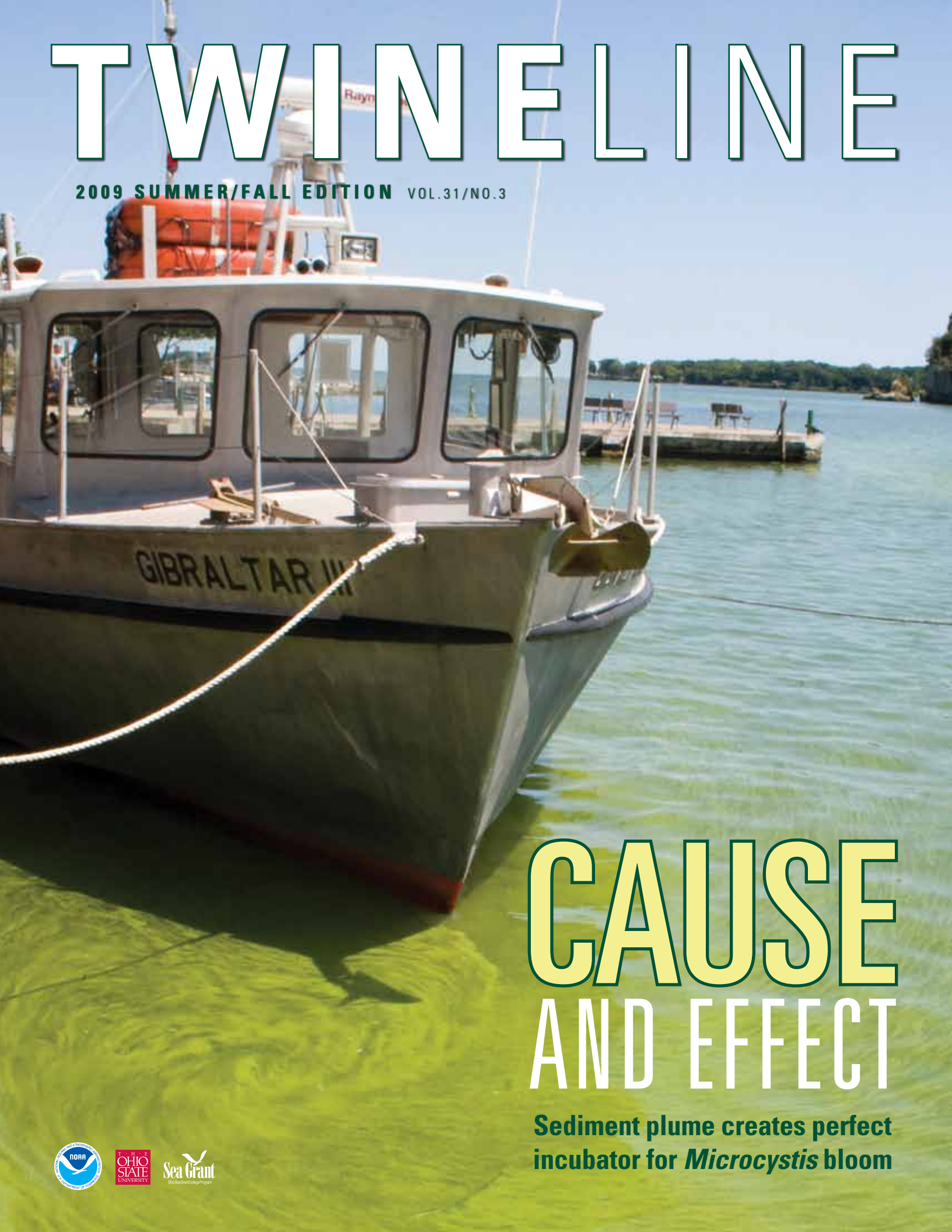


TWINE

2009 SUMMER/FALL EDITION VOL. 31/NO. 3



CAUSE AND EFFECT

Sediment plume creates perfect
incubator for *Microcystis* bloom



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Sea Grant receives network awards

Joe Lucente, Ohio Sea Grant Extension Educator, was honored with the 2009 Great Lakes Sea Grant Network (GLSGN) Mid-Career Award in July. He competed with Sea Grant Extension Agents from all seven other Great Lakes programs and was selected to receive the award through a competitive peer-reviewed application process that recognizes outstanding service to the GLSGN.

In addition, Sea Grant's Ohio Clean Marinas Program, led by Extension Educators Dave Kelch and Colleen Wellington, received a Great Lakes Outreach Superior Programming Award from GLSGN for its Boat Shrink Wrap Recycling Program. The award recognizes a multi-program or single state multi-partner initiative that has helped solve a problem of major importance in the Great Lakes basin.

Sea Grant congratulates Joe, Dave, and Colleen on their well-deserved recognition.



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Cover photo by Melinda Huntley *Microcystis* blooms like these off of Gibraltar Island have worsened in recent years, spreading from the Maumee River to the Lake Erie Islands and as far east as Avon Point, some 75 miles downshore.

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CAUSE AND EFFECT



Sediment plume creates perfect incubator for *Microcystis* bloom

by Stacy Brannan, Ohio Sea Grant Communications

Pea soup. Green Kool-Aid™. Spinach soufflé. No matter which food item comes to mind when you see harmful algal blooms (HABs) in Lake Erie's Western Basin or washed up along its shorelines, their existence is certainly unwelcomed. Blooms of blue-green algae called *Microcystis*—a common species of cyanobacteria that can produce toxins harmful to animals and people—have shut down beaches, negatively affected sport fishing and boating, and created a headache for water treatment companies. Some scientists believe that the blooms also contribute to the Dead Zone, floating out to the Central Basin where they sink and decompose, consuming the limited oxygen near the lake bottom. The blooms had disappeared in the 1980s, when Lake Erie seemed to be on the road to recovery, but the last 10 years have seen their resurgence.

In his work at the Lake Erie Center at the University of Toledo, Ohio Sea Grant researcher Dr. Tom Bridgeman was on the scene to witness one of the first large *Microcystis* blooms that formed in Maumee Bay in 2003. In the next few years, he began to see a pattern.

"We noticed from satellite photos that the blooms overlapped almost exactly with this



Turbid or muddy water acts as the perfect incubator for *Microcystis* blooms. The picture on the left shows the plume of sediment coming from the Maumee River on August 26, 2008—a breezy day when the water column was mixing. On the right, in a picture taken on September 3, 2008, you can see that the bloom had grown over the plume.



big, muddy river plume coming from the Maumee River," he recalls. "We started to think there might be a connection between the plume and the bloom."

