TWO DAYS on Lake Erie
Legislators See Ohio’s Greatest Natural Resource Up Close
Huntley Wins Achievement Award
Ohio Sea Grant Extension’s Tourism Program Director Melinda Huntley received the Early Career Individual Achievement Award at the Great Lakes Sea Grant Network’s annual meeting in Sheboygan, WI in June. The award recognizes Melinda’s many contributions toward the program’s role in Ohio’s tourism efforts since she joined Sea Grant in 2006. She competed with Sea Grant extension agents from all seven other Great Lakes programs and was selected through a peer-reviewed application process. “It was a real honor to be chosen for this award,” Melinda says. “Sea Grant has an amazing caliber of agents who are innovative, connected to their communities, and who deeply care about what they are doing. It’s a thrill to be recognized among these individuals.”
How does a cleaner Lake Erie translate to a stronger Ohio economy? Decision makers and elected officials touched, saw, and learned the answers at Legislative Days on Lake Erie on August 4 – 5. The event was hosted by Ohio Sea Grant, Lake Erie Shores and Islands, and two members of the Ohio General Assembly. At the opening luncheon in the shadow of Cedar Point’s newest ride, co-hosts Ohio Representative Dennis Murray (D-Sandusky) and Ohio Senator Mark Wagoner (R-Ottawa Hills) spoke about Ohio Sea Grant and Stone Lab’s accomplishments and contributions toward a healthier Lake Erie, Ohio’s greatest natural resource, before introducing the fourth co-host, Ohio State University President E. Gordon Gee.

Gee mentioned how “Stone Lab has been a stellar guide to preserving the quality of Lake Erie. We have faced tremendous challenges and turned them into tremendous research and teaching opportunities for our scientists and students.”

Ohio Sea Grant’s leveraging of funds amazes Rep. Murray, as he compares the lab’s work to alchemy. “The way they are able to take $300,000 from the state and leverage funds from the federal government and other sources and do the great things they do, it’s just magical and crucial for Ohio.”

After a quick ride across the Lake on the Jet Express ferry, attendees found themselves at Gibraltar Island where they met Stone Lab researchers in person and tried their own hands at science in the field. They sampled plankton, tested water transparency, and pulled a fish trawl from the lab’s research vessels. The plankton sample showed the water’s algae concentration. Some of the algae namely the blue-green algae called cyanobacteria, produce toxins that have been responsible for closing several Ohio public beaches. The fish trawls collected yellow perch, white bass, emerald shiners, and white perch, in addition to several zebra mussel and round goby, invasive species that are impacting Lake Erie’s ecosystem.

Before the event, many participants had known only what they had heard in the news about specific issues facing Lake Erie, but when they left, they had heard from scientists about dead zones and nutrient runoff, harmful algal blooms (HABs), and they had seen Asian carps up close.

“The hope is that as our elected officials return to Columbus and Washington, D.C. to make decisions, they will take with them the firsthand experiences and knowledge gained during their visit to our Great Lake,” says Melinda Huntley, Ohio Sea Grant Extension’s Tourism Program Director. “There’s nothing like a day spent measuring water quality and talking with some of our nation’s top Lake Erie scientists to give our decision makers the information they need to lead change.”
Scientists for a Day

It’s easy to read in the news about Lake Erie’s HABs and invasive species, but sometimes it’s difficult to fully understand these complex issues until people take an oxygen reading from a dead zone or see for themselves as algae blooms turn the water green.

Legislative Days participants stepped aboard one of Stone Lab’s research vessels and motored out from Put-in-Bay to learn about plankton and HABs. As the plankton sample settled in a jar, Stone Lab Co-Manager John Hageman pointed out the green layer forming on top of the water. “We solved this problem in the ’80s and ’90s by reducing phosphorus coming into the Lake and now it’s back,” he says.

He explained that these cyanobacteria have several negative impacts on the Lake. Some produce harmful toxins that lead managers and park officials to close public beaches when toxin concentrations get too high. And if that’s not bad enough, once the algae die, they sink to the bottom and consume oxygen from the water as they decompose. Dead zones form at the bottom of Lake Erie’s Central Basin (between Sandusky and Erie, Pennsylvania) where oxygen levels drop too low to support walleye, yellow perch, and other aquatic life that makes Lake Erie a popular destination for anglers. Almost 80 percent of the bottom water in the Lake’s Central Basin has low oxygen levels through the summer.

As a volunteer lowered an oxygen probe over the side, she watched the oxygen level drop to 6.2 parts per million, a healthy amount for fish. If this sample had been collected in the Central Basin where the dead zones form, that oxygen level could have been as low as 0, and animals would have had to move elsewhere in the Lake or die.

Sampling from the research vessel is as interesting for legislators and decision makers as it is for the 7,000 K – 12 students who participate in these hands-on experiences during Stone Lab field trips every year. Seeing and touching the problems that affect Lake Erie has a tendency to change people. Those who previously had been only told about the Lake and its issues become advocates for a healthier ecosystem. Stone Lab makes science exciting and helps Ohio by attracting more students to the “STEM” disciplines: science, technology, engineering, and math.

“It’s important to hear about and see the research and science behind the issues,” Rep. Murray says. “This is a bipartisan event because science doesn’t take sides. Facts are facts.”

Just the Facts

The first step in making a decision is collecting information to understand the issue. After seeing some specific concerns up close on the Lake, participants heard from Ohio Sea Grant and Stone Laboratory Director Jeff Reutter about the facts behind Lake Erie issues that may come across legislators’ desks.

