

OHIO SEA GRANT

2010–2014 Strategic and Implementation Plan

Including
F.T. Stone Laboratory,
the Center for Lake Erie Area Research (CLEAR), and
the Great Lakes Aquatic Ecosystem Research Consortium (GLAERC)



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CONTENTS

2010–2014 Strategic and Implementation Plan



A Program of Action

For more than 30 years, Ohio Sea Grant has worked to help restore and rejuvenate Lake Erie and its regional economy. With the unique combination of research, education, and outreach efforts, Ohio Sea Grant has become a program of action, working progressively with its stakeholders and partners, to solve the Lake's most pressing environmental and economic issues.

To share some of our stories, we have included sidebars within this strategic plan, highlighting just some of the work we've done within our four key focus areas. Through these stories, you'll learn more about recent research important for the restoration of our great lake, hands-on educational efforts to train tomorrow's workforce, and ways we have reached out to help communities and industries prepare for a stronger tomorrow.

Director's Letter.....	3
------------------------	---

Introduction	5
---------------------------	----------

Seven Issues Facing Lake Erie	
Sedimentation and Dredging	
Nutrient Loading and Phosphorus	
Harmful Algal Blooms	
The Dead Zone	
Aquatic Invasive Species	
Climate Change	
Coastal Community and Economic Development	
Program Description.....	8
Planning Process.....	11
Cross-Cutting Goals and Strategies for Ohio Sea Grant	13

Focus Area: Healthy Coastal Ecosystems	16
---	-----------

Program Performance Matrix	
Long-Term Visions	
Goals	
Strategies	
Short-Term/Mid-Term Outcomes and Measurable Outcomes	
Long-Term Outcomes and Performance Measures	

Focus Area: Sustainable Coastal Development	42
--	-----------

Program Performance Matrix	
Long-Term Visions	
Goals	
Strategies	
Short-Term/Mid-Term Outcomes and Measurable Outcomes	
Long-Term Outcomes and Performance Measures	

Focus Area: Safe and Sustainable Seafood Supply	64
--	-----------

Program Performance Matrix	
Long-Term Visions	
Goals	
Strategies	
Short-Term/Mid-Term Outcomes and Measurable Outcomes	
Long-Term Outcomes and Performance Measures	

Focus Area: Hazard Resilience in Coastal Communities.....	72
--	-----------

Program Performance Matrix	
Long-Term Visions	
Goals	
Strategies	
Short-Term/Mid-Term Outcomes and Measurable Outcomes	
Long-Term Outcomes and Performance Measures	

Anticipated Outcomes.....	82
----------------------------------	-----------



FROM THE DIRECTOR



I am pleased to present the 2010-2014 Strategic and Implementation Plan for the Ohio Sea Grant College Program at The Ohio State University. Because Ohio Sea Grant is a partnership of government, academia, and the private sector, this plan was developed with input from each of those partners and continues to address our 3 E's (environment, economy, and education) using our broad-based approach of research, education, and outreach. The plan builds on the program's 2005-2010 Strategic Plan and is structured to match the plan of the National Sea Grant College Program with four national focus areas: healthy coastal ecosystems, sustainable coastal development, safe and sustainable seafood supply, and hazard resilience in coastal communities. Among other things, the plan also addresses seven major problems/issues impacting Lake Erie: sediment loading, nutrient loading, harmful algal blooms, the Dead Zone, aquatic invasive species, climate change, and coastal community and economic development.

Lake Erie is the southernmost, shallowest, and warmest of the Great Lakes, arguably Ohio's most valuable natural resource and may even be one of the most important lakes in the world. It receives more sediment and nutrients and produces more fish annually than the other four Great Lakes combined. However, it is possible to have too much of a good thing, and excessive sediment and nutrient loading are leading to the region's most severe harmful algal blooms and one of this country's largest Dead Zones. When the Cuyahoga River burned in 1969, Lake Erie became the poster child for pollution problems in the country. In the early 1980s it became the "Walleye Capital of the World" and the best example of ecosystem recovery in the world. Unfortunately, since 1995, the lake has been deteriorating and we must stop the decline and turn the trend around.

In this plan, we have attempted to support and incorporate needs and priorities identified by the Binational Executive Committee of the U.S. and Canada, the Cooperative Science and Monitoring Initiative, the Lake Erie Lakewide Management Plan, the Council of Great Lakes Research Managers of the International Joint Commission, the Ohio Lake Erie Commission and its component agencies, the Great Lakes Regional Research Information Network, the Lake Erie Millennium Network, the Ocean Research and Resources Advisory Panel, the Great Lakes Regional Collaboration, the Lake Erie Partnership and its component agencies, the Ohio Phosphorus Task Force, The Ohio State University, the Ohio Board of Regents, and many more groups, including more than 125 members of Ohio Sea Grant's private sector advisory committees. This plan is a living document that is reviewed and modified annually as needs and opportunities change. Your input, suggestions, and criticisms are requested and always welcome.

Sincerely,

A handwritten signature in dark ink that reads "Jeffrey M. Reutter".

Jeffrey M. Reutter, Ph.D.
Director
Ohio Sea Grant College Program



INTRODUCTION

Lake Erie has been called the most important lake in the world. It provides shelter and nourishment to countless living things, including 11 million people who rely on it for drinking water every day. It is the southernmost, shallowest, warmest, and most biologically productive of the Great Lakes, producing more fish for human consumption than the other four lakes combined. But Lake Erie also faces a number of challenges that Ohio Sea Grant and its partners are working to address. Before outlining our strategic planning efforts, here are the seven most critical issues confronting Lake Erie.

Sedimentation and Dredging

When storms rage across the Lake Erie region in the spring and summer months, new sediment is washed from the landscape or sediment that had previously settled to the bottom of its tributaries is stirred up and flushed downstream to Lake Erie. The Maumee River, in Lake Erie's western basin, contributes more sediment to the lake than Lake Superior receives from all of its tributaries combined. At times the sediment



is visible, creating a murky and muddy plume that not only reduces property values by creating a less-than-

enticing view, but it also creates the perfect incubator for the growth of *Microcystis*—a common species of cyanobacteria that can produce toxins harmful to animals and people.