So in the summers of 2007 and 2008, Bridgeman's graduate student Justin Chaffin set out to see if there was indeed a connection between the two. It turns out that sediment plumes are the perfect incubator for the HABs, and limiting the mud that gets swept downriver and into Lake Erie's Western Basin could go a long way toward reducing their occurrence.

In Full Bloom

Chaffin's data collection endeavors didn't start out successfully. The summer of 2007 was unusually dry, which meant fewer, smaller blooms. "I only found *Microcystis* the first and last days I went out to sample," he says. The next year, however, was a different story. *Microcystis* levels were moderate all summer, and then, in August, a strong storm swept through the Western Lake Erie region, stirring up a lot of sediment that poured from the Maumee River and into the



In 2008, Ohio Sea Grant researcher Dr. Tom Bridgeman and his graduate student Justin Chaffin collected samples at six different sites a total of six times from July through September. Chaffin determined that the *Microcystis* had plenty of nitrogen but were still phosphorus deprived, indicating that phosphorus levels determine how much the blue-green algae will grow.

Maumee Bay. As Bridgeman and Chaffin had predicted, by September a massive bloom spread over the muddy plume, starting from the river and extending nearly 75 miles to Avon Point.

“Justin found that the summer of 2008 had the largest, most extensive *Microcystis* bloom since we started keeping track in 2002,” Bridgeman explains. “It was 20 times larger than what we’d seen in 2002 and six times larger than 2007.”

Bridgeman and Chaffin boarded their 25-foot research vessel to collect samples six times, starting in late July 2008 before the large bloom and continuing through September, from six different sites: two near shore at the mouth of the Maumee River, two at mid-range, and two off shore, toward the center of Lake Erie’s Western Basin. The mid-range points, it turned out, had the perfect characteristics of a *Microcystis* incubator.

“Near shore is too shallow, so light is able to penetrate down to the lake floor, giving all species of algae more than enough light to thrive. *Microcystis* doesn’t have an advantage there,” Chaffin says. “Further out, the

sediment and nutrients from the river plume are too dispersed. Those points in the middle have the right combination of turbidity, or muddiness, and depth.”

All things being equal, beneficial phytoplankton like green algae and diatoms will outgrow *Microcystis*, but the harmful cyanobacterium has one ability the others don’t: it can regulate its buoyancy. In a typical 24-hour period, a *Microcystis* alga gathers carbon in its cells via photosynthesis. The process causes it to grow heavier, and it eventually sinks toward the bottom of the lake. As it respires, or uses up its carbon stores, bubble-like structures called gas vacuoles are formed internally, causing it to rise to the surface again. Given enough time, *Microcystis* can adjust to conditions that might keep it from gathering light at the surface of the water. Very choppy water that would cause strong mixing of the water column, for instance, is too strong for it to overcome.

When waters are calm, 90% of all *Microcystis* cyanobacteria can be found at the surface. This can further shade other varieties of algae that don’t have the buoyancy benefit.

But there is a downside to *Microcystis*’ floating ability. In testing the samples, Chaffin found that bright, direct sunlight in calm water can actually damage the blue-green algae, regardless of the amount of mud in the water, as illustrated in Figure A. “On calm, sunny days, *Microcystis* floating on the surface became damaged quickly, showing loss of up to 50% of photosynthetic capacity in samples collected between 10 a.m. and 2 p.m.,” he explains. “Even after 2 to 5 hours of recovery time in the dark, traveling to the lab for testing, much of this damage was still unrepaired.” So the longer *Microcystis* is stuck in the sun’s direct rays, the more likely it is to be damaged significantly.

However, when the water is filled with sediment and breezes help to mix the water column, muddiness acts as a protective shield, as illustrated in Figure B. “On sunny days when the water was turbid and winds were blowing above 7 miles per hour, *Microcystis* was mixed more evenly throughout the water column, and no significant damage to its photosynthetic machinery was observed,” Chaffin relays. In having the opportunity to float just below the surface of the muddy water, the *Microcystis* can gather all the light it needs without sustaining ill effects.

Its responses even adapt to maximize its light-collecting efforts. “Any photosynthesizer will become more efficient at photosynthesis when it’s kept in low light conditions, whether it’s a small tree growing in a shaded forest or *Microcystis* growing in murky water,” Chaffin says. To prove that the cyanobacteria had made such an adjustment, Chaffin extracted the photosynthetic pigments from his *Microcystis* samples and tested them to determine how much chlorophyll and phycocyanin were present per gram of blue-green algae, knowing that both pigments are responsible for harvesting light energy. He found that *Microcystis* will produce double the amount of chlorophyll and six times the amount of phycocyanin, a pigment unique to cyanobacteria, when it’s in muddy water compared to when it’s in clear water.

But the turbidity of the Maumee River plume is not the only thing contributing to the massive *Microcystis* blooms. The river also washes high levels of nutrients into Lake Erie from agricultural runoff in the region. Chaffin tested his samples for the nutrients most commonly blamed for increased HAB growth: phosphorus and nitrogen.

“It’s typically thought that *Microcystis* does well when nitrogen is very low and phosphorus is high,” he explains. “Sure enough, when I tested the samples, the cyanobacteria had plenty of nitrogen but were still phosphorus deprived. So, the hypothesis still holds true: *Microcystis* is phosphorus limited in Lake Erie. The amount of phosphorus in the water is going to determine how much the cyanobacteria can grow.”

This result underscores the importance of determining the source of the phosphorus that has plagued Lake Erie for decades. Following the passage of the Great Lakes Water Quality Agreement and the Clean Water Act, phosphorus loading was limited in the 1970s, resulting in a cleaner, clearer lake. But even though the amount

of phosphorus being dumped into the lake has remained below the amount recommended by management agencies, the level of soluble reactive phosphorus in the lake water has increased since the mid-1990s. Researchers believe this may be attributable to a shift in the kind of phosphorus being flushed into the lake via runoff. Phosphonates—a kind of phosphorus commonly found in chemical weed killers—might be more biologically available to harmful varieties of blue-green algae, such as *Microcystis*, than to beneficial algae. Scientists at Ohio Sea Grant and other agencies are currently working to solve this puzzle.

Clearing the Water

As for clearing up the turbid plume that originates at the Maumee River, any management practice that would limit erosion would improve the situation. “Impermeable surfaces, such as roads, parking lots, and even hard-packed land, do not allow water to infiltrate the ground,” Chaffin relates. “Instead, the water is forced into storm drains and streams, taking soil

“If we can limit the amount of sediment that gets into the river,” Bridgeman explains, “it would decrease the amount of sediment that gets kicked up during storms over time.”

particles along with it. The key is to create barriers that slow down the water’s flow, allowing it to be absorbed. This applies to any watershed, not only Lake Erie.”

