

TWINELINE

2011 FALL/WINTER EDITION VOL. 33/NO. 4

MODELING THE SHORES OF LAKE ERIE

New Sea Grant research takes first step toward
better forecast of Lake Erie run-off and algal blooms



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On the cover: A close-up image of the Pennsylvania Ridge, which separates the Central and Eastern basins of Lake Erie, near Erie, PA.

New Stone Lab Display at OSU Main Library

Thanks to a partnership with Ohio State University Libraries, Stone Lab has had a great opportunity every week to educate more than 50,000 OSU students, faculty, and the public about Stone Lab courses and the environmental issues facing Lake Erie. A two-case display on Ohio State's Thompson Library 2nd floor has been up since March and will be again next June. To view this year's display, visit go.osu.edu/librarydisplay.



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.

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MODELING THE SHORES OF LAKE ERIE

New Sea Grant research takes first step toward better forecast of Lake Erie run-off and algal blooms

by Christina Dierkes, Ohio Sea Grant Communications

Computer modeling has become an important part of everyday life, from creating weather forecasts to deciding where to put a new traffic light. And, as with all models, the accuracy of their predictions depends on being able to feed them accurate information. This includes the initial information used to create the model, as well as any adjustments as measuring and modeling technologies improve over time.

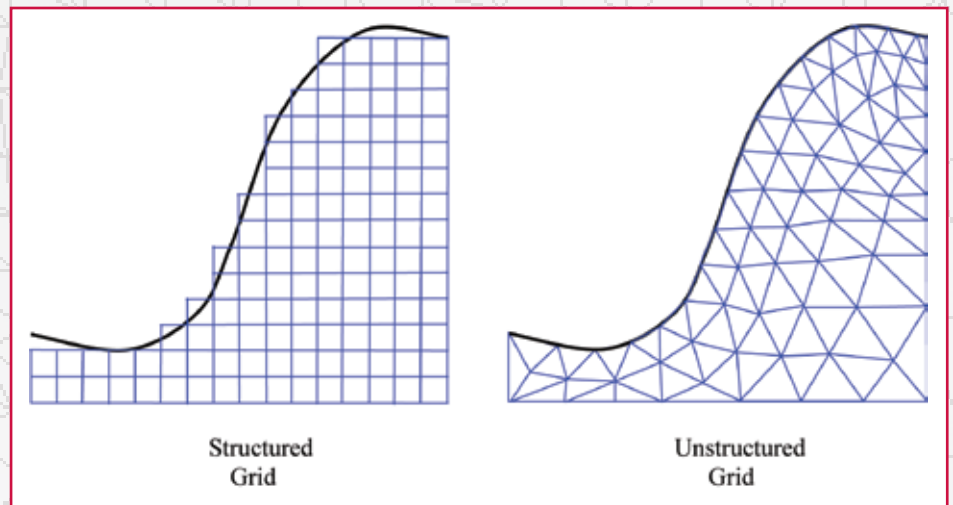
Dr. Ethan Kubatko, from Ohio State University's Department of Civil & Environmental Engineering & Geodetic Sciences, is working on such an adjustment to the Lake Erie Operational Forecast System (LEOFS) model, which visualizes the flow of water throughout Lake Erie. When Kubatko joined OSU in 2008, he came across a report of how the model had been performing and noticed a pattern to the data.

"Overall the model did pretty well, but it was found that in the nearshore areas, it didn't quite match up with data that they had," Kubatko says. "So what I proposed was that we would develop a nearshore model where we'd provide more detail in those regions to try to get better results."

Kubatko further explains that "one of the reasons why the old model didn't do as well near the shore is because it just didn't have the geometry accurate enough in these regions. So if you're not representing the geometry well, you're not going to get a good solution." The LEOFS model is based on a grid of fixed squares, which works well in open water, but the edges of the grid often include a mixture of land and water because the shoreline is too irregular to be represented by these squares.

Kubatko's approach to creating a grid for the model uses triangles of varying sizes that more closely conform to the actual outline of the lakeshore. Each surface triangle also

mesh is basically a digital map that's fed into your model, and it contains information like where the shoreline is, how deep the lake is in certain parts, and so on," he adds.



Previous computer-based models of the lake used a structured grid made of equally sized squares, causing areas of the lake to be left out of the model and pieces of land to be incorporated, resulting in simulations that did not correctly reflect real-life observations. Dr. Ethan Kubatko's unstructured grid incorporates a series of triangles that can vary in shape and size, effectively hugging the coast and providing better results.

contains depth information for its specific area, so the resulting three-dimensional model can accurately calculate exactly what the water is doing in each piece of the grid, which Kubatko refers to as a "mesh" to reflect its more flexible nature.

"You have a big body of water, like Lake Erie or the ocean, and you have a set of equations that you need to solve to get what the movement of the water would be," Kubatko says. "But of course each section of water is going to be different because it has different geometry, and so the next thing you have to do is to make a geometric model of the area. This

Creating the new mesh had its own set of challenges. Obtaining accurate data on the shape of the shoreline was one of those challenges. "We found that we had to be careful about where we got our shoreline data," Kubatko explains. "In other words, we would download the shoreline from an online database, but then we'd lay it over top of a more current satellite image, and we could see right away that it was off because of more recent development in the area. In a lot of places, we had to go back and get high-resolution satellite images and actually trace out the shoreline by hand." However, the

mesh has been successfully created, and the research was able to move on to the planned improvements of the original model.

Kubatko is quick to emphasize that the older model is still very valuable, explaining that it has laid a solid foundation for the current work of improving the nearshore aspects. “One important thing to point out is that scientists developed this model quite a while ago, and at the time, the computational resources weren’t like they are now,” he says, adding that “we simply have so much more computing power at our disposal now, so we can do more detailed simulations.”

The development of the new model is currently in the validation phase, where data from previous years is used to compare model outputs with actual events on the lake. Within this research phase, additional parameters are added to the model to ensure the most accurate representation of what influences water flow in the nearshore region. This includes wind patterns that drive much of the flow of water on the lake, as well as any water being pumped into the lake from tributaries like the Cuyahoga River in Cleveland or the Maumee River in Toledo.

“Right now we’re running simulations for the summer of 2009, and we’re currently in the process of analyzing the results and quantifying the errors,” Kubatko says. “Our preliminary results are good, they’re matching up quite well with the data we have. For example, if we take what the water elevation looks like at a certain buoy compared to what we’re getting with the model, it matches up pretty well.”

Models like LEOFS are based on fluid dynamics, the physics of how liquids and gases behave in motion. Put simply, “you have a set of differential equations, and if you solve them, that gives you the resulting movement of the water,” Kubatko says. Computer modeling is used to process large numbers of these equations at once, and to output them into a format that is more easily used in further applications.