One of those issues is nutrient loading. While forests filter runoff water that enters the other Great Lakes, only a precious few scattered wetlands filter the water coming into Lake Erie. Agricultural fields and urban areas cover northern Ohio’s landscape, draining nutrients from fertilizer, manure, and sewage treatment plants into the Lake. Ohio’s Lake is the southernmost, shallowest, and warmest of the Great Lakes, and the combination of nutrients and warm water makes Lake Erie the most biologically productive of the Great Lakes.

Reutter introduced the 50:2 Rule that shows Lake Erie’s importance as an ecosystem and a driver for Ohio’s economy. With only 2 percent of the total water in the Great Lakes, Lake Erie produces 50 percent of the fish and is often referred to as the “Walleye Capital of the World.” On the other hand, Lake Superior holds nearly 50 percent of the water, but produces only 2 percent of the fish.

Unfortunately, the same factors that make Lake Erie home to so many fish also make it an incubator for large growths of cyanobacteria that can produce dangerous toxins. Phosphorus and nitrogen, two crucial nutrients in agricultural fertilizer, fuel these HABs.

If excessive phosphorus continues to enter Lake Erie, the HAB problem will continue to grow and researchers agree that decreasing phosphorus runoff into waterways will reduce HABs. Scientists reduced large blooms in Lake Erie in the 1960s and ’70s by decreasing phosphorus loading by two-thirds. Now, the Lake is experiencing the phosphorus levels it had in the 1970s, when the Lake was so polluted that it was considered “dead.”

To guide Ohio’s agricultural fertilizer practices, Ohio Sea Grant and a bi-national team of scientists recently completed a report that makes recommendations for reducing nutrient runoff. “To avoid being regulated,” Reutter explains, “farmers need to be proactive and take the steps recommended in the report to reduce phosphorus loading.”

“Reducing phosphorus levels by two-thirds again will solve the HAB problem.”
A Healthy Environment Equals Tourism Dollars

The view is amazing when you stand at Lookout Point on Gibraltar Island. As the Jet Express ferry makes its regular trips to Put-in-Bay and fishing boats haul in their catches, it’s easy to understand the important role a clean Lake Erie plays in Ohio’s $39 billion tourism economy.

Ohio Sea Grant Extension’s Tourism Director Melinda Huntley talked about a recent survey that showed many people thought the water quality of Lake Erie was bad everywhere except near Cedar Point. “Perception is reality in the tourism industry,” she says. And advertising dollars are often what drives public perception. Because the theme park spends a lot of money advertising beyond Ohio’s borders, potential guests are most familiar with these images. People are not as familiar with images from other parts of the Lake because of the lack of state and local tourism advertising budgets. “Who is in charge of shaping the perception of Ohio?” Huntley asks. “In most cases, it is the tourism industry that shapes these perceptions through advertising. They spend a lot of money advertising beyond the borders of the state.”

For its part in building the capacity of Ohio’s tourism industry to address challenges, Ohio Sea Grant works with the Ohio Travel Association to conduct the Tourism Leadership Academy. Tourism professionals learn how to collaborate with those involved in transportation, historic preservation, economic development, and resource conservation policy decisions, and they get involved with legislative procedures in order to grow Ohio’s tourism industry. “We don’t do anything alone,” Huntley explains. “Instead, we work alongside coastal communities—recently we completed a strategic plan for Ashtabula County’s sustainable tourism—and sometimes we connect those communities with other organizations for assistance.”

Ohio Tourism Director Amir Elyon spoke about how the state is working to encourage sustainable tourism that would create jobs. “The Lake acts as an economic driver because it sustains 114,000 full-time jobs in counties along its coast,” he notes. “Building tourism helps all aspects of the state and brings a valuable return on our investment.”

Tourism Paying Off for Ohio

The importance of tourism is easy to see at Put-in-Bay and money spent on marketing Ohio’s tourism opportunities is a sound investment with potential to bring good returns for the state’s budget.

“We have a strong tourism marketing message in Ohio—‘Ohio is Too Much Fun for Just One Day’—and we are receiving 13 new tax dollars for every $1 spent on marketing,” says Matt MacLaren, Ohio Hotel and Lodging Association Executive Director. “However, with only a $5 million budget, our tourism division is only about a third of the average budget of our contiguous states. If we directed more funding to marketing Ohio, we could increase visitor spending and generate tens of millions of new tax dollars.”

Marc McQuaid, Executive Director of the Ohio Travel Association invited participants to join the effort to protect Lake Erie from invasive species and other known threats. “Ohio has a lot to offer,” he says. “The Lake Erie shores and islands are home to some of the greatest destinations in the state. The natural beauty found here is what drives visitors to the area. The region’s tourism industry is comprised of a vast network of businesses—large and small—that provide services to the visitors and keep them coming back.”
Sometimes, science is full of abstract facts that don’t seem to affect our everyday lives, but the dangers of flushing old medicine down the toilet aren’t difficult to understand.

Even though many people don’t think twice about flushing old medicine, it’s the worst way to clean out a medicine cabinet. Water treatment plants are the only barrier between our drains and the environment, but they don’t have the technology to remove these dangerous chemicals from wastewater. Instead, flushing allows pharmaceuticals to enter our streams and lakes and to eventually reenter our drinking water.