Plants are very good at capturing water in their root systems, so placing them in an area where water tends to flow is recommended. For instance, farmers can install buffer strips of vegetation around plowed fields and along rivers, and regional land managers can design drainage ditches with a number of turns to give rain water a chance to be absorbed. Wetlands also slow the flow of water and are natural contaminant filters, so restoring or creating them will reduce both sediment and nutrient loading.

People who are interested in doing their own part to limit soil runoff can catch rain from their home’s gutters in a rain barrel, the water from which can be reused for garden irrigation. Rain gardens—a planted strip along the edges of driveways, walkways, and any other impervious surface—will absorb storm water as well. Native plants, such as wild flowers, are particularly well suited to this task.

Storms will always stir up a certain amount of sediment that already exists in the Maumee River and Lake Erie, simply because they mix the water column. However, implementing some of these land use practices could make a real difference.

“If we can limit the amount of sediment that gets into the river,” Bridgeman explains, “it would decrease the amount of sediment that gets kicked up during storms over time.”

For more information about this research, which was jointly funded by Ohio Sea Grant and the Lake Erie Protection Fund, contact Dr. Tom Bridgeman at thomas.bridgeman@utoledo.edu. TL

Microcystis’ Response to Light

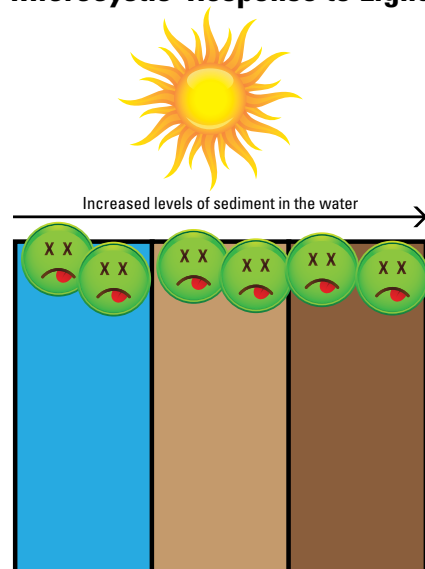


Figure A – *Microcystis* is damaged on calm, sunny days when they float on the surface of the water

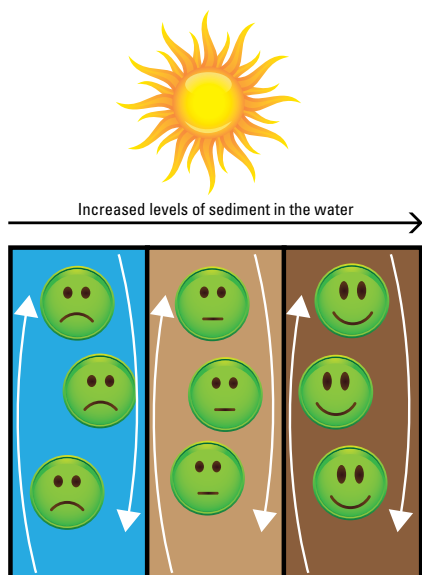


Figure B – Sediment protects *Microcystis* when the lake is mixing

Bright, direct sunlight in calm water can actually damage *Microcystis*, even if the water is muddy, because of its tendency to float on the water’s surface (Figure A). However, when the water is filled with sediment and breezes mix the water column, muddiness acts as a protective shield, helping the *Microcystis* to thrive (Figure B).

Old Problem, New Questions

Sea Grant researchers study nitrogen cycling as possible Dead Zone contributor

by Stacy Brannan, Ohio Sea Grant Communications

Traditionally, scientists have believed the Dead Zone forms when phosphorus in the lake water encourages excessive algae to grow. When those algae die, they sink to the cold Central Basin floor, where the limited oxygen in the water is consumed in the decomposition process, producing a Dead Zone. Limiting the amount of phosphorus that ended up in Lake Erie from fertilizers, detergents, and sewage treatment plants seemed to solve the problem in the 1970s. However, the last decade has seen a return of the hypoxic, or oxygen-depleted, areas of the lake, even though levels of external phosphorus loading have remained the same. To Ohio Sea Grant researchers Dr. Darren Bade and Dr. Bob Heath of Kent State University, this change signals a need to look at nitrogen—a nutrient that, if it proves to be a contributor, could completely recast the management strategies for Lake Erie.

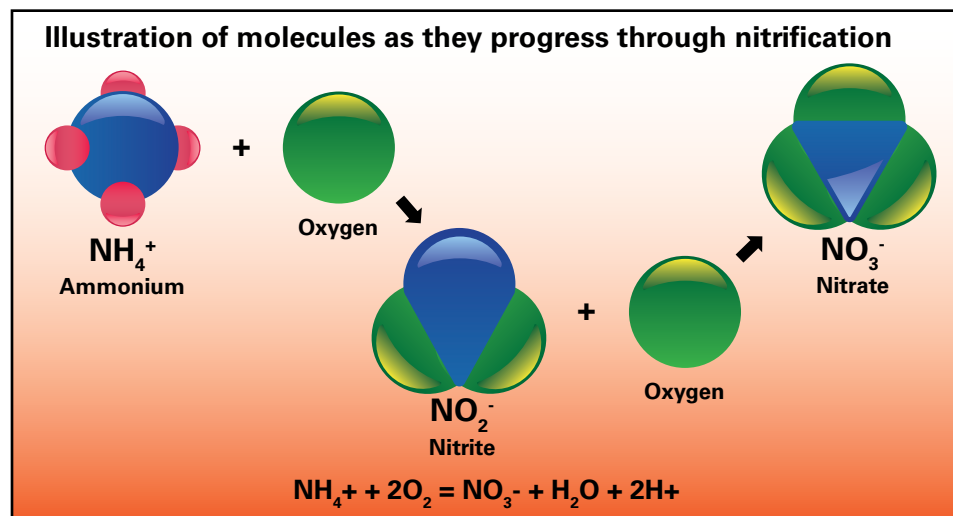
It certainly isn't clear that the algae decomposition rate really accounts for the level of oxygen depletion occurring, which led to Heath thinking about other possible causes. "I made a list of all of the things that can be oxygen consumptive," he explains. "Nitrification consumes four atoms of oxygen for every atom of nitrogen that gets oxidized from ammonium to nitrate. That's a lot of oxygen. I did some searching, and I realized that no one studying Lake Erie had looked at nitrification as a possible process for studying the Dead Zone."