Researchers often use supercomputer clusters like the Ohio Supercomputer Center in Columbus for this part of model development.

These further applications are wide-ranging, from studies on contaminate transport and water quality to analyses

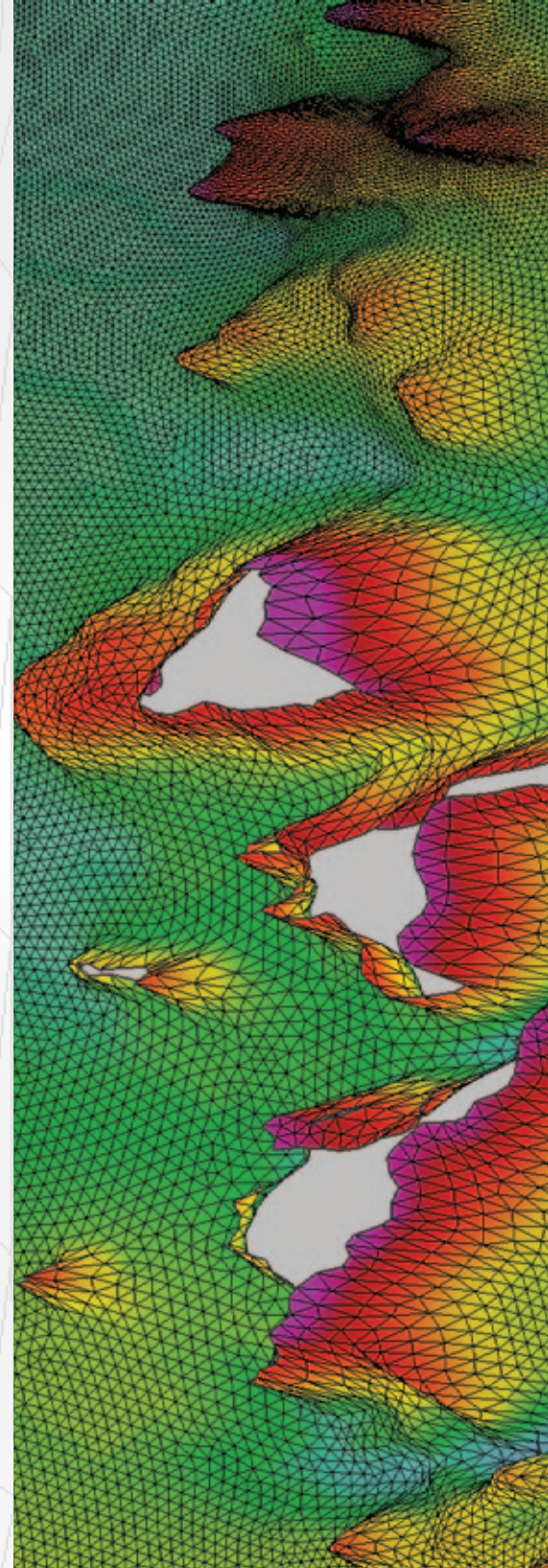
of storm surges and potential flooding. Nearshore modeling becomes important in letting people know in advance about algal blooms or other contaminants in recreational waters, for example. “When you have algal blooms near the shore, you know it’s alarming to people,” Kubatko says. “That’s where communities are, so it’s really the area you want to be able to capture well, because that’s the part people focus on.” With improved forecasting of these contamination events, it will be much easier to prepare for and warn people about them earlier, which can improve cleanup efforts and lead to increased trust between the community and those managing the affected areas.

Sedimentation and dredging are another focus area for future model use, as tributaries near the shoreline transport most of the sediments that end up clogging port entrances and shipping lanes. “You can’t really predict sedimentation or dredging without knowing what the water is doing, so you can look at figuring out the flow in the lake as one step in figuring out if and where you’re moving sediment,” Kubatko says. Knowing where the sediment will go allows communities and port management to plan ahead for dredging projects, making it easier to manage their budget.

Modeling the movement of water on, say, Lake Erie, where waves are frequent because of its shallow depth, also has implications for alternative energy solutions. Kubatko is currently planning a feasibility study for a company that has developed wave energy converters—small devices that use movement to generate electricity.

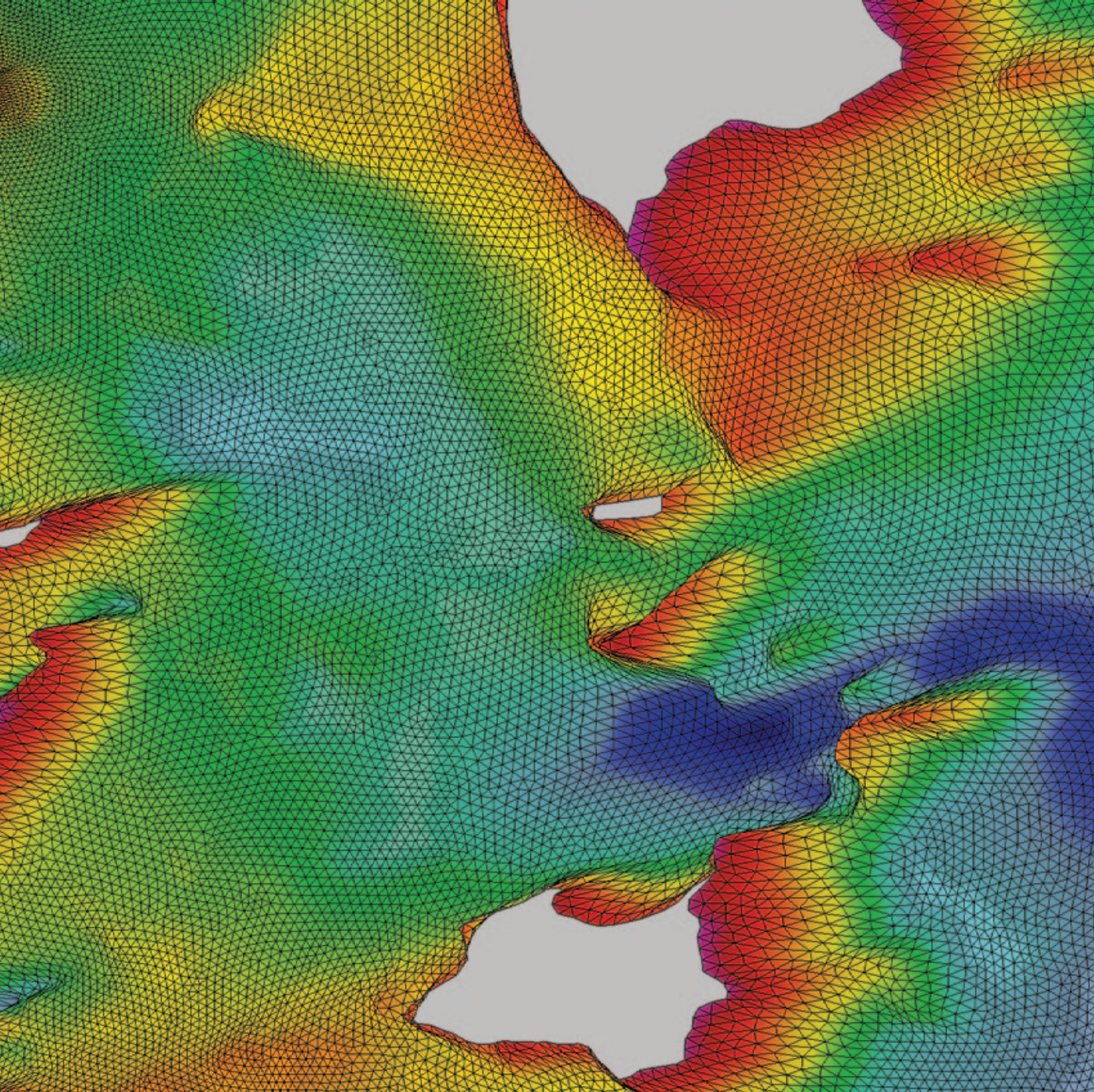
“It’s this little cylinder-shaped device, and you could plug your cell phone into it, for example,” Kubatko explains. “And then you’d throw that in your backpack or purse, and as you walk around, the movement of walking would generate power that would be enough to charge up your cell phone during the day.”