Over time, the build-up of sediment reduces the depth of harbors, making it necessary to dredge and remove the excess sediment to restore safe boat passage.

With dredging comes an additional risk of spreading pollutants like mercury and PCBs, which often rest at the bottom of these harbors attached to sediment particles. Communities must carefully assess the risks involved with any dredging project, taking care to properly dispose of contaminated sediment—often in specialized landfills or confined disposal facilities in the lake.

Nutrient Loading and Phosphorus

Nutrients provide the foundation of Lake Erie's food web. Phosphorus and nitrogen are essential nutrients for algae, which are then eaten by tiny zooplankton. Larval fish feed on zooplankton, and those young fish are often devoured by the bigger fish that people love to eat. In Lake Erie, the right balance of nutrients is an essential part of maintaining safe drinking water as well as the lake's role as a world-class fishery.

But when the levels of nutrients become too high, there are often consequences. Phosphorus, a key ingredient in many fertilizers and weed killers, finds

its way to Lake Erie from many sources, including sewage treatment plants and sewage overflows.

When water runs off agricultural fields and treated lawns, the water takes the element with it. Most living things need phosphorus to survive, but in Lake Erie, it's possible to have too much of a good thing. Nuisance and harmful algae will grow until their supply of phosphorus runs out (phosphorus is often the limiting nutrient in freshwater—the nutrient that is in the shortest supply), causing the blooms that make Lake Erie look like pea soup and contribute to the Dead Zone.

Harmful Algal Blooms

In Lake Erie, the most common type of harmful algae is the cyanobacteria *Microcystis*, which thrives in the warm, phosphorus-laden water of the western basin and sometimes produces a toxin called microcystin that can cause illness or irritation to people and animals. Aside from these health effects, harmful algal blooms can also cause taste and odor problems in drinking water, pollute beaches, and reduce oxygen levels for fish and other animals that live in Lake Erie. Zebra and quagga mussels are also thought to add to the problem by selectively filtering only beneficial algae from the water, leaving behind cyanobacteria.



Though the blooms originate in the Maumee and Sandusky bays in Lake Erie's western basin, currents cause them to drift out to the central basin where they die and sink to the lake bottom. Oxygen near



the lake floor is then used up in the decomposition process, resulting in a Dead Zone. Decreasing the amount of phosphorus that winds up in Lake Erie could go a long way toward reducing the size of these blooms.

The Dead Zone

Lake Erie is the shallowest of the Great Lakes, with an average depth of 24 feet in the western basin, 60 feet in the central basin, and 80 feet in the eastern basin. The water stratifies each summer in May or June, forming a warm top layer and a cold bottom layer with a transitional line between called the thermocline. Since this split generally forms about 50 feet below the surface, the central basin is left with only 10 feet of water below the thermocline where sunlight and the mixing action of wind cannot penetrate to replenish the supply of oxygen. The Dead Zone forms when the oxygen is completely consumed and remains in the central basin until the water mixes again in the fall. Any animals trapped in the area die, sometimes washing onto the Lake Erie shore in large numbers, as in a fish kill.

Although there is evidence that areas of low oxygen have existed in Lake Erie for centuries, the problem is exacerbated by the increasing levels of cyanobacteria that form harmful algal blooms. Since animals like zebra and quagga mussels will not eat cyanobacteria, much of it dies and falls to the lake bottom, where it consumes large amounts of oxygen as it is decomposed. Solving the mystery of harmful algal blooms may lead to a decrease in the Dead Zone.



Aquatic Invasive Species

More than 185 aquatic invasive species can be found in the Great Lakes, with about 75% of these arriving since the St. Lawrence Seaway opened in 1959, pointing to ballast water in cargo ships as one major cause. As the southernmost, shallowest, warmest, and biologically most productive of the lakes, Lake Erie is often the most hospitable to these foreign invaders. It's a fact that has undeniably changed its ecosystem in the last 50 years, pushing out native species and circulating toxins like mercury in the environment that otherwise would have settled into the sediment.

The first zebra mussel in Lake Erie was found on October 15, 1988, at Stone Laboratory. The

population of this filter-feeding, clam-like creature exploded, reaching 30,000 per square meter within a year and causing millions of dollars of damage to water treatment facilities all along the Lake Erie shore. More recently, round gobies have entered the landscape, competing with bottom-dwelling native fish and creating a new path for contaminants like mercury and PCBs to be passed up the food web and into the fish humans like to eat. At this moment, two species of Asian carp are threatening the Great Lakes with new invasions from the area of Chicago. Only improved management programs and public education will keep additional species from reaching the Great Lakes in the future.



Climate Change

The details may still be debated but most scientists agree: climate change is occurring, and human activity has contributed to the problem. As the earth's atmosphere continues to warm, many of the problems listed above will worsen. Storms will intensify and become more frequent, increasing the amount of sediment and nutrients in Lake Erie. These additional nutrients, as well as warmer water temperatures, will benefit harmful algal blooms and exacerbate

the Dead Zone. Milder winters could usher in new invasive species that may not have survived in colder temperatures, and native species populations may decrease without benefit of ice cover.

In its research, education, and outreach efforts, Ohio Sea Grant is working to better understand these critical issues and developing strategies to improve the forecast for Lake Erie for future generations.

Coastal Community and Economic Development

A key element of our past success has always been a focus on coastal community and economic development efforts. The current poor economy has further enhanced the need for a focus in this important

area. We will continue to emphasize projects that foster economic development, solve societal problems, enhance the value of Lake Erie to the state and region, and address important societal issues.

PROGRAM DESCRIPTION

Program Relationships and Reporting Structure

Dr. Jeffrey M. Reutter is Director of the Ohio Sea Grant College Program at The Ohio State University (OSU) which includes: Stone Laboratory, the nation's oldest freshwater biological field station (1895), the Center for Lake Erie Area Research (CLEAR), and the Great Lakes Aquatic Ecosystem Research Consortium (GLAERC), a consortium of 12 Ohio colleges and universities. Dr. Reutter reports to two vice presidents at OSU: Dr. Caroline Whitacre, Vice President for Research, and Dr. Bobby D. Moser, Vice President for Agricultural Administration. Stone Laboratory is the shared research facility for GLAERC and the base for many of Ohio Sea Grant's research, education, and outreach programs.