All living things need nitrogen to produce complex organic molecules like amino acids and proteins, but a large percentage of nitrogen in the atmosphere exists as nitrogen gas (N_2)—a form that can't be used by most organisms. However, some cyanobacteria found in Lake Erie can change nitrogen gas into a more biologically available form, a process called "nitrogen fixation." Once the inert N_2 gas form is bound with four hydrogen atoms to become ammonium (NH_4^+) it can be used by organisms for their nitrogen requirements.

The ammonium also can be further broken down through a process called "nitrification," in which certain bacteria break

apart ammonium as a source of energy. The nitrogen is then bound with three atoms of oxygen to form nitrate (NO_3^-), the form preferred by plants and algae. If the oxygen-consuming nitrification process is occurring at significant rates in Lake Erie, it could explain where some of the oxygen in the Central Basin is going.

the samples to determine how many of them are genetically capable of performing nitrification. "Curtis is measuring the numbers of those genes that you can find in a community," Heath reveals. "He's asking if there is a relationship between the numbers of nitrifying bacteria and the nitrification rate." The team will continue to collect



During the nitrification process, some kinds of bacteria get energy by breaking apart ammonium molecules and adding oxygen atoms—two to create nitrite and three to create nitrate. Ohio Sea Grant researchers Dr. Darren Bade and Dr. Bob Heath believe this large consumption of oxygen may be contributing to the Dead Zone.

Since summer 2008, Bade and Heath have collected water and sediment samples in Sandusky Bay, at points from the mouth of the Sandusky River to the Central Basin.

"We've found a pretty broad range of nitrification rates and oxygen consumption rates in the samples," Bade says. "Our studies to date show that nitrification can account for between 5% and 80% of the oxygen consumed. That seems to point to a great deal of nitrification, but we haven't been able to explain the variation. We thought it would be tied to the amount of ammonium available, since ammonium is part of the nitrification process, but so far we haven't shown that to be the case."

Curtis Clevinger, a graduate student at Kent State, is currently testing bacteria in

samples seasonally through summer 2010 to strengthen their early observations.

If they can eventually establish a correlation, Bade and Heath are hoping to create a new Lake Erie management concept that would include consideration of nitrogen loading. However, managing nitrogen is difficult because of the diversity of its sources, ranging from acid rain to agricultural runoff. For now, though, Bade is pleased to be working on such cutting-edge research.

"Some research answers a question that's been around a long time, while other research opens up a new area of questioning," he says. "This is definitely the latter."

For more information about this Sea Grant research, contact Dr. Darren Bade at dbade@kent.edu or Dr. Bob Heath at rheath@kent.edu. TL

Paving the Way

Ohio Sea Grant's first Extension Agent reflects on 30-year career

by Stacy Brannan, Ohio Sea Grant Communications



"Ohio Sea Grant has really been a job I look forward to. I get out of bed every morning and think, 'Okay, I gotta' get back to it' because it's work that I really like."

Some people are lucky enough to spend their lives in careers that seem tailor made for them. Ohio Sea Grant Extension Specialist Fred Snyder, with his knack for bringing people together and his penchant for teaching, is one of those fortunate ones. His impending retirement after 31 years has Sea Grant preparing for the loss of one of its trailblazers.

"Fred is the epitome of what it means to be a Sea Grant agent," says Dr. Jeff Reutter, Director of Ohio Sea Grant and Stone Laboratory. "He has always put the needs of his clientele first. He solves problems and eases the tension when conflict is present. No one has created partnerships, empowered people, helped businesses, or taught students better than Fred. We will seek a substitute, but no one can replace Fred Snyder."

Fred's connection to Stone Lab began before Ohio Sea Grant even started. In the summer of 1974, he worked sorting benthos samples at the Lab for the Center for Lake Erie Area Research at Ohio State University, and then served a graduate student under Dr. Eddie Herdendorf, the center's director. Shortly after graduation he became the first Advisory Services Agent for the then-brand-new Ohio Sea Grant College Program in October 1978.

One of his first challenges healed a rift that had evolved between

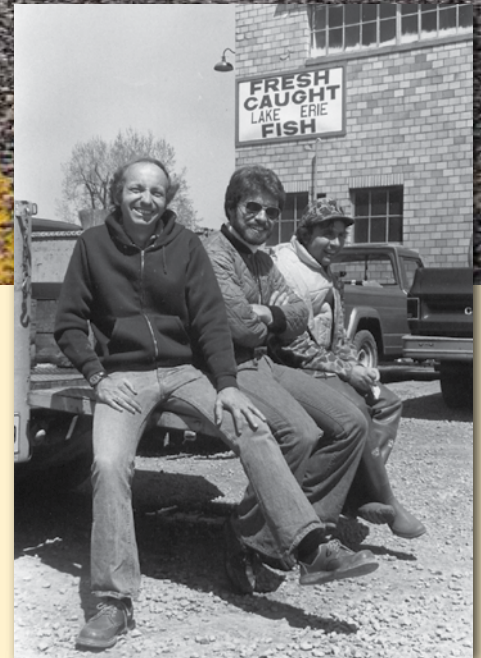
Camp Perry—a National Guard training post and firing range—and the surrounding Port Clinton community. Camp Perry had operated its firing range for decades without public complaint, firing artillery into an off-shore range and small arms into a near-shore range, which necessitated the closure of a section of Lake Erie. But once the walleye fishery began to grow in the 1970s and '80s, the public expressed its displeasure that the closure included a prime fishing reef.

"The public perception was that the range was closed all summer long, but my advisory committee discovered it was really only about two days a year," Fred recalls. "So we worked with Camp Perry to develop a system to notify the public via NOAA weather radio and local news outlets in advance of when the closures would happen. After that, the controversy just died."

Fred's gift for bringing people together has been evident as well in the annual Charter Captains Conference, which this year was held for the 28th time. For many charter fishing captains and other industry members, the conference has become the unofficial kickoff of the season each spring. Sixty-seven percent of captains who take part report that the cost-saving and profit-thinking techniques they learn save them money.

After so many years, Fred has finely honed the information he presents to conference-goers, making sure they're learning things that will be most helpful. "I'm not in the business of trying to teach professional fishermen how to fish, but better how to keep a successful business operation going," he says. "We discuss marketing and business, marine electronics, laws and regulations. It has become something that an entire industry relies on."