The company is now considering scaling up these small devices and placing them into Lake Erie, where the movement of the waves would allow them to generate electricity. Computer models can be used in feasibility studies for the project to determine where the highest wave energy areas (the places



where waves are highest) are found, and the company can then deploy wave energy converters in those regions to generate the most power. The updated model Kubatko is currently developing “would be crucial to the feasibility study,” he explains.

In the end, Kubatko sees great potential for his improved version of the LEOFS model,



This graphic illustration of the area around the Lake Erie Islands shows how the mesh's triangular grid elements closely follow the shape of the land. Previous square elements of uniform size were unable to account for the flow of water around this jagged coastline in such detail.

including an expansion to model the other Great Lakes using the same concepts. "Once you've seen that you can replicate what's happened in the past, you're in a position to start using the model for predictive capabilities. Of course I would be interested in

working with different agencies in the future, because once you validate a model like this, then you're really in a position where you can start using it to ask different questions." The model is expected to be ready for these new applications at the end of 2012. TL

This research is currently supported by Ohio Sea Grant. For more information about this research, contact Dr. Kubatko via his website at ceg.osu.edu/people/kubatko.3.



STOP AQUATIC HITCHHIKERS!™

Great Lakes Sea Grant Programs Teach Public How to Stop Invasive Species

by Matthew Forte, Ohio Sea Grant Communications

Wrapping up a good day of fishing, a father and his daughter winch their boat onto its trailer. As one of them pulls aquatic plants off the motor's prop, the other drains the live well and puts the fish into a cooler to take home. The tasks take a few minutes and soon they drive off, having done their part to prevent non-native species from hitching a ride to the family's next fishing spot.

This type of stewardship is exactly what a new regional initiative is trying to promote among recreational water users to prevent the spread of non-native plants and animals, or aquatic invasive species (AIS). AIS can hitch rides on aquatic plants, boats, muddy anchors, in bait buckets and live wells, and even in damp scuba diver wetsuits, spreading to other lakes and streams, and wreaking havoc as they go. Most of the 182 AIS that have been found in the Great Lakes, got there by riding in freighter ballast water and through navigation canals that connect the lakes with the Atlantic Ocean. But once AIS arrive in the Great Lakes, they aren't likely to spread to smaller bodies of water unless people transport them.

Stop Aquatic Hitchhikers!™ (SAH!) is a national program that helps recreational aquatic users become part of the solution in stopping the spread and establishment of AIS. Thanks to funding by the Great Lakes Restoration Initiative, SAH! is one component of a two-year campaign the Great Lakes Sea Grant Network (GLSGN), led by Minnesota, began last spring to raise awareness of AIS issues.

"Harmful aquatic invasive species pose a threat to the Great Lakes environment, economy, and recreation" says Doug Jensen, Minnesota Sea Grant AIS Program Coordinator. "Non-native species can affect people by clogging pipes and waterways, taking food resources from fish and other wildlife, and affect boating, fishing, waterfowl hunting, and other outdoor recreation."

The campaign's youth education portion, led by

Illinois-Indiana Sea Grant, focuses on enhancing the *Nab the Aquatic Invader!* website (iisgcp.org/NabInvader) with new material, including lesson plans and teacher training workshops. Another part of the campaign broadens an existing partnership

called *Habitattitude*™ that addresses the release of aquatic plants and pets into the environment by water gardeners and aquarium hobbyists. The campaign's third component is an effort to prevent the spread of AIS by fisheries and baitfish industries.

SAH! is the campaign's fourth component. Its message for aquatic users is a simple one—after putting your boat on its trailer, remove any aquatic vegetation, drain any water, clean the boat with high-pressure hot water, and let it dry for five days before placing it in another body of water. This short process ensures that organisms from one lake don't hitch a ride to another.

"SAH! outreach is a regional approach because this issue affects all the states in this region and even states that don't border the Great Lakes," says Dave Kelch, Ohio Sea Grant Extension Specialist and Ohio's AIS Program Leader. "Virtually all AIS in the Great Lakes have the potential to be transported from their



Zebra mussel



Simple steps like draining a boat's bilge water before leaving a lake reduce the risk of boaters, anglers, and other water users spreading non-native species among lakes and streams.



Purple loosestrife

point of introduction to any inland body of water that is not currently infested.”

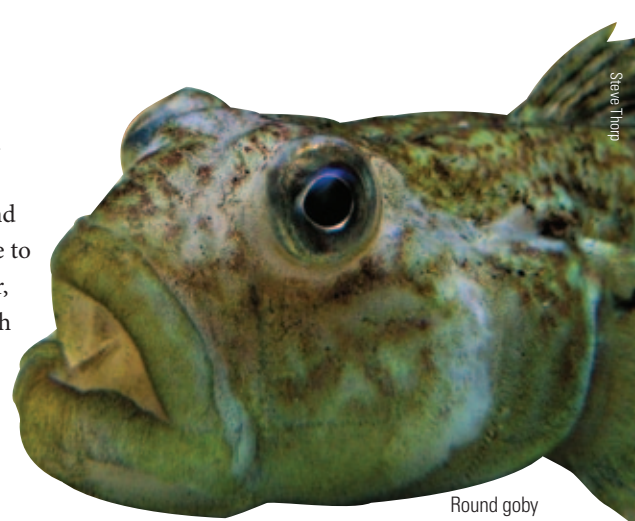
Over the last year, GLSGN programs delivered 136 talks featuring the SAH! message to groups ranging from fishing and boating hobbyists to civic organizations.