Ohio Sea Grant College Program

In the late 1800s, the United States government issued funding to the states to establish a network of universities with a focus on agriculture, science, and engineering to enhance our ability to produce food, develop the interior of the country, and expand our engineering and science capabilities. These universities are known as land-grant colleges. Ohio State is the land-grant college in Ohio and the home to our College of Food, Agricultural, and Environmental Sciences and the Ohio State University Extension Program. In 1966, Congress voted to use the land-grant model to enhance utilization, development, and wise management of this country's coastal, ocean, and Great Lakes resources by forming Sea Grant Colleges. These programs are part of the National Sea Grant College Program within the National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce. As one of 32 Sea Grant programs in the NOAA Sea Grant College Program, Ohio Sea Grant utilizes a partnership of government, private sector, and academic resources to address environmental, economic and education issues (the 3 E's), using a combination of research, education, and outreach projects and efforts. Based on our accomplishments and capabilities, The Ohio State University was officially designated to be a "Sea Grant College" in 1988.



Sea Grant is a matching funds program and requires at least \$0.50 of non-federal support for every federal dollar invested in the program. Matching funds for Ohio Sea Grant are provided by a line item in the budget of the Ohio Board of Regents, The Ohio State University, private businesses and individuals, and by the home institutions of scientists receiving Ohio Sea Grant funding.

Ohio Sea Grant celebrated its 30th anniversary in 2008. Over that span we supported 406 projects, with more than 250 principal investigators from 19 colleges and universities, and 444 graduate and undergraduate students on projects. Our research component supports approximately 10 large grants (up to \$60,000/year for up to three years) annually and 10 small grants (proposals for grants of up to \$10,000 for up to one year can be submitted at any time). The program has nine OSU Extension Educators from Toledo to Conneaut and a very productive communications component based in Columbus. Eugene Braig is the Assistant Director for Research, Jill Jentes Banicki is the Assistant Director for Communications, and Frank Lichtkoppler is the Extension Program Leader.

Research

Ohio Sea Grant currently funds the work of scientists from 12 universities throughout Ohio as they work to solve the most pressing problems facing Lake Erie—from determining the effects of polluted sediment on the food web to uncovering the economic value of a cleaner environment. Many of these scientists take advantage of facilities at Ohio Sea Grant's Stone Laboratory, the nation's oldest freshwater field station.



Education

Stone Laboratory serves as the main educational facility for Ohio Sea Grant, offering approximately 25 courses each summer to undergraduate and graduate students, advanced high school students, and educators. In addition to these college-level classes, as many as 7,000 students in grades 4-12 and other groups take part in the Stone Laboratory's Lake Erie Field Trip Program annually.



Outreach

Getting information out to the public is the key to Ohio Sea Grant's outreach endeavors. The program's nine Extension Educators, with offices spread across Ohio's Lake Erie counties, interact with Ohio citizens to answer their questions about Lake Erie, fishing, economic development, and tourism through presentations, trade shows, and the popular Ohio Sea Grant Online Discussion Board.

We have recently entered into an exciting collaboration with the Ohio Department of Natural Resources to provide outreach programming at their historic Put-in-Bay Hatchery and Aquatic Visitors Center on South Bass Island. In 2009, our first summer of operation, we attracted nearly 12,000 visitors to our Lake Erie educational programming on the site and anticipate similar success in future seasons.



Ohio Sea Grant Mission

The mission of the Ohio Sea Grant College Program is to increase the public's understanding and improve development and conservation of our Great Lakes and ocean resources, with particular emphasis on Lake Erie. Within this mission we have several significant goals:

- Promote sustainable economic development on the Lake Erie coast and watershed by applying scientific knowledge to solve resource problems;
- Develop the critical knowledge and technology to help coastal industries in Ohio as they work to enhance their bottom line;
- Identify, protect, and conserve valuable coastal habitats and strive to improve environmental conditions in the Lake Erie and Great Lakes ecosystems;
- Enable coastal and Great Lakes communities to successfully adapt to changing social and economic conditions; and
- Improve the quality of marine and aquatic education in Ohio to foster more informed citizenry with a higher quality of life.





Franz Theodore Stone Laboratory

Established in 1895, Stone Laboratory is the oldest freshwater biological field station in the United States and the center of Ohio State University's teaching and research on Lake Erie. The lab serves as a base for more than 65 researchers from 12 agencies and academic institutions, all working year-round to solve the most pressing problems facing the Great Lakes.

In addition to its role as a research facility, Stone Laboratory offers 25 college-credit science courses each summer for undergraduate and graduate students, advanced high school students, and educators. It also serves as the base for the Lake Erie Science Field Trip Program for students in grades 4-12 and adults.

Stone Laboratory Mission

The mission of the Franz Theodore Stone Laboratory is to serve Ohio State University, the Ohio Sea Grant College Program, the State of Ohio, and the people of Ohio as their research, education, and outreach facility on Lake Erie. Its programming should address the needs of the following audiences: students in grades 4-12, college undergraduate and graduate students, K-12 teachers, research scientists, decision-makers and elected officials, technical staff in state and federal agencies, and the general public.

Within this mission we strive to:

- Improve the quality of science education in Ohio by creating high-quality, hands-on science education opportunities for students in grades 4-12 and adults;
- Provide undergraduate and graduate research training;
- Create special educational opportunities for teachers;
- Help decision-makers and elected officials make more informed decisions through education and training programs; and
- Encourage and support research on critical issues and problems facing Lake Erie, the Great Lakes, and the environment, to foster more informed management decisions.



Center for Lake Erie Research (CLEAR)

In 1969, headlines across the country blared the news of the Cuyahoga River catching fire. In response, Ohio State University created CLEAR in 1970 to focus the expertise of Ohio State's faculty on Lake Erie problems and issues.

Using Stone Laboratory as its research base, CLEAR addressed issues related to pollution, nuclear power, water intakes and discharges, phosphorus, oxygen levels in the central basin, and parasites in fish. CLEAR now operates under the umbrella of the Ohio Sea Grant College Program.