Teaching is one of Fred's strong suits. In addition to his work with industry, he is a fixture at Stone Laboratory each summer, where he teaches one-week courses in Introductory Aquatic Biology and Lake Erie Sport Fishing. After 17 years, he's developed a special Aquatic Biology curriculum that gives students a chance to see physical and chemical processes in action, and his fishing course has students on the lake every day, learning the techniques and equipment he hopes will make them smart fishermen. "It's all way too much fun to be considered work," he says.



Over his more than 30-year career, Ohio Sea Grant Extension Specialist Fred Snyder has worked to forge partnerships between Lake Erie industries and groups around the country. When the Louisiana crayfish industry contacted him looking for bait fish, he worked to connect them with Lake Erie commercial fishermen, who each year disposed of hundreds of tons of gizzard shad—a prolific fish for which people had no use.

Reflecting on his long career, Fred expresses pride in what Ohio Sea Grant has become during his tenure.

"I'm really proud that through the years I've played a role in making Sea Grant a household name for tens of thousands of people," he explains. "I've helped to build an Extension program where we serve as a point of transfer from the university to the public, showing them how to find information, helping them use it, answering their questions, solving their problems. People on the online message boards now say, 'You ought to ask Sea Grant,' and I think that's something to be proud of." TL

Ohio Tourism Team Opens the Toolbox

by Stacy Brannan, Ohio Sea Grant Communications

Tourism is big business in Ohio, bringing in \$38 billion each year from a wide variety of businesses, including hotels, attractions, restaurants, retail shops, and transportation companies. In 2008, Ohio State University Extension's Ohio Tourism Team recognized that the key to tourism's continued growth lies in encouraging new business ventures and partnerships in the state, as well as strengthening product development by educating business owners and destination marketers.

Gathering information to help foster those connections, then making it available in one online resource seemed like the perfect solution, and the Ohio Tourism Toolbox at ohiotourism.osu.edu was born.

Working directly with the Ohio Department of Development's Tourism Division, which provided match funding to an OSU Extension grant, the Ohio Tourism Team assembled links to resources on a number of topics, including starting a new business, taking advantage of collaborative marketing opportunities, identifying trends, gathering community input on tourism development, and creating new products. Ohio Sea Grant Tourism Program Director Melinda Huntley is a co-leader of the Ohio Tourism Team and helped create the Ohio Tourism Toolbox.



As the \$38 billion tourism industry grows in the state of Ohio, its long-term economic impacts will be calculated through business revenue, job creation, payroll, new business development, and local and state tax revenue.

"The Toolbox is the only comprehensive depository of information aimed at starting, sustaining, or growing a tourism-related business in Ohio," explains Amir Eylon, Ohio Tourism Director. A link to the Toolbox is available directly from the State of Ohio's tourism industry website.

The Toolbox website is broken down into different industry sections, such as attractions, convention and visitors bureaus, restaurants and wineries, and lodging, with resources available specific to each section. But just as importantly, each page also provides connections to the greater tourism industry.

"Many times individual industry sectors may not understand that they are part of a much larger tourism industry," says Huntley. "So although we give them resources specific to their business interests, we also have linked them to other places on the website that may help them better identify their role in the greater scheme of things." Making people more aware of the "big picture" could encourage them to



More than 1,500 industry professionals visited the Ohio Tourism Toolbox website in the first three months following its launch.

develop new projects in emerging niche industries like culinary tourism.

Kari Kauffman, Tourism Director for Experience Columbus, has been working with other Ohio Tourism Team members to form a chapter of the International Culinary



Tourism Association. In Ohio, this means bringing together agriculture and more traditional tourism entities.

"Typically, culinary tourism is very aligned with cultural tourism because it's all about experiencing a destination's culture through its foods," Kauffman explains. "But Ohio has such a rich agricultural history that agritourism really is an important part of culinary tourism for us. It's everything from food festivals and farm tours, to culinary retail markets like Heini's cheese in Amish country, to cooking classes at lodging venues and tours of attractions like the North Market in Columbus. It incorporates a lot of different industries that could use the Toolbox to find out more information."

Culinary tourism is one of several key emerging national markets highlighted on the Toolbox. Others include sports tourism, ecotourism, and heritage tourism, as well as hot topics like hospitality training and sustainability. Website visitors can also find how-to material and applicable state and national research findings.

Huntley says the Toolbox will never really be complete. "As new educational needs and audiences are identified, we add to the site," she explains. "We are also creating educational materials specific to Ohio's tourism industry. In fact, I just completed filming a 30-minute program on developing nature-based tourism that will be posted soon."

The Ohio Department of Development's Tourism Division hosted town hall meetings for members of the tourism industry throughout the state in late May and early June to let people know about the site, but it's too early to tell how much the industry is taking advantage of it.

"Success will be determined by traffic numbers on the website itself, of course, and also by the number of people who step up to become active members of the Ohio Tourism Team, helping to shape new products and programs or assisting with special projects. Just joining in on our conference calls is a good place to start," Huntley says.

Those interested in receiving e-mail notifications about upcoming Ohio Tourism Team conference calls and events should contact Melinda Huntley, Ohio Sea Grant Tourism Program Director, at huntley@coastalohio.com. TL

These Islands are for the Birders (and History Lovers, Too!)



ature lovers and history buffs planning excursions to the Lake Erie Islands have a new resource at their fingertips.

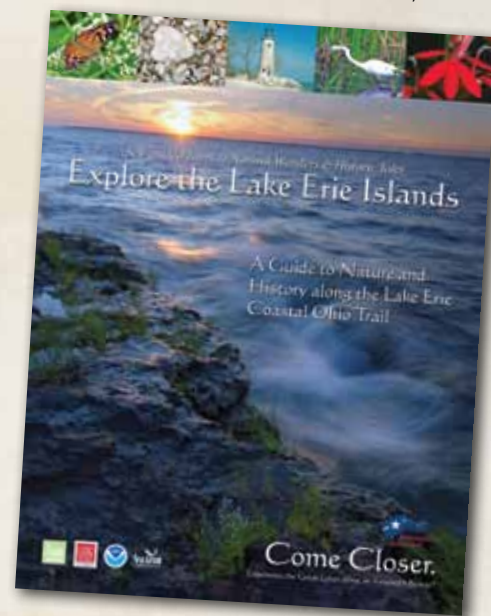
Explore the Lake Erie

Islands: A Guide to Nature and History along the Lake Erie Coastal Ohio Trail, a 64-page guidebook, provides detailed descriptions of each island and its parks, preserves, and historical sites. Entries also include lists of flora and fauna often spotted in the area, as well as directions, transportation options, and contact information.