At 90 displays at boat, sport, and travel shows, Sea Grant representatives handed out educational material along with key floats, fishing towels, bumper stickers, and boat trailer stickers, all reminding people to clean, drain, and dry their boat. Together, efforts to promote AIS awareness through the SAH! campaign have generated 5.1 million exposures, already exceeding the campaign’s goal of 4.85 million.

People become proactive and take responsibility for their actions when they learn about AIS. Sea Grant-sponsored surveys of boaters in multiple states from 1994 to 2000 show a high correlation between AIS awareness and a willingness to take action. In 2007, another survey found that more than 97% of boaters in three states are now willing to take action to prevent the spread of AIS.

“Those results tell us that boaters are very concerned about AIS, but they need to know what the threats are and what to do about them,” Jensen points out. “They show that education must continue and that is what our new campaign builds upon.”

Beyond survey results, Minnesota’s AIS education efforts beginning 20 years ago illustrate the power of an informed public. With 11,800 lakes and the nation’s third highest number of boat owners, the state has plenty of opportunities to spread AIS.



Round goby

However, the invasive zebra mussel didn’t appear in inland Minnesota until 2000 (the mussel was first found in Lake Erie in 1988).

“We don’t have thousands of public lakes in Ohio,” Kelch says, “but our lakes still warrant protection, and we can’t ignore that. Ohio’s western Lake Erie waters are some of the most productive freshwater fisheries in the whole world, and the recreational anglers it attracts fuel the region’s economy. Working to ensure visiting boaters don’t spread invasive species benefits Ohio and the region.”

“If there’s something we can do to slow or stop the spread, why not make the effort?”

Learn more about Stop Aquatic Hitchhikers!™ by visiting protectyourwaters.net. **TL**

Sea Grant Leads Creation of Ohio’s New AIS Plan

Round goby, zebra mussel, and sea lamprey are just a few of the 111 non-native species that have radically changed Lake Erie’s habitat in the past 20 years. With no natural predators, these aquatic invasive species or AIS have caused problems for Great Lakes ecosystems, competing with valuable native species and altering food webs.

But a new management plan being collaboratively developed by Ohio Sea Grant and the Ohio Department of Natural Resources (ODNR) Division of Wildlife could make it harder for future AIS to enter and establish themselves in Lake Erie or inland in Ohio. Ohio Sea Grant Assistant Director Eugene Braig and Ohio Sea Grant Extension Specialist Dave Kelch are rewriting that document, the state’s AIS Comprehensive Management Plan, to

guide a multi-agency team effort against AIS.

“It’s time to rethink the plan with an eye to practical implementation that includes all the state management agencies,” Braig says. “We need a new plan to deal with the current and future AIS and we want to clearly define each agency’s responsibilities according to their available budget and personnel.”

The plan guides management decisions regarding AIS with the three main goals of preventing new introductions of non-native species, limiting the spread of established AIS populations, and helping reduce the harmful impacts from existing AIS in the state. As an authoritative source of information about AIS-related regulations, the plan lists agencies’ responsibilities concerning

AIS. For example, if several invasive fish were to be discovered in a lake and management agencies decided to use toxicants to stop the fish’s spread, the plan will provide guidance for decision making and define agency roles.

“We need to be prepared for the unknown,” Kelch says. “There is a huge list of species we may get sometime and we need to be ready to address those species if they come here.”

Braig and Kelch are working with John Navarro, administrator of the ODNR Division of Wildlife AIS program, and the several members of Ohio’s AIS committee. After Braig and Kelch draft the plan by the year’s end and it receives approval, Ohio agencies will begin to work as a team to implement the updated plan and tackle the AIS problem. **TL**

Lake Erie From Above... WAY ABOVE

by Christina Dierkes, Ohio Sea Grant Communications

Everyone who lives on the shores of Lake Erie has probably seen an algal bloom—sheets of green or blue-green algae covering the water's surface, sometimes accompanied by a foul odor of rotten eggs that can severely impact water quality. In a best-case scenario, such algal blooms lead to unpleasant weekends at the beach, but worst-case scenarios can range from fishkills to liver damage due to the toxins some algae release. These potential difficulties make effective monitoring systems an important research priority.

To observe algal blooms and the related changes in water quality in the Great Lakes region, Dr. Joseph Ortiz at Kent State University is developing a method that uses satellite imagery to determine the level of chlorophyll—a green plant pigment present in many types of algae—in the lake water. His research, which is currently funded by Ohio Sea Grant, focuses on the Western Basin of Lake Erie, where environmental conditions make determining algal levels, both with conventional methods and from the satellite imagery, more difficult than in the rest of the lake. However, remote sensing technology is likely to be of use in monitoring water quality in the entire Great Lakes system.

“Generally you’re trying to monitor a very large area of water and draw conclusions from a relatively small number of water samples,” Ortiz, a professor in the



Satellite image showing distribution of sediment, phytoplankton and phyto-detritus (dead phytoplankton) in the Western Basin of Lake Erie and Sandusky Bay. The darker water on the right contains low concentrations of these materials, while the lighter shades contain various amounts of these particles delivered by the rivers and streams feeding into the lake.

Department of Geology, explains. In the early years of water quality monitoring, people would collect samples of water, look at them under a microscope, and determine the amount of phytoplankton (the technical term for algae) by counting the cells present in the sample. “You can imagine that takes a lot of time and a particular set of skills in order to be able to identify those critters,” Ortiz summarizes.

Monitoring algal levels and the resulting water quality has come a long way since then, but most methods still require travel to a sample site, as well as further analysis in a laboratory. “For us to go out and collect about 20 samples takes a whole day,” Ortiz explains. “So people were looking for better ways to do things, and one better way is to take your sensor and put it up in space or fly it from an aircraft, where you can use remote sensing techniques to measure the plant pigment.”

The advantage in monitoring phytoplankton in the lake from space lies in the large area researchers can survey in a short amount of time, Ortiz says, adding that, “depending on the type of satellite you have and its orbit, you can take measurements across the entire lake in an hour or scan the entire lake in a couple of days.” This provides a tremendous amount of data, but that data only covers the surface of the water, not what’s below it. “Part of what we’re doing with this project is

trying to figure out how representative the surface samples are of what’s happening at depth in the lake,” according to Ortiz.