“Until people realize there is a problem, they won’t do anything to fix it,” says Marti Martz, Pennsylvania Sea Grant Coastal Outreach Specialist. “There should be a regular, safe, environmentally friendly way to get rid of these drugs. We’re trying to address both issues by educating people about the risks and by providing ways for people to dispose of their medicine.”

Thanks to funding from a Great Lakes Restoration Initiative project, representatives from Ohio, Illinois-Indiana, New York, and Pennsylvania Sea Grant programs are spreading awareness of the problems caused by flushing medicine and are hosting collection events where people can safely discard unwanted medicine.

During a recent collection event in August, officials in Pennsylvania collected over 100,000 pills in four hours. “And those were from only the people who heard about the event,” Martz says. “A lot of people don’t know about it yet.” Since the project began in October 2010, the partner Sea Grant programs have collected and destroyed 1,340,000 pills and reached 615,000 people with educational material, on pace to leapfrog their goals of one million pills and one million people.

“As we see the positive response from people, it invigorates us and makes it easier for us to work harder to reach our goals,” says Helen Domske, New York Sea Grant Coastal Education Specialist. “Many people are just unaware of the problem. They think they’re doing the right thing by flushing medicine down the drain. Once we tell them that’s the worst thing they can do, they say, ‘Oh, I won’t do that again.’ It’s such a simple step people can take and has a direct impact on the environment. Once you give them the message, they get it.”

At collection events, people turning in medicine fill out a survey so officials can learn why people have extra medicine. Some turned in medicine from deceased family members, and others dropped off medicine as much as 26 years old, but most people’s medicine is in near-full bottles, with only a few pills missing. This is what happens when doctors prescribe 30 pills and patients take only a few. Officials place the collected pharmaceuticals in 55-gallon drums, which hold nearly 50,000 pills, and then destroy them in a high-temperature incinerator.

“Ideally it would be easier if pharmacies offered take-back programs so people could simply return unused medicine,” Martz says. “That’s a goal we’re working toward.”

If there isn’t a nearby collection event, people should mix their unwanted medication with coffee grounds or cat litter to discourage criminal activity, seal it in a sturdy container, and hide it in their trash. This aspect of medicine disposal draws help from another partner—law enforcement. Ohio Sea Grant Extension Specialist Dave Kelch will be assisting law enforcement agencies in Ohio’s coastal counties with unwanted meds collections events next spring and will place secure prescription drop-off boxes at law enforcement offices.

“Teaming up with law enforcement agencies is the way to go because we’re both addressing the same problem for different reasons,” Kelch says. “They don’t want pills in the hands of criminals and we don’t want it in the water.”

Making Advocates

Besides holding collection events, the Sea Grant partners are working with several groups to teach people about the issue and make them advocates. Working with a program that encourages middle and high school students to become active in their community, Pennsylvania Sea Grant spread medicine disposal information to a group of students who focused on starting medicine take-back programs at pharmacies. Illinois-Indiana Sea Grant responded to calls from...
Thousands of people have turned in old medicine at collection events organized by Great Lakes Sea Grant programs. Part of their project is to educate doctors and medical students about the dangers of prescribing too much medicine at one time.

High school teachers interested in talking to their students about the dangers of prescription medicine by creating curriculum materials, called the Medicine Chest, to teach their lawmakers to pass two bills supporting medicine collections.

Because of that effort, a Pennsylvania congressman may introduce legislation this fall to allow people to return medicine to their pharmacy and teachers in Illinois pressed their lawmakers to pass two bills supporting medicine collections.

In the undergraduate class she teaches at the State University of New York, Domske has asked her students to develop projects related to the disposing of unwanted medicine. Students' surveys on Facebook, flyers posted around campus, and displays in the student union have reached thousands of people. One student even created stickers to put on dormitory bathroom mirrors, asking “Do you know what you’re flushing?”

Illinois-Indiana Sea Grant and the 4-H team at Purdue University created and distributed a curriculum for 4-H groups with the goal of teaching 100,000 youth and adults how to dispose of medications properly. This summer, Domske has shared the curriculum at education workshops with middle and high school teachers so they can teach their students.

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With the start of autumn, birds migrate to warmer climates to avoid a cold winter. Nearly 25 million geese and ducks stop over at the marshes in Lake Erie’s western end on their way south, attracting several hundred thousand birdwatchers and hunters. The problem is that some birds bring along viruses, which someday might include a virus that presents an increased threat to humans, like the dangerous avian influenza virus.

Ohio State University’s Drs. Richard Slemons and Robert Gates have begun a two-year Ohio Sea Grant project to study how conditions in the marshes affect the survival of low pathogenic influenza A viruses routinely detected in waterfowl. The marsh water’s conductivity, pH, and temperature all affect how long viruses stay infectious. A longer infectious period would allow more birds to be exposed to the virus over a longer period of time and potentially become infected and carry the virus further south.

It’s important to understand how environmental conditions affect avian flu because the last four human pandemic flu viruses, including the H1N1 outbreak two years ago, originated in part from birds. Learning more about how marsh conditions lengthen or shorten viruses’ infectious period will enable scientists to manipulate those conditions in a marsh to degrade a virus more quickly or know how long to limit access to infected marshes.

Once they know how environmental conditions affect avian flu, public health officials can determine how to react. “Just like officials close a beach when E. coli levels are high, if we find that an avian flu virus is in wild birds using Ohio marshes, health officials can assess which marshes should be closed to the public,” Slemons explains. “We could also recommend what personal precautions should be taken and for how long.”