Great Lakes Aquatic Ecosystem Research Consortium (GLAERC)

Ohio Sea Grant formed GLAERC in 1992 to bring together aquatic scientists from 12 colleges and universities across Ohio, including Bowling Green State University, Case Western Reserve University, Cleveland State University, Heidelberg College, John Carroll University, Kent State University, Miami University, Mount Union College, Ohio State University, Ohio University, University of Toledo, and Wright State University. The mission of GLAERC is to enhance collaboration, cooperation, and communication, and to aid in sharing of equipment and facilities. This consortium makes Ohio's top scientists more effective and competitive for federal funding, improving their ability to address the critical issues and problems affecting Ohio's surface waters. Stone Laboratory serves as the Consortium's shared research facility.

PLANNING PROCESS

Self-Evaluation Activities and Strategies to Receive External Input

In addition to focusing on priorities and actions for the future, our regular planning process includes a number of self-evaluation activities designed to improve the operation and effectiveness of the program. These activities included:

- meetings with our external Sea Grant Extension Advisory Committees, the Friends of Stone Laboratory, and the Ohio State University Vice President's for Research and Agriculture (and their administrative staffs) to review our efforts and priorities;
- one-on-one meetings between the director and each staff member to discuss their position and ideas; and
- quarterly/monthly meetings of the Sea Grant Administration, Extension and Communication staff.

Design Strategies

When NOAA and NOAA Sea Grant developed their strategic plans for the period 2003-2008, we felt it was important to revise and update our 2005-2010 plans to reflect the format and logic of the national plan and show how national priorities were being addressed locally in Ohio. The major effort in this regard was to modify our structure so that our priorities fit into the 11 Sea Grant Thematic Areas of the 2003-2008 national strategic plan.

National Sea Grant's 2009-13 Strategic Plan "Meeting the Challenge" reorganized the Sea Grant priorities into four broader Focus Areas. With the help of our partners—the Ohio Coastal Management Program, Old Woman Creek National Estuarine Research Reserve, and the Lake Erie Commission—we analyzed our activities in Ohio to again demonstrate how the national priorities are being implemented in our state. Our current activities and proposed new efforts were all quantified and fit into the matrix created by the four focus areas of the new national plan. Also in our new Ohio Sea Grant plan, we have attempted to support and incorporate needs and priorities identified by the Binational Executive Committee of the U.S. and Canada, the Cooperative Science and Monitoring Initiative, the Lake Erie Lakewide Management Plan, the Council of Great Lakes Research Managers of the International Joint Commission, the Ohio Lake Erie Commission and its component agencies, the Great Lakes Regional Research Information Network, the Lake Erie Millennium Network, the Ocean Research and Resources Advisory Panel, the Great Lakes Regional Collaboration, the Lake Erie Partnership and its component agencies, the Ohio Phosphorus Task Force, The Ohio State University, the Ohio Board of Regents, and many more groups, including more than 125 members of Ohio Sea Grant's private sector advisory committees. This plan is a living document that is reviewed and modified annually as needs and opportunities change.

The Research Process

Since 2006, 36-47% of Ohio Sea Grant's core budget has been dedicated to competitively funded projects. Proposals for small grants (requesting up to \$10,000) from our development fund can be submitted to our office at any time. Proposals for larger research grants (up to \$60,000 per year for up to three years) are requested through a biennial request for proposals (RFP). Submissions are welcome from anyone, and the RFP is freely disseminated to every college and university in Ohio. The most recent RFP is publicly accessible through the research pages on our web site: www.ohioseagrant.osu.edu/research.

Preproposals submitted to the RFP cycle are subject to review by a panel consisting of both internal Ohio Sea Grant and external agency professionals. Based upon that panel's review, full proposals are either invited or discouraged; however, no proposal will be declined based upon preproposal evaluations.

Full proposals submitted to the RFP cycle are all subject to external peer review. Investigators are also permitted to draft written responses to peer reviews before proposals and reviews are evaluated by an external panel of expert professionals and scientists invited from agencies, academia, industry, and other stakeholders. A representative from the National Sea Grant Office attends the panel meeting to ensure fairness and the absence of conflicts of interest. The Director of Ohio Sea Grant takes recommendations of the panel into consideration when submitting full proposals to the national office with our biennial omnibus.

Funding Priorities

In an effort to elicit more quality submissions that address areas of concerns related to social sciences, a special request for projects "that can create jobs and enhance economic activity through improved practices, product creation, and specialized training" was issued in our 2009 RFP. The request also sought projects focused on "human dimensions studies and proposals documenting the economic value of Lake Erie natural resources and the impact of cleaning up Lake Erie Areas of Concern." This request resulted in the successful submission of two economic studies to begin February 2010. We expect to continue and refine our efforts to encourage socioeconomic research with future RFPs.

Endowments

As we look to the future it is clear that our growth and our excellence will be closely tied to our ability to provide a greater portion of the program's support through private donations and endowments. As 2009 came to a close we were very pleased to receive a \$50,000 addition to one of our endowments, and with matching support from the Friends of Stone Laboratory (FOSL), we were able to complete two new endowments: the Blankenship Scholarship Fund for students studying at Stone Laboratory from Appalachia, and the Stone Laboratory Tuition Reduction Fund.

In addition, we sometimes give priority to projects to be jointly funded with collaborating sponsors. This was the case with our 2009 RFP, where priority was "given to supporting at least one project at Old Woman Creek NERR focusing on healthy coastal ecosystems. This project will be co-funded by Old Woman Creek and Sea Grant." This request also resulted in one successful submission for an invasive species project to be conducted at the NERR site. In 2008, this strategy resulted in a harmful algal bloom project jointly funded by the Ohio Lake Erie Commission. We will continue to encourage similar collaborations with potential cosponsors in future RFP cycles.

RESEARCH, EDUCATION, AND OUTREACH

Cross-Cutting Goals and Strategies for Ohio Sea Grant

To accomplish the goals outlined within the Ohio Sea Grant Strategic Plan, three cross-cutting values intertwine throughout all four focus areas. These overall goals and strategies reflect the unique integrated Sea Grant approach to solving coastal issues. Research, extension, and education are the tools Ohio Sea Grant uses within all four focus areas identified within the strategic plan. Also important to achieving its goals are leadership and collaboration with others, leveraging the ability of various organizations and agencies to work together toward solutions.