To do so, Ortiz and his colleagues, along with undergraduate and graduate students, have been going out onto Lake Erie on vessels operated by Stone Laboratory to collect water samples from a number of sites in the Western Basin. Those samples are analyzed in the laboratory, and results are then compared to results from the satellite measurements. “We use the information from the water samples to better calibrate the remote sensing tools so we can get much more accurate and much better coverage of what is happening in the lake,” Ortiz explains.

Results so far show that remote satellite surface measurements from the Western Basin of Lake Erie, when processed through previously validated algorithms, are fairly representative of what is happening below



In the Kent State University Geology Hydrology Lab, Dr. Joseph Ortiz and undergraduate Renee Crain observe a beaker of water filled with suspended Lake Erie sediment. The researchers measure the size of the suspended particles using a laser analyzer to determine the properties of the suspended sediment.

the water's surface, allowing Ortiz and his colleagues to consider practical applications of the technology in the near future.

The Western Basin, which stretches from the western shore to Sandusky Bay, is the smallest and shallowest part of Lake Erie, but also the most productive area in terms of plant productivity. "Lake Erie is one of the most productive lakes on the entire planet," Ortiz says, adding that "the reason why is because Lake Erie is so shallow on the Western Basin that you can very easily stir up nutrients from below and keep those phytoplankton growing." In addition, light—which is needed for photosynthesis—can penetrate more easily, and rivers deliver nutrients, making these shallow, nutrient-rich warm waters the perfect environment for blue-green algae to bloom. While such

productivity generally sounds like a good thing for an ecosystem, in this case the resulting algal growth does more harm than good as it reduces available oxygen in the water, for example.

In addition to generally good conditions for algal blooms in this area, data collected by various monitoring stations over a number of decades have shown that nutrient levels in the lake have been rising recently, due to a number of possible influences such as agricultural practices and an increase in the population of lakeshore communities. As an increase in nutrients may be linked to an increase in algal blooms, being able to monitor water quality as efficiently as possible is becoming more important to those managing drinking water that's drawn from the lake.

"We're starting to work with Ohio EPA to monitor conditions in the reservoirs that are being used for drinking water in various municipalities," Ortiz explains how the researchers are putting their results to use. "Often, community resources are tight, and taking measurements on a full number of samples by employing remote sensing techniques gives a more accurate picture of the way things are," Ortiz adds. He believes this could lead to differences in how water is treated, and may help water managers ensure that they can address a problem before the consumer is affected by it. **TL**

For more information about this Ohio Sea Grant-funded project, contact Dr. Joe Ortiz at jortiz@kent.edu or visit his website at www.personal.kent.edu/~jortiz.



FOR THE BIRDS

New Collaborative Website Promotes Birding Sites along Lake Erie Coast

by Matthew Forte, Ohio Sea Grant Communications
Photos by Jim McCormac, ODNR Division of Wildlife

If you want to see just how popular bird watching has grown to be along Lake Erie, go to the parking lot at Ohio's Magee Marsh in Ottawa County and glance at the license plates. On a busy spring day, you might see every state in the Union represented. Magee is considered one of the best birding sites in North America, attracting 20,000 people each May, but several birders come for a day and leave without ever realizing that there are several more birding sites only a short drive away.

Ohio Sea Grant has partnered with the Ohio Department of Natural Resources (ODNR) Division of Wildlife to create a new website, lakeerieohiobirding.info, that publicizes 84 birding sites along Ohio's Lake Erie coast and encourages people to visit multiple sites, possibly stretching their day trips into overnight excursions. Featured sites make up the Ohio Lake Erie Birding Trail, which links lesser-known sites that offer great birding to those that already enjoy notoriety.

"For a long time, we have focused on birding as a niche market for tourism along Lake Erie," says Melinda Huntley, Ohio Sea Grant Extension's Sustainable Tourism Program Director. "What was missing was a comprehensive way to get information to birders. The birding trail connects several sites into a cohesive itinerary and increases people's awareness that we have some of the best birding sites in North America."

Stretching 312 miles from Toledo to Conneaut, the Ohio Lake Erie Birding Trail includes more than 30 different counties,

cities, and organizations. Many of the sites are state or county-owned forests, parks, and wildlife areas, and two sites are even privately owned cemeteries that allow public access. Several smaller sites along the lake don't warrant stand-alone descriptions on the website, so information about these small-but-good sites is included in the listings for nearby larger sites.

"If the trail at one site is packed, we want to let people know about other nearby sites so we can minimize stresses on the popular environments," says Jim McCormac, ODNR Division of Wildlife Public Information Officer. "Many of these smaller sites have a great view of the lake so birders can set up their spotting scope and scan the air to see

what flies by. Some sites are hidden gems that people haven't heard about."

The website, which went live in mid-September, boasts more than 1,600 color photos of birds and is basically a one-stop visitor's guide for Lake Erie birding. In addition to directions to birding sites and a listing of the bird species that can be expected there based on season, the website also lists local attractions and links to visitors bureaus to help provide access to hotels and restaurants. By showing the wealth of Lake Erie birding sites and offering information about local amenities, the website encourages visitors to plan longer stays along the coast. Visitors can even get updates about rare species sightings via a Twitter feed (@LakeErieBirding) on the website.



A packed boardwalk in Magee Marsh Wildlife Area shows that the Lake Erie coast is a great place to see migrating birds. Ohio Sea Grant partnered with the ODNR Department of Wildlife to create a website that guides birders to 84 sites along the lake.

“This website allows us to get information into the hands of people who may not have otherwise gone to a park to watch birds,” says Kendra Wecker, Wildlife Diversity Coordinator for ODNR Division of Wildlife. “By catering to both beginning and advanced birders, the website is a great tool for anyone planning a trip to the lake for birding, and this is just the beginning of what we’re doing for birding tourism.”

The ODNR Division of Wildlife and Ohio Sea Grant are developing a spiral-bound guide book that is due out next year to provide additional details about the birds that migrate through the Lake Erie region and their habitats. Both organizations are conducting workshops for park managers and tourism professionals to teach them how birding is a large part of the tourism market and how they can attract more birders. Birding is big business with nearly 120,000 out-of-state-birders visiting Ohio and birders across the nation spending nearly \$36 billion annually on the hobby in 2006.

To make those numbers more relevant, Ohio Lake Erie Birding Trail partners are giving birdwatchers small cards to leave at whatever businesses they happen to visit in their travels, like gas stations, restaurants, and hotels. The cards, which say “Birding Means Business” and include a link to the website, help local businesses become more aware that visiting birders spend money locally. The cards also give birders a chance to start conversations about the importance of conservation.