Animal producers and zoo managers could use findings from the project to protect their animals, visitors, and employees from contracting viruses. “Once you understand how environmental conditions affect avian flu virus survival, you can potentially manage and control those conditions,” Gates points out.

Ohio State University students Charlie Schwarten and Jacqueline Nolting are developing lab environments based on conditions in Winous Point Conservancy, a marsh near Lake Erie, in Ottawa County. These environment models use actual marsh water to replicate the typical Lake Erie marsh as accurately as possible. Changing one variable at a time, the scientists are studying how each one affects the survival of viruses. So far, avian flu viruses seem to survive the longest in an environment with slightly basic pH, cool temperature and fresh, clean water.
Slemons points out that the research—due out next spring—is a proactive way to plan for a worst-case scenario. “If a dangerous virus were introduced into North America by wild birds, we would have a model to use to assess the risks before the virus spread into or beyond the marshes in Ohio.” And since Lake Erie is only a stopping point for birds flying south, controlling avian flu here in Ohio could help protect animal and human health in southern states and in South America.

After sampling an extensive population of birds, scientists have never found a dangerous avian flu virus in North America, but we shouldn’t wait to prepare. “It wouldn’t surprise me if a dangerous virus showed up tomorrow, next week, or never showed up,” Sherman says. “These viruses are totally unpredictable and it would be important to understand how the environment affects them if they do show up here.”

For more information about this Ohio Sea Grant-funded research, contact Dr. Richard Slemons at richard.slemons@cvm.osu.edu or Dr. Robert Gates at gates.77@osu.edu.

Researchers created microcosms that simulate Lake Erie marshes to observe how environmental conditions, including pH, temperature, and water conductivity, affect the infectious period of avian flu.

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New Report on Phosphorus to Help Solve Ohio’s Algae Problem

As harmful algal blooms in Ohio’s lakes continue to cause water to be unsafe for visitors, a new report released in June by 15 scientists and lake management agencies could help guide the state to better agricultural fertilizer practices in the hopes of decreasing algal bloom occurrences.

The 17-page report, “Lake Erie Nutrient Loading and Harmful Algal Blooms: Research Findings and Management Implications,” documents findings of seven research projects ranging from studies of algal bloom starting locations to tests of how much phosphorus soil can retain. The projects show how high levels of phosphorus, the key component in fertilizer, cause massive (and toxic) algal blooms in lakes and practices to conserve phosphorus could have a dramatic effect on those algal blooms in Ohio’s lakes.

“We have seen the concentration of algal toxins in Lake Erie increase each summer at an alarming rate—reaching 60 times the amount considered safe for drinking water,” says Dr. Jeff Reutter, Ohio Sea Grant Director and contributor to the report. “What this report does is it shows the research that backs up the team’s recommendations.”

Those recommendations include that managers and individual farmers should incorporate phosphorus into the soil rather than apply it on top of the ground, should not apply more phosphorus than is needed, and reduce phosphorus applications in autumn and winter. These steps would ultimately lead to a two-thirds reduction in total phosphorus running off into public waterways.

“The hope for this report is that we would implement these recommendations and eliminate harmful algal blooms,” Reutter says. “While we believe that a two-thirds reduction in the amount of phosphorus entering Lake Erie from agricultural fields will be required to solve the harmful algal bloom problem, we predict this can be accomplished primarily by altering current fertilizer application strategies used by farmers without harming crop production.”

For a copy of the report, visit go.osu.edu/phosphorus. More information about the report or the U.S. Environmental Protection Agency and the Ohio Lake Erie Commission-funded research projects, contact Jeff Reutter at reutter.1@osu.edu.
rushing teeth takes time out of our morning routine and cleaning the scum from shower walls is a chore, but believe it or not, the same germs at fault for these nuisances have been causing some major problems for freighters on the Great Lakes.

The nuisances are biofilm or microorganisms that grow on surfaces—like ships or docks—that stay in water. Constantly corroding the ships’ hulls and causing decreased ship speed with large build-ups, biofilm has been costing companies more than $5.7 billion annually in preventative measures. For years, boat owners and dock managers coated ships with heavy-metal based paints to prevent biofilm buildup but with environmental toxins becoming a concern, they discontinued their use. A new Sea Grant-funded project led by University of Akron researchers Lu-Kwang Ju and Bi-min Zhang Newby is looking into finding safer, non-toxic solutions for the shipping industry to fight biofilm.

“We're trying to slow down the rate and strength of biofilm's adhesion,” Ju says. “For the coating industry, this is still a very large problem. Really, it's an economical problem—we can always strip off a protective coating and apply a new one, but cost is the issue. If you have a better anti-biofilm substance, you don't need to replace the coating as often.”

In a previous Ohio Sea Grant project, Newby studied a naturally forming chemical that removed 90 percent of the biofilm while being five times less toxic than the traditional anti-biofilm paints. Ju’s group had been producing another natural chemical, called rhamnolipid, which also could prevent biofilm growth. Ju and Newby set out to learn more about how this rhamnolipid affects biofilm growth and how biofilm corrodes metals.

Shortly into the new study, Ju and Newby realized they needed to create a new test device to obtain consistent results. The researchers designed a system that provided them the means to monitor biofilm as it grows in glass chambers, simulating boat hulls in water. Water waves and currents play an important role in biofilm growth so to get real-life results in the lab, the device mimics these waves.
role in whether biofilm sticks and grows on surfaces (strong waves discourage biofilm from sticking), so the new system mimics this water movement to get real-life results.