The guide was funded by the Ohio Lake Erie Commission's Lake Erie Protection and Restoration Fund and created in partnership with Ohio Sea Grant, the Ohio Chapter of The Nature Conservancy, and the Lake Erie Coastal Ohio Trail. It was developed to fill a need for the 68% of American travelers who seek destinations where they can experience the outdoors. The hope is for the book to highlight the importance of protecting these natural spaces.

"The *Explore the Lake Erie Islands* guide will be a wonderful resource for visitors, with exciting places to visit and information on birds, plants, snakes, and butterflies, and where to find them," says Lisa Brohl, Chair of the Lake Erie Islands Chapter of the Black Swamp Conservancy. "It should bring an awareness and new appreciation of the natural treasures that the islands hold and the need to preserve them for future generations of visitors."

Unlike traditional Lake Erie tourism, which generally takes place during the warm summer months, resource-based tourism happens year-round. Birdwatchers, in particular, are more likely to visit during the spring and fall migration seasons. An increase in the number and diversity of tourists to the



area supports economic development in the Lake Erie region.

"This publication will be beneficial not only to each individual site, but also to the many businesses and communities throughout the region that depend on visitors for much of their income," says Larry Fletcher, Executive Director of the Ottawa County Visitors Bureau. "I

anticipate seeing nature and history lovers spending a lot more time in the Lake Erie Islands area once this guide gets into their hands!"

Guidebooks can be downloaded at ohioseagrant.osu.edu.

Individual copies may be picked up at no cost at the Lake Erie Shores and Islands Welcome

Centers in Port Clinton and Sandusky, as well as at South Bass Island's Aquatic Visitors Center and the South Bass Island Lighthouse. To order by mail, send a \$5 check or money order to cover shipping and handling, made out to Ohio State University, to Explore Lake Erie Islands, 1314 Kinnear Road, Columbus, OH 43212. TL



Priming the DEAD ZONE

Newly discovered winter alga may be linked to Lake Erie's summertime event

by Stacy Brannan, Ohio Sea Grant Communications



With the winds howling and snow falling, it seems like few microscopic creatures could survive a winter in Lake Erie. But Ohio Sea Grant researchers Drs. Michael McKay, George Bullerjahn, and Scott Rogers of Bowling Green State University have discovered life under the icy surface in the form of the diatom *Aulacoseira islandica*—and they believe it may even be contributing to that summertime phenomenon, the Dead Zone.

McKay and Bullerjahn discovered the cold-loving algal plankton in Lake Erie by accident while onboard a Canadian Coast Guard icebreaker with New York Sea Grant researchers Michael Twiss and Steve Wilhelm in February 2007. “Apart from Professor David Chandler’s pioneering research in the late 1930s, to our knowledge there had been little done to study Lake Erie, its microbiology, and plankton in the winter months,” McKay says. “Our plan was to go, do some sampling, and see what was out there. We had no expectations of what we would find.”

What they found were pockets of brownish-looking water, some the size of swimming pools and some that stretched for kilometers. At first they suspected it might be stirred-up sediment, but their testing proved otherwise.

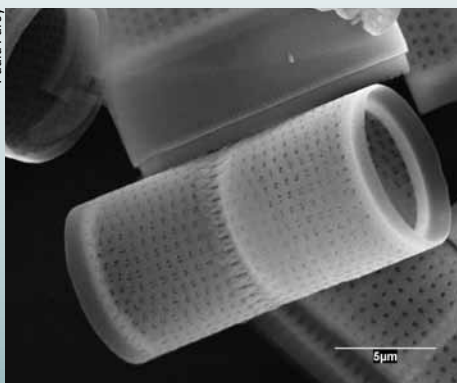
“I think a lot of people assume the lake is dormant in the winter,” Bullerjahn surmises. “As biologists, we knew that wouldn’t be true, but we were not prepared for the outcome: large accumulations of healthy diatoms under the ice, causing the ice to look brown.” It turned out that 80% to 90% of the biomass in those discolored water samples was *Aulacoseira*

islandica, a psychrophilic, or cold-adapted, diatom that can survive in low light and seemingly disappears when spring rolls around. “They don’t seem to be present once the water warms up,” McKay explains.

So, how might diatoms that thrive in the winter influence a Dead Zone that occurs in July and August? It all has to do with their life cycle.

The *Aulacoseira* appear to be able to maintain their position just below the surface of the ice, where they are able to absorb sunlight and multiply. What McKay and Bullerjahn want to know is what happens next. Are they eaten by zooplankton and other organisms? Or do they die and sink to the bottom of Lake Erie?

Paula Furey



Ohio Sea Grant researchers Drs. Michael McKay and George Bullerjahn have discovered large, brownish blooms of the diatom *Aulacoseira islandica* thriving under Lake Erie’s ice. Making up nearly 90% of the algal biomass, these cold-adapted plankton could be the bacteria’s fuel that sparks Lake Erie’s Dead Zone in the summer.

“If it turns out that most of these diatoms end up on the lake floor, they would provide a large source of organic carbon for bacteria to decompose, which would consume oxygen,” McKay says. “If this decomposition happens mainly when the water warms up and stratifies—forming a warm upper layer and a cold lower layer in the summer months—and not during the frigid winter months, it has to be contributing to the Dead Zone.”

To test this theory, the group will use Sea Grant funding to collect data for the next two winters, including taking part in several more science cruises. In addition, Environment Canada will use its icebreaker to deploy sediment traps that will sit on the bottom of the lake during the coldest months of the year, which should help determine if the diatoms are indeed sinking to the bottom of the lake.

If the blooms are occurring because of high nutrient levels in the water, it would be essential to track and potentially limit the source of those nutrients. Other theories point to the zebra mussel invasion as the trigger for *Aulacoseira*’s growth because of the mussels’ ability to increase levels of dissolved silica, a nutrient needed in large amounts by the algae. Certainly, McKay and Bullerjahn and their newly discovered, winter-loving diatom are poised to shake up the traditional models that considered Lake Erie more or less dormant from November through March. Preliminary data should be available in Summer 2010.

For more about this Sea Grant-funded research, contact Dr. Michael McKay at rmmckay@bgsu.edu or Dr. George Bullerjahn at bullerj@bgsu.edu. TL

You've heard the hype in the news, *now get the facts!*

CLIMATE CHANGE WEBINAR SERIES

Climate Change and Ohio's Economy: Implications of Cap and Trade for Ohioans



Thursday, October 15, 2009 12:00 – 1:30pm

This webinar will provide the latest information on the:

- Science of climate change, and potential implications for Ohio's future climate
- Status of federal climate change legislation in Congress
- Role of cap-and-trade policies
- Likely economic implications for Ohio consumers and businesses
- Actions landowners can take to reduce carbon emissions

The webinar is free, but space is limited.