“People are very familiar with the economic impacts for the region from fishing and Cedar Point, but birders are another group of travelers to the state,” Wecker says. “And they’re a group that’s likely to keep getting bigger.”

Wildlife observation is one of the top recreational activities for Ohioans and birding is quickly gaining popularity. The new website will not only help Ohio attract tourism dollars, but it will also allow Ohioans to gain better access to activities they enjoy. Studies show that one of the main reasons people don’t participate in outdoor recreation is their lack of information.

Lake Erie is such good birding territory because it is a crossroads for birds from all

“The lake’s influence on birds coming to Ohio is hard to overstate. Ohio has a lot of good places to visit to observe natural history and birds, but Lake Erie rules the roost.”

—Jim McCormac, ODNR Division of Wildlife Public Information Officer



Headlands Dunes State Nature Preserve, shown here, is one of several tremendous, but not well-known, birding sites along Lake Erie. The Ohio Lake Birding Trail will increase tourism by enticing people to travel to more sites and extend their visits to the coastline.

parts of the continent and it provides diverse habitats that draw different birds. The same abundant food in the lake that makes Lake Erie the “Walleye Capital of the World” also makes the region attractive to birds on their migratory journeys. Of the 421 bird species ever sighted in Ohio, nearly 400 have been seen at Lake Erie.

“The lake’s influence on birds coming to Ohio is hard to overstate,” McCormac says. “Ohio has a lot of good places to visit to observe natural history and birds, but Lake Erie rules the roost.”

McCormac says birding at Magee Marsh is so great that it could turn almost anyone into a bird watcher. “To win someone over to birding, I would take him to Magee Marsh on the second Saturday in May,” he says. “It’s the peak of migration and International Migratory Bird Day. There are

thousands of people on the boardwalk, and birds can be dripping from the trees. You almost don’t need binoculars—the birds are often so close that you can almost touch them with your fingertips.”

But McCormac points out there’s no need to wait until next year to see a lot of birds close to your home—just check the Lake Erie Birding Trail website for directions to the Headlands Dunes State Nature Preserve east of Cleveland. “Fall and early winter bring scads of waterbirds,” McCormac says. “You can sometimes see 50,000 birds at one time, including rare species mixed in. It’s really incredible.” TL

For more information about the Ohio Lake Erie Birding Trail, visit lakeerieohiobirding.info or contact Melinda Huntley at huntley@coastalohio.com.

OHIO SEA GRANT STAFF NEWS

Fortner Receives Top Award for Work in Environmental Education

Dr. Rosanne Fortner, former Ohio Sea Grant Education Director and current COSEE Great Lakes Director, received the highest honor from the North American Association for Environmental Education (NAAEE) at its annual conference on October 15 in Raleigh, North Carolina. Fortner was presented the 2011 Walter E. Jeske Award, which recognizes an individual's outstanding service to NAAEE and leadership within the environment education profession.

"I am so humbled by this award," Fortner says. "We all reach the heights by standing on the shoulders of giants, but in environment education, I've also been buoyed up by the professional accomplishments of my students. This is a giving profession, always paying forward."

Fortner has spent her career helping science educators find new, engaging ways to bring the Great Lakes into their classrooms. As part of the first project Ohio Sea Grant



Dr. Rosanne Fortner

funded more than 30 years ago, Fortner introduced science teachers to new methods of presenting ecology topics to help students connect oceanic issues to the Great Lakes. By encouraging input from science teachers, she led the development of class materials to teach about several environmental issues, including climate change science in 1993, propelling Ohio Sea Grant to the forefront of teaching the subject.

Even after her retirement from Ohio Sea Grant in 2005, Fortner mentored 10 teacher

fellows toward Master's degrees at Stone Laboratory, where she has taught courses for 27 summers.

In his nomination letter, Tom Marcinkowski, the award's 2010 winner, praised Fortner as someone who has "stood for and pushed for excellence in our field. She is highly deserving of this award and this recognition for her lengthy and numerous contributions to the wider environmental education profession."

As the Director of COSEE Great Lakes, Fortner has fostered connections between educators and scientists and she spearheaded the development of the Great Lakes Literacy Principles, which provide a framework for teaching about the lakes. And her impact has been felt both within and far beyond the Great Lakes region as she has given presentations in nine countries and served in Cyprus as a 1999 Fulbright Scholar. **TL**

Binational Committee Recognizes Stanford and Partners for Snake's Success Story

The 15-year collaborative project to protect and grow the population of the Lake Erie watersnake (LEWS) was honored as a Success Story at the State of the Lakes Ecosystem Conference (SOLEC) on October 26 in Erie, Pennsylvania. A binational committee selected the LEWS project from among 29 nominated projects that have improved the Great Lakes environment, community, and economy; formed strong partnerships; and developed and distributed educational information.

Ohio Sea Grant and Stone Laboratory's Outreach Coordinator, Kristin Stanford, along with several partners, accepted the regional award for their efforts to keep the native snake species from extinction. Northern Illinois University, the Ohio Department of Natural Resources Division of Wildlife, the U.S. Fish and Wildlife Service, and Black Swamp Conservancy Lake Erie Islands Chapter all joined together to lead the recovery of the LEWS.

The snake is a federal threatened, state endangered species that lives only on the western Lake Erie Islands. Thanks to this wide-reaching partnership, the LEWS population has rebounded and was removed from the federal list of endangered and threatened species this past August.

"This was such a surprise and a great honor to be recognized by SOLEC," Stanford says. "I'm really proud of all of our partners in the LEWS recovery effort and excited to be able to accept this award for all of us."

Stanford has worked toward the native snake's recovery since 1999. Part of her work focuses on LEWS population surveys, in which more than 10,000 individual adult LEWS have been marked, creating one of the largest ever mark-recapture studies of reptiles. Although the snake is harmless, humans have been one of its main threats over the last century. Stanford, known as "The Island Snake Lady," launched an aggressive education and outreach campaign in 2000



Kristin Stanford

to change people's opinions of the animals. By speaking at public schools and teaching herpetology courses at Stone Lab, Stanford continues to educate and energize the next generation of conservationists. **TL**

GLOBAL CHANGE **LOCAL IMPACT**

OSU Climate Change Webinar Series



The Swamp in OSU's Backyard

by Christina Dierkes, Ohio Sea Grant Communications

When the climate change conversation turns to storing carbon emissions in plant materials, people tend to think about forests and other large, often woody plants. But some researchers have found that wetlands, which are often more commonly known as marshes and swamps, may be much more effective in storing atmospheric carbon in its inactive forms.