We need better information about how the Great Lakes ecosystem functions and how human activities affect coastal and Great Lakes habitats and living resources.

Goal: Sound scientific information to advance understanding of the nature and value of our coastal and Great Lakes resources; to identify new ways to conserve and use these resources; and to support evaluation of the environmental impacts and socio-economic trade-offs involved in coastal decision-making.

Strategy: Support research to generate the scientific, technical, and legal information needed to increase understanding of coastal and Great Lakes processes; support the development of new businesses, products, tools, and technologies; and answer the most pressing questions related to coastal and Great Lakes resource conservation, use, and management at the local, state, and regional levels.

Strategy: Play a leadership role within and outside of the Sea Grant network in increasing the amount of socioeconomic research available to help decision makers evaluate socioeconomic trade-offs and assess risks to the future health and productivity of coastal and Great Lakes resources.

Strategy: Integrate, translate, and disseminate research findings and technological discoveries to the citizens, industries, and leaders who need them to capitalize on opportunities and make wise management decisions.

We need citizens who understand the complexities of coastal environments and the interactions between human use and the health of coastal ecosystems.

Goal: An informed public that understands the value and vulnerability of coastal and Great Lakes resources, and demands informed science-based decisions about the conservation, use, and management of these resources, and a well-trained workforce that makes this a reality.

Strategy: Advance coastal and Great Lakes literacy through formal and informal learning opportunities in our schools, museums, aquariums, and other educational forums, including online and digital venues.

Strategy: Use Sea Grant's strong university partnership to create new research and education opportunities in marine and aquatic science for undergraduate and graduate students and to develop information products and training opportunities that will help build the workforce capacity for coastal-related jobs and professions.

Strategy: Collaborate with NOAA and other partners to build public awareness about critical coastal and Great Lakes issues, using the integrated research, extension, and communication capacities of Sea Grant.

We need management and decision-making processes that are based on sound information, involve everyone who benefits from the beauty and bounty of coastal and Great Lakes resources, and include mechanisms to evaluate trade-offs between human and environmental needs.

Goal: Decision-making processes that involve the full-range of coastal interests, that integrate efforts of public and private partners at the federal, regional, state, and local levels, and provide mechanisms for establishing common understandings and generating outcomes that balance multiple interests.

Strategy: Use Sea Grant's research, extension and education capabilities to encourage and support the creation of public decision-making processes that minimize overlap, maximize effectiveness, and provide an integrated response to coastal problems and opportunities.

Strategy: Build consensus on complex issues such as coastal land use, energy development, public access, invasive species control, and climate change impacts by supporting cutting-edge research, building broader understanding among various constituency groups, and convening diverse groups of stakeholders to work together to find common solutions.

Strategy: Strengthen partnerships to promote national, regional, and issue-related collaboration among federal and state programs, and other partners in order to support more effective and integrated coastal decision making.

OHIO SEA GRANT'S STRATEGIC PLANNING PROCESS

*“If you are planning for one year, grow rice.
If you are planning for 20 years, grow trees.
If you are planning for centuries, grow men.”*
– Chinese Proverb

Ohio Sea Grant conducted a strategic planning process in 2009, identifying where the program is heading, what it hopes to achieve, and how to both reach and measure these achievements.

Ohio Sea Grant's starting point was the National Sea Grant College Strategic Plan that identified national goals, strategies, and outcomes. Aligning these national goals and strategies to Ohio's coastal community needs occurred through analyzing previous Ohio Sea Grant strategic plans, annual reports and accomplishments, partnership priorities, and stakeholder input. What evolved was an Ohio Sea Grant Strategic Plan that addresses Ohio, Lake Erie, and Great Lakes' priorities, while also supporting the direction of the National Sea Grant College Program.

To ensure usability of the strategic plan and relevancy of its recommendations, the planning process incorporated an implementation strategy. Ohio Sea Grant College Program staff and stakeholders will annually review the recommended strategies and implementation steps, and they may be adjusted given emerging issues, shifting local priorities, or coastal needs.

Four focus areas create the framework for the Ohio Sea Grant Strategic Plan – Healthy Coastal Ecosystems, Sustainable Coastal Development, Sustainable Seafood Supply and Hazard Resilience in Coastal Communities. Within each of the focus areas, Ohio Sea Grant identifies the long-term visions and strategies for achieving success.

Long-Term Visions – What the Ohio Sea Grant College Program and its stakeholders want to achieve



Goals – What the Ohio Sea Grant College Program strives to achieve while reaching these visions (5-year timeframe)



Strategies – What the Ohio Sea Grant Program plans to do to achieve those goals



Strategic Actions – Specific actions Ohio Sea Grant will take to implement these strategies



Implementation Steps – Who will do what to implement strategic actions (1- to 3-year timeframe)