E-mail Diana Lantz at Lantz.30@osu.edu to register. She will send instructions to registered attendees.

All presentations will be brief, only 10 minutes. Participants will have the opportunity to e-mail questions to the speakers during the seminar.



**ohiowatersheds.
osu.edu/climate**

Welcome and Introduction - Brent Sohngen

What is climate change and why is it important to consider policy now? A science perspective

Ellen Mosley-Thompson, Director, Byrd Polar Research Center, Ohio State University

Climate change and Ohio

Tom Blaine, Ohio State University Extension

What is cap and trade? What do legislative proposals currently in Congress say about it?

Brent Sohngen, Professor, Department of Agricultural, Environmental, and Development Economics, Ohio State University

Implications of cap and trade for Ohio industry and jobs

Tim Haab, Professor, Department of Agricultural, Environmental, and Development Economics, Ohio State University

What's in it for agriculture and forests? Land-based offsets in the cap-and-trade system

Bill Stanley, Director of Conservation, The Nature Conservancy, Ohio Chapter

Discussion



Aquatic Visitors Center Reels 'Em In

by Stacy Brannan, Ohio Sea Grant Communications



There's nothing like being around a group of kids as they watch a smallmouth bass gobble up a round goby—especially if the kids caught the goby themselves. “It’s like a rollercoaster. Everybody screams, and they love it,” says Tory Gabriel, Fisheries Program Manager for Ohio Sea Grant Extension. Gabriel has spent this summer developing new education programs at the Aquatic Visitors Center on South Bass Island, which once operated as a state fish hatchery and for more than 15 years served as an education center for the Ohio Department of Natural Resources (ODNR) Division of Wildlife.

Two years ago, budget constraints and the difficulties of running the center from the mainland forced ODNR Division of Wildlife to close the building. Ohio Sea Grant sensed

an opportunity and approached the agency about forming a partnership wherein Sea Grant would reopen and take over the day-to-day management of the center.

“Ohio Sea Grant has an office and staff on South Bass already, and our education and outreach missions are very similar, so the partnership was a good fit,” explains Eric Postell, Outdoor Education Supervisor for ODNR Division of Wildlife.

Gabriel, along with Sea Grant staff and volunteers, set to work in the spring, creating new displays and sprucing up the center’s four 800 gallon aquaria. “We have the aquaria set up with different habitats that you’d find in Lake Erie,” he explains. “The smallmouth tank is set up with a bunch of limestone rock ledges, along with rock bass and freshwater drum, and we have a weedy habitat with pumpkinseed, bluegill, largemouth bass, and even a muskie. Then there’s the open water habitat with yellow perch, walleye, and white bass.”

In addition to information about the historical operation of the hatchery, there’s also an interactive area that allows visitors to look at Lake Erie water under microscopes and identify the creatures they see by matching them to drawings on a large poster display. The biggest draw, however, is the dock, where kids under age 16 can fish for free and even borrow fishing gear for the day. That’s where the gobbled gobies come into play.

“They catch a lot of bluegill and pumpkinseed, occasionally a nice bass or yellow perch, but most of the kids get pretty good at catching gobies,” says Gabriel. “Since they’re invasive, we legally can’t put them back into the lake, so it gives us a chance to teach a little lesson about the food web by feeding them to the smallmouth bass.”

For families interested in learning even more about Lake Erie science, Gabriel also put together hands-on programs each Saturday. Activities ranged from sifting through Lake Erie sediment for macroinvertebrates to using the remotely operated vehicle to spy on fish hiding under the dock. Dr. Jeff Reutter, Director of Ohio Sea Grant and Stone Lab, hopes the new offerings enhanced the already outstanding Aquatic Visitors Center experience for the nearly 12,000 visitors that came through its doors this summer.

“This partnership with the Division of Wildlife is something that I had always wanted because the hatchery is a great facility,” he says. “It’s a real opportunity for us to teach the next generation about the importance of protecting Lake Erie.”

The Aquatic Visitors Center will reopen in the spring of 2010 and plans are already underway to enhance the visitor’s experience even more. For more information, including hours of operation, visit ohioseagrant.osu.edu. TL



This summer, nearly 12,000 people came through the doors of the Aquatic Visitors Center, and many took advantage of free fishing on the dock for children under age 16.

Amy Miller: Work, Learn, Lead, Teach

by Stacy Brannan, Ohio Sea Grant Communications

Sometime in the spring of 2008, Amy Miller found herself sitting at a table in Ohio State University's rec center, pondering what she might do that summer. Her eyes landed on a Stone Lab ad sitting on the table top, and she immediately thought, "Stone Lab! That's a good idea." It was a revelation that has led to two very busy summers on Gibraltar Island and a lot of new experiences.

"I feel like I've learned so much from just being here, being exposed to so many new things because everything is hands-on," Amy explains. "You get thrown into different situations with a variety of equipment, doing things that you'd never get to do on main campus. When you actually get to experience something instead of just hearing about it, you learn how to do it really well."

She's definitely learned a lot and taken advantage of a number of programs available to Stone Lab students. That first summer, Amy, who is now a Senior in the School of Environment and Natural Resources at Ohio

State, took a course in Field Ecology during the first term while working part-time for the Lab. The second term had her taking Introductory Ethology while also collecting data for her Research Experience for Undergraduates project that contributed to an ongoing study tracking the spread of the emerald ash borer in the Lake Erie Islands. Her focus was on South Bass and Gibraltar.