Dr. William J. Mitsch, Distinguished Professor in the Department of Environment & Natural Resources at the Ohio State University, has been studying wetlands across the world for more than thirty years, and his research results suggest that, in a freshwater wetland like Old Woman Creek

in Huron, Ohio, the accumulation of carbon in the soil alone adds up to a substantial amount of carbon removed from the atmosphere. "We had an average wetland like Old Woman Creek with about 140 grams of carbon per square meter per year," Mitsch says. "That's a good number, that's high."

To put that number into perspective, one needs to know that one hectare or 2.5 acres of swampland would then store 1,400 kilograms of carbon per year. That's the equivalent of the carbon emissions from one passenger vehicle in a year, according to the Environmental Protection Agency. In the grand scheme of things, even that does not sound like much, but as with many topics in the climate change conversation, every little bit counts.

"I can't prove that with the 140g of carbon per year that my wetlands are sucking up, the average temperature of the world is therefore going to be .001 degrees Celsius cooler," Mitsch says. "But for wetlands of the world, we have some calculations that suggest that carbon sequestration in wetlands on a global scale could be on the order of more than 10% of the carbon coming out of the smokestacks," he adds. And that number is quite a bit more impressive.

Two of those hectares of swamp land taking in carbon from the atmosphere can be found right in Columbus on OSU's campus. The Olentangy River Wetlands Research Park is the only facility of its kind in the world, providing OSU students and visiting



Dr. Mitsch has studied carbon sequestration research in Great Lakes wetlands such as the NOAA Old Woman Creek Estuarine Research Reserve in Huron, Ohio. His research has found that a wetland like Old Woman Creek can store about 140 grams of carbon per square meter every year.

researchers with unique access to large wetlands study sites since its creation. The park officially opened with the flooding of two experimental wetlands basins in 1994, and has continued to grow and develop.

Building the two wetlands became its own experiment when the researchers decided to plant one wetland and leave the other one to populate on its own. “The plants we put into the planted wetland were cute, they’re little plants,” Mitsch says. “Those tend to be the ones that some wetland ecologists favor. We knew the big boys like cattails and some of the other big plant varieties would come in on their own, so we didn’t plant those,” he adds.

It turned out that leaving wetlands to plant themselves led to a more productive wetland than the one that was planted—“grabbing carbon out of the air and making plants out of it,” Mitsch says. The planted wetland, on the other hand, has always been more diverse, at least in terms of the number of different plants

present there. “At the end of 15 years, you’re left pondering the question of which is a better wetland, and my answer to that is, it depends on what you want,” Mitsch says. The result of his long-term experiment will be published in early 2012 in the journal *BioScience*. If carbon sequestration (binding atmospheric carbon into a nonreactive form in the soil) is the main goal of creating a new wetland, leaving the area to plant itself is definitely the way to go.

In addition to being a very good carbon sink, wetlands also remove other nutrients from the water that flows through them, including nitrogen and phosphorus that would otherwise end up in lakes or the ocean, causing algal blooms there. Mitsch and his colleagues have found that the Olentangy River wetlands continue to remove both nutrients, but the removal of phosphorus, while continuing to happen, has decreased over the past 15 years. “Nitrogen, on the other hand, does not show a very significant

trend either way,” Mitsch says. “In fact if you look at just the last five years, if it hasn’t become steady state, it looks like it might even start removing more nitrogen the older the wetland gets,” he adds.

In the future, these findings may become a good argument for creating wetlands as a “buffer” between agricultural areas and large bodies of water affected by algal blooms. “These wetlands clean up water, they’re nature’s kidney,” Mitsch summarizes.

While wetlands have been shown to effectively sequester atmospheric carbon, they do also produce some methane as part of the natural anaerobic processes that also bind carbon into the soil. “Our studies suggest the more carbon the wetlands sequester, the more methane you get too,” Mitsch says. However, “on a carbon balance, a lot more carbon goes into the wetlands than is coming out,” he adds. “I’m not saying methane doesn’t matter. If it comes off a

landfill, then it does matter because the landfill is not sequestering carbon as well, but in a wetland, the sequestration of carbon trumps the creation of methane gigantically.”

In the end, all climate change arguments in favor of wetlands won’t make a difference if the public isn’t interested in maintaining and visiting them. Ecosystem services—the concept of nature providing a service—always makes more sense when put into a local context, after all. “Let’s talk about flood mitigation,” Mitsch explains. “If the water ends up stored in the wetland instead of in your basement, that’s a pretty ideal example. I think on a big flood, the water we store temporarily on the site would stand something like 20 feet deep in Ohio Stadium,” he adds. “That’s a lot of water.”

And last but certainly not least, a lot of people appreciate the biodiversity that these wetlands bring into the city, and to the world at large. “That’s why we’re so loved by the community,” Mitsch says. “It’s an incredibly diverse landscape in wetlands because they tend to be where the land and the water meet. The aesthetics and the appreciation of nature, to be able to see it without being behind bars like in a zoo, I think humans understand that.”

To hear more about Dr. Mitsch’s research into wetlands and climate change, you can view his archived webinar at changingclimate.osu.edu. More information about the Olentangy Wetlands Research Park is available at swamp.osu.edu, which includes opportunities for groups to schedule a tour of the facility and learn more about the importance of the area to the local community.

William J. Mitsch is a Distinguished Professor within the School of Environment and Natural Resources at Ohio State University. His research and teaching over his 37-year career have focused on wetland ecology and biogeochemistry, wetland creation and restoration, ecological engineering, ecosystem restoration and modeling. He has authored or co-authored over 300 peer-reviewed publications and has edited or co-authored 17 books including four editions of the popular textbook Wetlands and two versions of Ecological Engineering. He is founder and editor-in-



The Olentangy River Wetlands Research Park near Ohio Stadium. The two kidney-shaped wetlands basins are pictured at the center, with the Heffner Wetland Building to the right. The research park is the only one of its kind in the world, providing researchers from across the globe with the opportunity to study wetlands processes on a large scale.

chief of the international journal Ecological Engineering. He founded the Olentangy River Wetland Research Park on OSU’s campus in 1991 and continues to be its Director. In August 2004 he was awarded the 2004 Stockholm Water Prize for lifetime achievements in the modeling, management, and conservation of lakes and wetlands.

Dr. William Mitsch studies wetland ecosystems in Ohio, the United States, and across the world. Pictured here is Corkscrew Swamp near Naples in southwest Florida.



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Research at Stone Lab is an Extension of Grayson's Passion

by Matthew Forte, Ohio Sea Grant Communications

Ever since he could remember, John Grayson has been a fisherman. From the time he was a five-year-old barely able to hold a fishing rod, John has had a passion for the sport. But this past summer, Stone Lab gave him the opportunity to go beyond just reeling in fish and sparked his passion for research that will help him and other anglers better protect Lake Erie for future generations.