**Will It Stick?**

Ju and Newby pumped biofilm through their testing device to determine if the rhamnolipid barrier would reduce the tendency of common Lake Erie biofilms like *P. aeruginosa* and *E. coli* to stick and grow. Once the biofilm stuck, the researchers fluctuated the water speed to test how easily they could remove the biofilm from the glass walls.

The study proved that even at low concentrations, a rhamnolipid barrier is very effective for keeping the two species off surfaces. Rhamnolipid prevented 90 percent of *P. aeruginosa* and 50 percent of the *E. coli* from sticking to the surface.

Because it was at such low concentrations, Ju and Newby suspect the rhamnolipid barrier may put out a signal that “tells” biofilm not to attach. That could explain why rhamnolipid was more effective at blocking one biofilm species than another.

“We believe that at these low concentrations, signal molecules bind with receptors on the bacteria and that triggers the bacteria to not stick to the surface,” Ju explains. “The barrier can be species-specific if it only works against biofilm species that have those certain receptors.”

What this will mean is rhamnolipid won’t be able to counter all biofilms alone; other molecules will need to be added to fully prevent biofilms from forming. “This method hasn’t been used yet,” Ju says. “So far, people are looking for one thing to kill every kind of biofilm, but it doesn’t look like that can be done because it has bad ecological effects.”

**Testing Corrosion**

The second part of the team’s project looked at biofilm’s ability to corrode ship hulls. The researchers placed slivers of aluminum and carbon steel in the testing device to expose the metals to biofilm. Both *P. aeruginosa* and *E. coli* biofilms grew and spread out quickly on both metals, covering the entire surface in 19 and 24 hours.

The *P. aeruginosa* biofilm appeared to create a protective coating that prevented oxygen from reaching the metal surface and slowed corrosion of the carbon steel. *E. coli*, on the other hand, showed no signs of protecting the carbon steel, instead causing significant corrosion and showing rough, yellow and brown surfaces. Neither biofilm appeared to have an effect on the aluminum slivers as it is generally more corrosion resistant than carbon steel.

This project’s findings are important steps to understanding and ultimately producing new biofilm barriers, but the new testing device itself will prove to be crucial in further biofilm research. Thanks to Ju and Newby, researchers around the country are seeking to use the device to further their anti-biofilm coating work.

For Ju and Newby, the journey to learn about biofilm and biofilm barriers can take one of two directions from here. They can study the mechanisms behind biofilm formation and how barriers prevent its attachment to surfaces, or the researchers can study the actual effects of biofilm on structures. “Biofilm isn’t going away so the best thing we can do is learn how to make cleaning it up easier,” Ju says. “We hope that our new device helps us understand these microorganisms because that will help us find a solution faster.”

For more information about this Ohio Sea Grant-funded research, contact Dr. Lu-Kwang “Luke” Ju at ju@uakron.edu or Dr. Bi-min Zhang Newby at bmznewby@uakron.edu.
John Hageman has worked to give K–12 students the same opportunities to experience science as he had at their age. He pulled his first fish trawl on Lake Erie as a high school sophomore during a Stone Lab field trip, and he has never forgotten the excitement. In fact, it will be what he misses the most after retiring at the end of August.

Stone Lab has served as both a foundation for John’s interest in aquatic biology and as an outlet for his enthusiasm for science, as he watched students get excited about the same things he was excited about for the 24 years he served as Stone Lab’s Manager.

As the teaching assistant in his high school ichthyology class in 1976, John went with the class to visit Stone Lab three times and grew more enthralled with fisheries biology each time. When his teacher heard that Ohio State University’s Center for Lake Erie Area Research (CLEAR) had an opening for a fish identification job, she recommended that John apply. His experience identifying fish honed in class and at Stone Lab prepared him well, and John, a 17-year-old high school senior at the time, landed the job. The part-time position saw him receive his first paycheck from CLEAR at a humble $2.50 an hour.

“I became a very familiar fixture in the university’s zoology, natural resources, and biological sciences departments,” John says. Through college and for the four years after he graduated, John identified tens of thousands of larval fish samples, collected larval fish samples in Michigan, and studied fish spawning, nutrition, and feeding.

The field work experience made him the winning candidate for the Stone Lab Manager position when it opened in 1987. John remembered the fundamental role his initial Stone Lab experience played in his career, and he focused on building the science field trip program to spark grade school students’ interest in science. While field trip students already went out on research vessels to collect plankton samples and trawl for fish, John saw that their teachers were requesting more activities. To fill the time and make the school trips more worthwhile, John developed an invertebrate walk where students collect organisms to study in the lab to determine water quality.

John didn’t stop there. He channeled the expertise already available at Stone Lab and created ornithology and geology walks to study the birds and rock features on Gibraltar Island, and worked with a researcher to develop an edible plants walk. Stone Lab Co-Manager Matt Thomas and Outreach Coordinator Kristin Stanford helped plan herpetology sessions, allowing students to get up close and personal with the lake’s snakes and amphibians.

“We want to get as many students to come up here as possible,” John says. “What’s important to me is that we can give more kids exposure to Lake Erie ecology and teach them about healthy ecosystems. I just think what would have happened if I hadn’t made those trips to Stone Lab as a high school student, or how many students have made the decision to become biology majors after coming here on field trips.”

With more activities to take, schools have had more reasons to stretch their Stone Lab trips to overnight stays, and under John’s leadership, the program has grown from attracting 1,300 students per year to an average of more than 7,000 participants, including students from 70 schools in four neighboring states.