"I walked around and found as many ash trees as I could," she explains. "I measured the diameter to get an idea of the tree size, marked it with a Global Positioning System (GPS) device, and then rated its health on a scale 1-3. At the end I had a map with color-coded GPS points based on those health scores. I was looking for the center of the epidemic, probably the

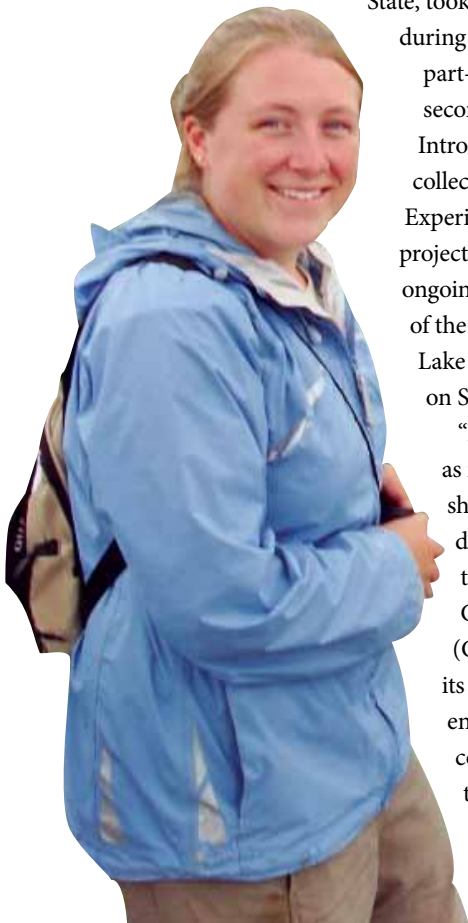


entry point where the borers would have come in, but I didn't find anything definite. My conclusion was that the borer is probably there—and there are definitely signs of ash tree decline—but their numbers are just not high enough yet for us to see it easily."

In April 2009 she got yet another perspective on the day-to-day workings of the nation's oldest freshwater biological field station when she became a Stone Lab workshop instructor. It's given her a chance to teach kids grades 4 and up about Lake Erie science, in addition to taking on a variety of special projects.

"Amy has shown great leadership skills, which has allowed us to turn her loose on projects like landscaping, painting, and recycling, as well as leading group tours and workshops on Gibraltar Island, at the South Bass Island Lighthouse, and at the Aquatic Visitors Center," says John Hageman, Stone Laboratory Co-Manager and Amy's supervisor. "She also developed a special bird lecture for the two Elderhostel groups we hosted this spring that was extremely well-received."

Overall, the experience has broadened her thoughts about future careers. "I'm actually considering teaching, now that I've done it," Amy reveals. "That wasn't something I'd thought of before, but I really like working with the kids and teaching the workshops. It's fun to see kids from all different places get excited about things they might never have experienced or thought they would enjoy before." Whatever she chooses to do in the long term, these new-found teaching skills may come in handy sooner rather than later: after graduation, Amy's considering a stint in the Peace Corps. **FOSL**



Friends Of Stone Laboratory

Dear friends,

Stone Laboratory is now in full swing for the fall workshop season, and the Buckeye Island Hop is right around the corner, October 2-4. As of this writing, nearly 40 people are scheduled to volunteer to help Stone Lab and the neighboring Put-in-Bay community that weekend. To stay informed about more upcoming volunteer opportunities, visit our award-winning website at stonelab.osu.edu/events.

I would also like to take the opportunity to recognize two important friends and supporters of Stone Laboratory, Fred Snyder and Chris Winslow. Fred retired at the end of this summer after three decades of work as an Ohio Sea Grant Extension Agent and many summers teaching Introductory Aquatic Biology and Lake Erie Sport Fishing at Stone Lab. Chris, past president of FOSL, has spent the last several summers conducting research and teaching at Stone Lab. With his dissertation from Bowling Green State University nearly finished, Chris has accepted a tenure-track position as assistant professor of ichthyology at Kutztown University of Pennsylvania. We wish them both well and thank them for all their hard work and dedication.

Lastly, I encourage anyone with questions or ideas about Stone Laboratory to contact me. Together we can work toward an excellent future.

Sincerely,

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

Third Annual Donor Dinner

Stone Lab once again hosted the annual Donor Dinner on August 13, 2009, recognizing donors who have made a cumulative lifetime contribution of \$1,000 to support Stone Laboratory and the Ohio Sea Grant College Program. The nearly 50 people in attendance this year were given the opportunity to visit some of the program's newest outreach endeavors, including the Aquatic Visitors Center and the South Bass Island Lighthouse.

Following the tours, everyone returned to Gibraltar for some time for fellowship with old friends. One high point of the day was Director Jeff Reutter formally inducting Shirley (Dunlap) and Cliff Bowser into the Stone Laboratory Hall of Fame.

Dinner was served in the dining hall where everyone got to hear a little bit about some of the student research conducted by Research Experience for Undergraduates Program participants this summer. After an informative and enjoyable afternoon, everyone was free to stay for the evening's guest lecture or make their way to the ferries for their trips home. **FOSL**



Shirley and Cliff Bowser were recently inducted into the Stone Laboratory Hall of Fame. Shirley Bowser was instrumental in the development of the Stone Laboratory Research Fund in memory of Franz and Kate Stone and in the development of the Dunlap Fund to support education and development in memory of her father, John Dunlap. These are the Lab's two largest endowments. Shirley and Cliff also have been outspoken advocates of the Laboratory and have been wonderful ambassadors for the program.

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 unequalled learning experience available to all outstanding students.” Members of the Friends provide a way for former students to support the facility by raising awareness and funds for scholarships, research, and equipment.

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FOSL

FOSL members:

Watch your mailboxes this fall
for our annual donation mailing!

A Job Well Done! by Mike Heniken

By the time you read this, a major event will have taken place for the Ohio Sea Grant Program and Stone Lab—the retirement of Fred Snyder. Fred and I go way back. We were roommates at Stone Lab more years ago than I care to say. As is often the case with roommates, there was a little adjusting that had to take place. He was often up until the wee hours reading, and I learned to sleep with the lights on.

We got along fine and both shared an interest in fishing. The best night of fishing I have ever had was with Fred, right out in the bay between Peach Point and Gibraltar. It was a magical night. We literally caught fish on every cast—smallmouth bass, white bass, and even a walleye. Mind you, this was in an Ohio State University rowboat and long before the lake was cleaned up in the late 1980s.

For our graduate research, we both worked on larval fish distributions: me on the Western Basin of the lake and Fred on the Maumee and Sandusky Rivers. In 1978, the Ohio Sea Grant Program came into being, and Fred became its first Advisory Services Agent. Fred's lifelong love of the outdoors and his academic background from Stone Lab gave him the tools he needed to really take off and run with the program—that and his generally gregarious and easy-going personality.



In more than 30 years, he has helped to create and establish Ohio Sea Grant as an award-winning and internationally recognized program of excellence.

Too often we don't recognize and thank the people around us who are doing great jobs every day. Fred is an example of the kind of impact that Stone Lab can have on

an individual's life, as well as its impact on the economic and environmental health of our region. The Lab has inspired people to achieve great things, forged life-long personal and professional friendships, and continues to lead in its educational and outreach programs.

Thanks, Fred, for the example you set, the people you have inspired, and all of your years of dedicated service. I'll see you out on the lake. **FOSL**



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