STRATEGIC AND IMPLEMENTATION PLAN

Ohio Sea Grant 2010–2014

FOCUS AREA –
HEALTHY COASTAL ECOSYSTEMS

GOALS	STRATEGIES How Ohio Sea Grant will achieve its goals	SHORT/MID-TERM OUTCOMES and <i>Measurable Objectives</i> What Ohio Sea Grant will achieve within the next four years, and how these achievements will be measured	LONG-TERM OUTCOMES and <i>Performance Measures</i> What Ohio Sea Grant will achieve long-term, and how these achievements will be measured
Healthy Coastal Ecosystem Goal 1: Sound scientific information to support ecosystem-based approaches to managing the Lake Erie and Great Lakes coastal environment.	<p>Healthy Coastal Ecosystem Strategy 1A: Support research to improve our ability to understand and forecast ecosystem changes in Lake Erie caused by stresses to the system and reduce the impact of these stresses, with particular emphasis on fisheries, harmful algal blooms, nutrient and contaminant loading, sewage outflows, invasive species, and the Central Basin Dead Zone.</p> <p>Healthy Coastal Ecosystem 1B: Contribute to the development of baseline data, standards, and indicators to support ecosystem-based approaches to land use, water, fisheries, and other resource management within Ohio and Lake Erie, working with programs like NOAA's Great Lake's Environmental Research Laboratory (GLERL), the International Joint Commission (IJC), the U.S. Environmental Protection Agency (USEPA), the Great Lakes Observing System (GLOS), and others.</p> <p>Healthy Coastal Ecosystem 1C: Develop methodologies that can be used to evaluate ecosystem-based management approaches to assess their effectiveness once they are in place and to guide future management efforts, working with the Great Lakes Fishery Commission, the International Joint Commission (IJC), and other international, federal, state, and local partners.</p>	<p>Short/Mid-Term Outcome: Baseline data, standards and indicators developed by Ohio Sea Grant and its partners are used to support ecosystem-based approaches. <i>Measurable Objective:</i> Ohio Sea Grant will actively solicit applied ecosystem research and seek to annually support at least one research project to assist ecosystem managers.</p> <p>Short/Mid-Term Outcome: Methodologies are developed and used to evaluate ecosystem-based management approaches and guide future management efforts. <i>Measurable Objective:</i> Ohio Sea Grant will annually facilitate at least one effort to identify research priorities for the Binational Executive Committee.</p> <p>Short/Mid-Term Outcome: Planners and decision-makers know how to minimize impacts of land use, resource extraction, and other human activities on the ecosystem. <i>Measurable Objective:</i> Ohio Sea Grant will annually facilitate at least one effort to identify the information and training needs of community planners and other decision makers.</p> <p><i>Measurable Objective:</i> By 2013, in partnership with the Ohio Coastal Training Program and other partners, 10 land use planners and decision makers will receive technical training to increase their abilities to implement best land use practices and balanced growth principles.</p> <p><i>Measurable Objective:</i> By 2013, in partnership with the Ohio Coastal Training Program and other partners, 50 land use planners and other decision makers will be trained annually to use geospatial analysis tools for strategic conservation planning and assessing the potential impacts of land use patterns on water quality and natural resources.</p>	<p>Long-Term Outcomes: Ohio's coastal residents, resource managers, policymakers, businesses, and industries:</p> <ul style="list-style-type: none">- have access to sound scientific information to support ecosystem-based approaches to managing the coastal environment and restoration of degraded ecosystems.- use ecosystem-based approaches in the management of land, water, and living resources in the Lake Erie area.- balance social, natural, and physical science in managing resources and work with each other to make decisions.
Healthy Coastal Ecosystem Goal 2: Widespread use of ecosystem-based approaches to managing land, water, and living resources in the Lake Erie and Great Lakes coastal area.	<p>Healthy Coastal Ecosystem 2A: Work with partners within and outside of NOAA to develop data, models, and training activities that support ecosystem-based planning and management approaches and share these with a wide variety of constituents in the Lake Erie watershed.</p> <p>Healthy Coastal Ecosystem 2B: Support the development of the Great Lakes Observing System (GLOS), the Great Lakes Sea Grant Network, NOAA Climate Service, Great Lakes Regional Research Information Network (GLRRIN), and other collaborative efforts that advance our capability to predict the effects of human activities and environmental changes on coastal resources in order to take steps to mitigate impacts, best manage a changing environment, and adapt to their effects.</p> <p>Healthy Coastal Ecosystem 2C: Provide life-long learning programs for people of all ages that enhance understanding of Lake Erie, coastal and Great Lakes environments and promote stewardship of healthy ecosystems.</p>	<p>Short/Mid-Term Outcome: Constituencies have access to data, models, and training that support ecosystem-based planning and management approaches. <i>Measurable Objective:</i> Ohio Sea Grant implements five workshops, training modules, and educational products each year. <i>Measurable Objective:</i> Ohio Sea Grant reaches 5,000 coastal stakeholders with education and outreach activities annually.</p> <p>Short/Mid-Term Outcome: Lake Erie coastal residents, resource managers, businesses, and industries have the ability to predict the effects of human activities and environmental change on coastal resources. <i>Measurable Objective:</i> As a result of Ohio Sea Grant educational programs, 75 people are trained annually to recognize the potential impacts and effects of human activities and environmental change on coastal resources.</p> <p>Short/Mid-Term Outcome: People of all ages understand coastal, ocean, and Great Lakes environments and the need for stewardship of healthy ecosystems. <i>Measurable Objective:</i> Ohio Sea Grant will annually reach 5,000 grades 4-12 and adult learners at Stone Laboratory, 1,000 on the Ohio Sea Grant Lake Erie Discussion Board, and 50,000 on the Ohio Sea Grant website with information about coastal, ocean, and Great Lakes environments and the need for stewardship of healthy ecosystems.</p> <p><i>Measurable Objective:</i> Annually, Ohio Sea Grant will lead collaboration with educators and partners to adapt ocean literacy principles to Lake Erie and help formal and informal educators use Lake Erie literacy principles and concepts to develop educational curricula.</p>	<p>Long-Term Outcome: Ohio Sea Grant works with managers within the Lake Erie area to assist them in obtaining the resources to undertake and implement restoration projects and to evaluate and adapt as needed.</p> <p>Long-Term Outcome: The function, values, and productivity of Lake Erie's degraded ecosystems are restored.</p> <p><i>Performance Measure:</i> By 2013, 25 stakeholders have used ecosystem-based approaches in the management of land, water, and living resources of the Lake Erie watershed as a result of Ohio Sea Grant research, communication, extension, education, and partnership activities with the Ohio Coastal Management Program, the Ohio Lake Erie Commission, the Lake Erie Lakewide Management Plan, Ohio Department of Natural Resources, the Old Woman Creek National Estuarine Research Reserve, the Ohio Environmental Protection Agency, and others.</p> <p><i>Performance Measure:</i> By 2013, 20 acres of degraded ecosystems have been restored with significant Ohio Sea Grant facilitation, research or other support.</p> <p><i>Performance Measure:</i> By 2013, two communities have restored degraded ecosystems with significant Ohio Sea Grant facilitation, research, or other support.</p>
Healthy Coastal Ecosystem Goal 3: Restored function, value, and productivity of Lake Erie and Great Lakes degraded ecosystems.	<p>Healthy Coastal Ecosystem 3A: Support research to improve the effectiveness of ecosystem restoration and identify promising new restoration approaches and technologies.</p> <p>Healthy Coastal Ecosystem 3B: Invest in the development and dissemination of new information, policies, technologies, and methods to address water quality degradation, prevent the introduction and spread of aquatic non-native species, and minimize the negative impacts of these on coastal, ocean, and Great Lakes food webs.</p> <p>Healthy Coastal Ecosystem 3C: Provide technical support for citizens, organizations, and businesses that need help with specific mitigation/restoration problems, giving them access to the latest information and techniques.</p>	<p>Short/Mid-Term Outcome: Coastal residents, resource managers, businesses, and industries have access to new approaches and technologies developed to improve the effectiveness of restoring coastal ecosystems. <i>Measurable Objective:</i> Annually, Ohio Sea Grant reaches 5,000 coastal residents, resource managers, business representatives, and industry representatives with information about new approaches and technologies to improve ecosystem management.</p> <p>Short/Mid-Term Outcome: Coastal residents, resource managers, businesses, and industries learn more about Lake Erie, its natural resources, issues, and opportunities. <i>Measurable Objective:</i> Annually, Ohio Sea Grant helps 5,000 coastal residents and visitors learn more about Lake Erie natural resources, issues, recreation (fishing), and tourism opportunities.</p> <p>Short/Mid-Term Outcome: Managers draw on both scientific information and the public to prioritize which ecosystems to restore and to set realistic restoration goals. <i>Measurable Objective:</i> Ohio Sea Grant facilitates the development and dissemination of scientific information within Ohio Remedial Action Plan (RAP) Committees for Ohio's Areas of Concern.</p>	