“There’s probably nobody in Stone Lab’s history that has meant more to the lab than John,” says Jeff Reutter, Ohio Sea Grant and Stone Laboratory Director. “We never had a more dedicated and hard-working employee than John. His focus was always entirely on enhancing our impact, improving our quality, and making room for one more student.”

Without a doubt, John’s favorite part of his job has been watching students’ eyes light up to the natural world for the first time. “Looking at a plankton sample under the microscope and seeing water fleas glide across the screen, you hear them say ‘ohh,’ and ‘ahh.’ They had no idea what lives in water,” he says. “And it’s exciting to see their anticipation—just like the feeling I still get when we pull in a catch of fish with a trawl. It’s a thrill every time. That’s what I’m going to miss.”
Climatic change is not only likely to affect our weather, our water levels, and our health, but also the variety of birds we see in our backyards and city parks. Changing environmental conditions will affect where these birds live, raise their offspring, and spend their winters, and wildlife managers across the Great Lakes region and beyond will have to consider these potential changes when deciding on the best way to manage the wooded areas in their care.

Dr. Steve Matthews is one of the researchers providing wildlife managers, other forestry officials, and the general public with tools to make informed decisions about the potential future of birds in the Eastern United States, including the Great Lakes region. Matthews’ research focuses on how bird species are distributed across a landscape, and how those patterns may change in terms of climate change projections.

“The general focus of a lot of my work is in developing species distribution models and trying to understand what environmental conditions species are most associated with in terms of climate, tree sites, and elevations, for example,” Matthews, Research Assistant Professor in the School of Environment & Natural Resources at Ohio State University, explains. “I am also interested in how those bird habitats may change under different climate change scenarios,” he adds.

To determine these habitat changes, Matthews and his collaborators Louis Iverson, Anantha Prasad, and Matthew Peters of the US Forest Service use statistical models that analyze current distributions of both the birds of interest and of the trees in these habitats under current environmental conditions. Once the model has determined the relationship between the current climate, the tree species present in a certain area, and the birds that live there, the researchers can use projected climate data from the Intergovernmental Panel on Climate Change (IPCC) to get an estimate of how climate change may affect bird populations in the future.

“Using the RandomForest algorithm, which is the modeling approach that we use to identify the connections between climate, trees and birds, we can say that a species appears to be associated with spring-like temperatures, for example, but there’s also an important link to a tree species of a certain type,” Matthews explains. “This means that if we can build those models and we get those estimates, then we can basically swap the climate out with future projections. The advantage of using trees as a predictor for birds as well is that we can then also have an idea of how those trees’ habitats can change,” he adds.

Models like these are already used to estimate the impact of decisions about how to manage forests and wildlife populations in light of climate change, from determining what trees would fit best
into a reforestation project to which bird species are going to be most impacted by a changing forest composition, but Matthews and his colleagues suggest that predictions that are based on climate alone do not tell the whole story.

“We rely on those models to identify the important connections between species under current conditions, but as climate or habitat changes, it’s important to understand that these connections may break or shift,” Matthews says. “So we want to be able to quantify how species’ habitat may change, but we also have to keep in mind that other factors come into play. For example, on the tree side, red maple is projected to decline under climate change, that’s what the profile would suggest. We also know that it has...
adaptable capacities and can grow under a variety of conditions, so our decline projections should be taken in the context that the species might be quite adaptable.”

Such potential adaptability in turn may allow tree species to provide more than the projected habitat for associated birds. It also suggests that some bird species may be similarly adaptable to changing environmental conditions. This idea is not taken into account by current statistical models, which therefore may not provide the full picture of how a species (be it bird or tree) may respond to certain environmental conditions.

To improve the predictive powers of current models, Matthews and his collaborators at both Ohio State University and the US Forest Service have developed “modification factors” that allow for input of variables beyond climate change. These “ModFacs” consider species’ life history characteristics as well as additional distributional summaries. The third component of their multi-model framework makes a detailed quantitative assessment of potential species expansion or move beyond current habitats, specialized local knowledge and current land use (such as agriculture), and are applied to standard models to better inform management decisions.

Support for wildlife and forestry managers has recently become more important, Matthews says. “The approach we take is that a list of species is informative, but there are other components that need to be included,” he explains. “These species distributions aren’t static, and they have never been static. So in the long term, changes are likely to occur, and we’re going to have to build in an idea of how adaptable species may be to those habitat changes. One of the key results is that by looking at how the climate may change and how the species’ habitat may be stressed, the individual characteristics of a species’ distribution might change as well.”

The most recent tool Matthews and his collaborators have developed is a vulnerability assessment that tries to lay out the ways in which, as a species changes, “you can adapt how areas are currently managed to identify the ecosystems that may be most vulnerable,” Matthews says. The assessment tries to pull all of that information together, to show the data that are likely to be important, and to present the information in an easily understandable but not too simplified manner. “Then the managers on the ground, the ones that are most familiar with the situation, they are the ones that are in the best position to make the important decisions,” Matthews concludes.

How statistical models can assist managers in making these important decisions was one focus of Matthews’ recent Global Change, Local Impact webinar as well. Matthews also introduced another currently available tool to visualize changes in bird species distribution under climate change, not just for wildlife managers but also for the interested public: an online Climate Change Bird Atlas that provides distribution data for 150 bird species in the Eastern United States, both under current conditions and under various climate change scenarios, allowing wildlife managers concerned with protecting a particular species to understand how climate change may affect that species’ future distribution in their region of concern.