The senior forestry, fisheries, and wildlife major from Wellington, Ohio spent last summer at the lab taking an ichthyology class and carrying out research for the Ohio Department of Natural Resources (ODNR) Division of Wildlife, thanks to Stone Lab's Research Experience for Undergraduates (REU) Scholarship Program. Sure, holding a job over the summer would have earned him more money, but he points out that the experience he gained by carrying out the entire REU project from start to finish will prove more valuable to his long-term career goals.

"I'm glad the REU scholarship gave me a chance to spend my summer at Stone Lab and carry out real-world research," John says. "I'm planning on entering graduate school soon and the experience I've gained by conducting scientific research, from hypothesis through the presentation of my findings, will definitely help prepare me."

For his project, John worked with Chris Vandergoot of the ODNR Division of Wildlife on part of a long-term study of devices used to track the movement of walleye, a valuable game fish. Before purchasing the devices, the division wanted to know their limitations and accuracy.

Tracking walleye will give the ODNR Division of Wildlife information to use in managing and protecting the fishery. Managers want to know where spawning sites are and how far walleye travel to reach them. This information could allow managers to protect or restore spawning areas to keep the walleye population numbers up.

"Our goal was to recommend the distance to space the tracking devices," John explains. "Since the devices cost \$1,400 each, you don't want to use any more than you need. We weren't able to give final numbers about the devices' range, but our project was a solid start."

"Working with John was a real joy," Chris says. "He was always willing and ready to get out on the lake and you could always tell that he was formulating questions in his mind about the experiments we were running."

Stone Lab was a perfect place for John to fulfill his curiosity. Between his research and class, he was out on the lake every day, which he found fascinating.

"I thought class, with all the field sampling out on the lake, was extremely fun," he says. "We caught a lot of strange fish—things you don't see very often, like 15-inch goldfish, and other fish I had never seen, like bowfin, northern pike, and various sucker species. I've always thought fishing was a great mystery of finding what's underneath the water because it's always surprising. Stone Lab helped fuel my curiosity."

Just collecting fish for research wasn't enough for John and he made time to fit sport fishing into his daily schedule on Gibraltar Island. The summer at Stone Lab allowed him to play a small part in preserving the walleye fishery in Lake Erie, Ohio's greatest natural resource.

"Knowing the spawning habitats of Lake Erie walleye is an important step in protecting them," John says. "I'm glad I had the chance to get in on this research at the ground floor. It's not every day that you get to be involved with a study that helps both the environment and the sport fishing on Lake Erie for anglers like me."

FOSL



Friends Of Stone Laboratory

Dear friends,

Dear Friends,

The most significant role of FOSL is to support research, education, and outreach initiatives at Stone Laboratory. This summer, FOSL supported eleven students engaging in Research Experiences for Undergraduates (REU) and Research Scholar projects at Stone Laboratory! REUs offer significant and meaningful opportunities for students to learn about scientific research. Participating in research can be the critical event that launches students into in-demand careers in science, technology, engineering, and mathematics. Future Great Lakes researchers, educators, and policymakers are starting their career journey with the Stone Lab REU Program.

This year, select research projects investigated impacts of nitrogen limitation on algal growth, compared methods to improve fish population assessments, analyzed the effects of weather trends on dissolved oxygen, and tested new techniques to improve monitoring of the Lake Erie Watersnake. FOSL is proud to support Stone Lab REU students who, in collaboration with faculty mentors, made significant contributions to the understanding of the Great Lakes ecosystem. With additional FOSL support, several students attended state and national conferences to present their research results to the scientific community.

Many well-qualified students apply to the REU program each year, and many are turned away due to limited funding. FOSL Friends can help us provide additional experiences to high-quality, interested student researchers, so as 2011 draws to a close, please consider making an end-of-year donation to a Stone Laboratory scholarship fund. Your contribution will support students in the REU program as they begin their own scientific journey.

I thank you for your continued dedication to and support of FOSL programs and initiatives!

Sincerely,

Tracey Meilander
FOSL President

broaderimpacts@yahoo.com

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Wakanene Kamau

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Nathan Arroyo—REU
Reed Brodnik—REU
Sara Dimick—REU
Lauren Flick—Research Scholar
Phoenix Golnick—Research Scholar
John Grayson—REU
Maya Hughes
Lindsey Korfel—REU
Sophia Mort—REU
Samantha Stoklosa—REU
Hilary Thompson—REU
Kathryn Welch

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

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Let's Go to the Hop!

The 10th Buckeye Island Hop was another rousing success. More than 40 volunteers rolled up their sleeves to help out on Gibraltar and South Bass islands. Their efforts benefited not only Stone Laboratory but also Perry's Monument, the Lake Erie Islands Historical Society, and the Nature Center on South Bass. The variety of jobs included acid washing the walls of the fish runs in the Aquatic Visitor Center, power washing buildings, cleaning out numerous buildings, weeding/mulching/planting, painting,



insulating, and even some small construction projects. Imagine, these volunteers also made monetary contributions for the privilege of working so hard.

Although it was a long work day, everyone experienced the best island weather in 10 years! The day's activities ended with a reception at the Gazebo, photos on the patio, and a delicious perch dinner. That evening, Lisa Brohl, who has taught botany classes at Stone Lab, presented “Conserving Island Lands—A Thankful Look Back.” She showcased the efforts of the Lake Erie Chapter of the Black Swamp Conservancy and the many successful projects the organization has undertaken, such as the Scheeff East Point Nature Preserve, Jane Coates Wildflower Trail, Ladd Carr Wildlife Woods, Kuehnle Wildlife Area, and the Middle Bass East Point Preserve. Stone Lab researchers and field trips use all these areas.

After the evening presentation, many participants headed over to South Bass venues in order to watch the Ohio State vs. Nebraska game. After Sunday morning breakfast, those who were interested took an informative Edible Plant Walk around Gibraltar. Many thanks to all of the volunteers and the university staff who worked this weekend. The food was terrific and all the logistics went off without a hitch.

The Arts and Sciences Alumni Society was recently selected as a Gold Star Society by the Ohio State University Alumni Association. The Buckeye IHOP, an outstanding example of cooperative alumni engagement between the College of Arts and Sciences and the Friends of Stone Lab, contributed to this great accomplishment. The 2012 IHOP is scheduled for September 28–30. Please save the date! **FOSL**



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As one of Stone Lab's first REU students in 2005, Kelsey Reider studied the Lake Erie Watersnake, sparking her love of amphibians and research.

Now she's a Ph.D student and a National Science Foundation Fellow at Florida International University, completing a year of research in Costa Rica's tropical forest to help preserve reptile and amphibian habitat.

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