FOCUS AREA –

HEALTHY COASTAL ECOSYSTEMS

Within the focus area of HEALTHY COASTAL ECOSYSTEMS, the following long-term visions create the basis of the *Ohio Sea Grant Strategic Plan*:

Ohio's coastal residents, resource managers, policy makers, businesses, and industries have access to sound scientific information to support ecosystem-based approaches to managing the coastal environment and restoration of degraded ecosystems.

Ohio's coastal residents, resource managers, policy makers, businesses, and industries use ecosystem-based approaches in the management of land, water, and living resources in the Lake Erie area.

Ohio's coastal residents, resource managers, policy makers, businesses, and industries balance social, natural, and physical science in managing resources and work with each other to make decisions.

Ohio Sea Grant works with managers within the Lake Erie area to assist them in obtaining the resources to undertake and implement restoration projects and to evaluate and adapt as needed.

The function, values, and productivity of Lake Erie's degraded ecosystems are restored.

To evaluate our progress toward these visions, the following represent the ways Ohio Sea Grant will measure our achievements. These performance measures are aligned with the *National Sea Grant Program Strategic Plan*:

The number and variety of stakeholders who have used ecosystem-based approaches in the management of land, water, and living resources of the Lake Erie watershed as a result of Ohio Sea Grant research, communication, extension, education, and partnership activities with the Ohio Coastal Management Program, the Ohio Lake Erie Commission, the Lake Erie Lakewide Management Plan (LaMP), the Ohio Department of Natural Resources (ODNR), the Old Woman Creek National Estuarine Research Reserve, Ohio Environmental Protection Agency (EPA) and others.

Acres of degraded ecosystems restored with significant Ohio Sea Grant facilitation, research, or other support.

Communities that have restored degraded ecosystems with significant Ohio Sea Grant facilitation, research, or other support.

Goals for Healthy Coastal Ecosystems

Within the HEALTHY COASTAL ECOSYSTEMS focus area, three goals guide Ohio Sea Grant's future activities. These goals include the following:

- Sound scientific information to support ecosystem-based approaches to managing the Lake Erie and Great Lakes coastal environment.
- Widespread use of ecosystem-based approaches to managing land, water, and living resources in the Lake Erie and Great Lakes coastal area.
- Restored function, value, and productivity of Lake Erie and Great Lakes degraded ecosystems.

Each of these goals has a series of short- and mid-term outcomes with measurable objectives that will be used to determine progress in reaching these desired states. These outcomes and measurable objectives are identified following each goal statement.

Healthy Coastal Ecosystems Goal 1:

Sound scientific information to support ecosystem-based approaches to managing the Lake Erie coastal environment.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: *Baseline data, standards, and indicators developed by Ohio Sea Grant and its partners are used to support ecosystem-based approaches.*

Measurable Objective: Ohio Sea Grant will actively solicit applied ecosystem research and seek to annually support at least one research project to assist ecosystem managers.

Short/Mid-Term Outcome: *Methodologies are developed and used to evaluate ecosystem-based management approaches and guide future management efforts.*

Measurable Objective: Ohio Sea Grant will annually facilitate at least one effort to identify research priorities for the Binational Executive Committee.

Short/Mid-Term Outcome: *Planners and decision-makers know how to minimize impacts of land use, resource extraction, and other human activities on the ecosystem.*

Measurable Objective: Ohio Sea Grant will annually facilitate at least one effort to identify the information and training needs of community planners and other decision-makers.

Measurable Objective: By 2013, in partnership with the Ohio Coastal Training Program and other partners, 10 land use planners and decision-makers will receive technical training to increase their abilities to implement best land use practices and balanced growth principles.

Measurable Objective: By 2013, in partnership with the Ohio Coastal Training Program and other partners, 50 land use planners and other decision-makers will be trained annually to use geospatial analysis tools for strategic conservation planning and assessing the potential impacts of land use patterns on water quality and natural resources.

Unraveling the Mysteries of Nanoparticles

Tiny particles engineered to have specific attributes, like the ability to deflect sunlight or bond with certain cells, have the potential to change medicine, science, and even consumer products. As these nanoparticles, sometimes the size of a single virus, are used more often in everyday products like sunscreen and water-resistant clothing, they are likely to find their way into Lake Erie. Their impact once they arrive is anyone's guess, since the safety of nanoparticles as they relate to human health and the environment is still very much unknown.

To begin to unravel this puzzle, Ohio Sea Grant researchers Dr. John Lenhart and Dr. Hal Walker



of the Ohio State University College of Engineering are working to determine the fate of nanoparticles once they arrive in the lake. Using three engineered nanoparticles—nanosilver, zinc oxide, and cadmium—the pair is performing tests using sediment, lake water, and varying conditions to uncover what processes control the movement of the particles.