For an archived version of Dr. Matthews’ webinar “Regional Impacts of Climate Change on Forests and Bird Communities”, visit changingclimate.osu.edu. The Global Change, Local Impact webinar series is a multi-departmental effort within Ohio State University, led by Ohio Sea Grant, OSU Extension, and nine other OSU departments, to help localize the climate change issue for Ohioans and Great Lakes residents.
For most amateur photographers, it’s intimidating to turn the dial from Automatic to the manual setting. The photographer has to worry about a lot of knobs and buttons in order to get the right shot. It’s confusing, frustrating, and sometimes enough to make you want to sell the camera and just buy postcards of your vacations.

But for the 13 students who took Stone Lab’s Outdoor Photography Workshop, manual is the new Automatic. Well, maybe it’s not that easy yet, but the workshop was a giant leap for me, as one of those students, toward understanding photography at a new level.

Any member of the public can attend Stone Lab’s two- or three-day workshops, so keep an eye on the Stone Lab website (go.osu.edu/SLworkshop) for information. Nearly 50 people took advantage of the six non-credit workshops offered this summer and fall that covered topics ranging from algae identification to Lake Erie sport fishing.

Our instructors, Jim Doty, a professional freelance photographer, and Dr. Jeremy Bruskotter, Assistant Professor at Ohio State University, are not only photography experts (they could list off by memory the settings for taking a picture in the moonlight), but they are also experts at demystifying cameras.

After arriving at Stone Lab on Gibraltar Island on Friday, and stowing luggage in our dorms, our class met and got a rundown of what we would learn over the next two days.

In any other class, the instructors would hand out a syllabus. Instead, Jim and Jeremy asked us what we’d like to learn. Of course, they had anticipated most of our questions and came equipped with answers in the form of handouts and slideshows. The session turned into a helpful question-and-answer time and then we went to dinner, where we could sit with the instructors and ask them even more questions. This is one of Stone Lab’s greatest benefits over the traditional classroom—when you take a class on an island, there are no office hours because the instructors are always available.

That night we were treated to a beautiful golden sunset and we learned how to set our cameras to take photos in the dark. It sounds simple, but things get tricky since the camera must stay perfectly motionless for 10 or 15 seconds.

On Saturday morning, we headed to a hidden piece of coastline on Kelleys Island that was home to small yellow flowers and grey and red pebbles…and that was soon crawling with photographers, kneeling down to take pictures or trying to capture the gentle waves as a still photo.

We spent Sunday morning in a South Bass Island vineyard, and when we returned to Gibraltar, we shared and commented on each other’s best photos.

Friday afternoon we had been takers of snapshots, but when we headed back to the mainland, we possessed the tools and the know-how to take good photographs. Now it’s up to us to practice. By next year, we’ll have some great photos and more questions for our instructors. Tl.
behind most great scientists, there is a great teacher. Angela Greene is probably the best science teacher a 7th grader could have. With just as much energy as she had 24 years ago as a novice teacher, Angela is using her Stone Lab experiences to make science come alive for the future scientists at Tecumseh Middle School in New Carlisle, Ohio.

Angela’s first Stone Lab course seven years ago introduced her to science field work, and even though she wasn’t prepared to spend all day tromping through the woods and streams, she loved the experience. She returned home excited to have her students get up close and personal with science, and Angela has since become an advocate for Stone Lab by encouraging other teachers to spend their summers at the island lab in Lake Erie’s Western Basin.

“I can’t imagine doing anything else over the summer,” she says. “If I could be at the lab all year long, I would. After you do field work, you come back with a completely different way of teaching science that allows students to actually enjoy class.”

Angela takes what she learns at Stone Lab and adapts it to her classroom. “Bio-blitzing” is one way she introduces hands-on science to motivate her students to love science almost as much as she does. Greene uses this unique term to describe how on one day each year, she packs her van full of monitoring equipment and aquariums and sets up a miniature science lab along a nearby lake. She then assigns students to collect specific animals, while other students use binoculars to spot as many species of birds as possible and identify them with a field guide. Students spend the afternoon processing all their finds with Angela recording all the data in a notebook.

Cindy Botello went from dreading science class last year to serving as Angela’s lab aid as an 8th grader this year. “I used to think science was kind of boring, but then I had her class and began thinking it’s interesting,” Cindy recalls. “Instead of having us read out of a book, Mrs. Greene lets us do the actual science.”

In the classroom, Angela’s aspiring scientists conduct a long-term study of what lives in fallen pine needles and leaf litter, and you know the students enjoy the study because they come in during their study hall, gym, and even math class to help. Every speck must be accounted for, and Angela doesn’t use any class time for it.

“You wouldn’t believe all the students who come in,” Angela remarks. When students find something, they write their name and the organism’s name on a sticky note to post on the white board. “Everyone wants their name on a sticky note.”

If that’s not enough to keep the students busy, they also monitor and record data on the nearly 40 live animals, including snakes, geckos, and other reptiles, in Angela’s classroom. While most teachers have a planning period, Angela’s free time becomes students’ lab time. Her students care so much about the projects that Angela hosts an open lab night once each quarter.

“I wouldn’t want it any other way,” she says as she prepares her classroom for fall classes. “Can you imagine being a 7th grader and hating science?”

Angela has wanted to teach science ever since she had an extraordinary 5th grade teacher, Mrs. Elliot. Now, Angela has passed along her former teacher’s love for science, as several of her own students have pursued science degrees. It’s enough to make Angela want to wait a few extra years before retiring.

“If I couldn’t teach, I would be lost as to what my career might be. I have no idea what I would do. I can’t imagine not getting a 12-year-old jazzed about science.”

FOSL
Dear friends,

The Friends of Stone Lab is beginning the 30th anniversary year of its founding and for a young organization, we have had a great deal of success. We have created numerous endowments, which annually produce $50 – 65,000 for scholarships, research scholars, and REUs. We save the program many thousands of dollars by simply lending a hand, in the form of numerous volunteer activities and we help with many different education and outreach activities.

The question now is where do we go from here and how do we get there? In a time of tight budgets, our team has to look for innovative ways to increase revenues to the program. We need all of our FOSL members to continue their generous support, but we also need to broaden our horizons to find philanthropic organizations whose goals align with Stone Lab and Ohio Sea Grant, and pursue grants and gifts from them.

So how does this relate to you? Each of us has our own backgrounds, interests, and capabilities. In order to adapt to the imminent and future needs of the programs we support, we need to increase the diversity of members who are involved. There are many opportunities available to serve on the FOSL Board of Directors, committees, and other volunteer activities that you may be uniquely knowledgeable and qualified to fill.

Please consider what you can do to help. It starts with each of us as individuals deciding to do what we can. Spread the word and encourage involvement in FOSL activities. Please contact the Stone Lab office or any of the FOSL board members to find out how you can be more involved. We want to make the next 30 years as successful as the first!

Sincerely,

Tracey Meilander  broaderimpacts@yahoo.com
FOSL President

Stone Lab Thanks Donors
The 5th annual donor dinner was held at Stone Lab on Saturday, August 13. This annual event recognizes all the donors who have made lifetime cumulative donations of $1,000 or more to Stone Lab or the Ohio Sea Grant Program. The approximately 40 people in attendance had a wonderful afternoon of fellowship and remembrance. Everyone had the opportunity to tour Gibraltar Island and the Research Building on South Bass to learn about the construction and remodeling activities beginning this fall. The education center, located in the fish hatchery, was also a highlight of the afternoon’s activities. FOSL

County Commissioner and Mayor Day
Nearly 50 county commissioners, mayors, and local decision makers participated in our program, where they visited the South Bass Island Lighthouse and the Aquatic Visitors Center, heard presentations by Stone Lab and Ohio Sea Grant’s experts on key issues affecting Lake Erie and coastal communities, and participated in a science cruise on the lab’s research vessels, pulling a fish trawl to collect plankton, water, and invertebrate samples. FOSL

Program Changes
It is with mixed emotions that Stone Lab and Ohio Sea Grant report some personnel changes to key staff positions.

John Hageman—Co-Laboratory Manager, retired, August 31, 2011
Mark Wilhelm—Physical Staff, retired, August 31, 2011
Colleen Wellington—Clean Marinas Coordinator, resigned, June 30, 2011
Kristin Stanford—Education & Outreach Coordinator, hired, August 1, 2011

Kristin will take over many of John’s responsibilities in coordinating the education and outreach programs at Stone Lab. FOSL wishes everyone the best in all of their new pursuits. FOSL
The Friends of Stone Laboratory (FOSL) began in 1981 as a support group to “bring Stone Laboratory into the 21st century with the best possible facilities, equipment, and professors, and make this an unequaled learning experience available to all outstanding students.” Members of the Friends provide a way for former students to support the facility by raising awareness and funds for scholarships, research, and equipment.

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Do you want to connect with your Stone Lab classmates and friends? How about receive invitations to FOSL activities and keep up on what is happening at Stone Laboratory? Why don’t you join us on Facebook and stay in touch? Even though our FOSL group is technically a closed group, anyone with an interest in Stone Laboratory, FOSL, and the Great Lakes is welcome. If you already have a profile on Facebook, type “Friends of Stone Laboratory” in the Search box and make a request to join. We will process your request and soon you will be in touch with all things Stone Lab. If you are not a current Facebook user, this is a great opportunity to set up a profile and find us online. We are currently a relatively small group, but want to build up our members. Wouldn’t it be great to know what all of your fellow Labbers are doing? Please accept this invitation and help us grow and keep yourself up-to-date! FOSL
CLIMATE CHANGE.

We hear the term everywhere, but what does it really mean for us, right here in the Great Lakes region?

Find out with the second season of the **GLOBAL CHANGE, LOCAL IMPACT** webinar series.

- **Thursday, September 29 12:00-1:00 EDT**
  Regional Impacts of Climate Change on Forests and Bird Communities  
  Dr. Steve Matthews, School of Environment and Natural Resources, Ohio State University

- **Tuesday, October 18 12:00-1:00 EDT**
  Recent Trends of Heavy Precipitation in the Great Lakes  
  Dr. Dave Kristovich, Center for Atmospheric Sciences, University of Illinois

- **Tuesday, November 8 12:00-1:00 EST**
  Climate Change and Great Lakes Wetlands  
  Dr. William Mitsch, School of Environment and Natural Resources, Ohio State University

- **Thursday, December 1 12:00-1:00 EST**
  One Health: Environmental Sustainability, Food and Climate Change Across the Disciplines  
  Dr. Lonnie King, College of Veterinary Medicine, Ohio State University

**Missed one?** Visit the webinar archive at [ChangingClimate.osu.edu](http://ChangingClimate.osu.edu)