"You need to find a pathway of exposure," Lenhart explains. "If the particles aggregate, or stick together, they'll probably just settle into the sediment, where they will be relatively harmless. But if they remain free floating, that could cause problems."

With the data they're collecting, they will try to determine why some particles aggregate while others do not. This should lead to a better understanding about which particles will require careful monitoring in the future.

Healthy Coastal Ecosystems Strategy 1A:

Support research to improve our ability to understand and forecast ecosystem changes in Lake Erie caused by stresses to the system and reduce the impact of these stresses, with particular emphasis on fisheries, harmful algal blooms, nutrient and contaminant loading, sewage outflows, invasive species, and the Central Basin Dead Zone.

Development of Biosensors to Monitor Health

Strategic Action: *Develop accurate means to predict the impacts of stressors on aquatic organisms and strengthen indices of coastal ecosystem health through the development of biosensors for biological and chemical monitoring.*

Research Implementation Step: “Development and Implementation of a New Molecular Test for Active VHS Infraction in Fish,” Stepian, C.A.; University of Toledo; February 2011-January 2014; newly funded.

Improved Fishery Forecasts and Management Strategies

Strategic Action: *Develop improved fishery forecasts and management strategies in collaboration with management agencies.*

Research Implementation Step: “Otolith Microchemistry as a Natural Tag for Mixed Stock Analysis of Hatchery-Reared Steelhead,” Farver, J.R. and Miner, J.G.; February 2008 - January 2011; (R/LR-014)

Research Implementation Step: “Temporal and Spatial Analysis of Walleye and Yellow Perch Genetic Stock Structure: A High-Resolution Database for Fishery Management (Part II),” Stepian, C.A.; University of Toledo; February 2008 – January 2011; (R/LR-013)

Better Understanding of Lake Erie’s Ecosystem

Strategic Action: *Learn and teach others more about the Lake Erie food web and the trophic pathways of nutrients and contaminants in the system.*

Research Implementation Step: “Winter Assessment of Microbial Biomass and Metabolism in Lake Erie,” McKay, R.M.L., Bullerjahn, G.S. and Rogers, S.O.; February 2009 – January 2011; (R/ER-081)

Strategic Action: *Understand the role and value of wetlands as critical habitat and in nutrient and contaminant removal by supporting research.*

Research Implementation Step: “Environmental Tolerance of Type A Influenza Virus Isolated from Wild Waterfowl in Ohio,” Slemons, R. and Gates, R.; Ohio State University; February 2011 – January 2013; newly funded.

Strategic Action: *Monitor and assess origins and impacts of emerging stressors as they impact the Lake Erie ecosystem.*

Research Implementation Step: “Improved Estimates of Sediment Oxygen Demand in Lake Erie Hypoxia Forecasting,” Matisoff, G.; January 2008 – April 2010; (R/EM-029-PD)



Research Implementation Step: “Fate of Inorganic Nanoparticles in Surface Water Environments,” Lenhart, J.J. & Walker, H.W.; Ohio State University; February 2009-January 2011; (R/PS-041)

Research Implementation Step: “The Role of Sediment in Controlling the Fate and Toxicity of Microcystin,” Walker, H.W. & Lenhart, J.J.; Ohio State University; February 2011 – January 2013; newly funded.

Strategic Action: *Identify strategies for sustaining healthy coastal wetland ecosystems by mitigating and adapting to the impacts of stressors, such as land use decisions, invasive species, and climate change, by co-funding research with Old Woman Creek National Estuarine Research Reserve.*

Research Implementation Step: “Trophic Structure Responses to Vegetational Changes and Herbicides in a Great Lakes Coastal Wetland;” Holomuzki, J.R.; Ohio State University; February 2010 – January 2012; newly co-funded with Old Woman Creek National Estuarine Research Reserve.

Strategic Action: *In partnership with the Ohio Department of Natural Resources, continue to assess the impacts of aquatic invasive species on the Lake Erie ecosystem, methods to reduce introduction of new aquatic invasive species, and control measures to prevent the spread of those invasive species already present.*

Implementation Step: Dave Kelch will seek funding to support the investigation of more obscure pathways for aquatic invasive species to arrive in the State of Ohio, including access points for Asian Carp.

Implementation Step: Dave Kelch and Eugene Braig will continue to serve on the Ohio Aquatic Invasive Species Committee as appointed by the Ohio Department of Natural Resources, Division of Wildlife and assist in the development of a new Aquatic Invasive Species Plan and Rapid Response Plan for Ohio.

Detection of Contaminants

Strategic Action: *Ohio Sea Grant will continue to solicit and support research to develop and evaluate technologies for detecting harmful contaminants within Lake Erie.*

Research Implementation Step: “Development and Validation of a High-Resolution Nearshore Model for Lake Erie;” Kubatko, E.J.; Ohio State University; February 2010 – January 2013; newly funded.

Winter Algae May Be Priming the Dead Zone

It may seem that few microscopic creatures could survive a winter in Lake Erie, but Ohio Sea Grant researchers at Bowling Green State University have discovered a cold-loving algae may be contributing to the summertime Dead Zone. Drs. Michael McKay and George Bullerjahn first observed the algae, *Aulacoseira islandica*, floating under Lake Erie's ice in February 2007. The pair determined that the plankton sometimes made up as much as 90% of the living organisms in collected samples.

Their goal is to determine whether the algae get eaten by zooplankton and other organisms or simply die and sink to the bottom of Lake Erie. If the algae end up on the lake floor, it will decompose, using up oxygen in the process. If this decomposition happens during the summer – and not during the rigid winter months – then researchers hypothesize that, “It has to be contributing to the Dead Zone,” explains McKay. The Dead Zone is a term given to areas of water with reduced oxygen, thus an inability to sustain lake life.

The group collected data in winter 2010 and will repeat the process in 2011, taking part in several science cruises and deploying sediment traps that sit on the bottom of the lake during the coldest months of the year.



Evaluation of Dredging Options and Risks

Strategic Action: *Assess the risks of contaminants in dredged materials, assist in the identification of disposal options, and evaluate water quality of major urban ports and Areas of Concern to determine cumulative effects, preserve coastal resources, and improve infrastructure.*

Research Implementation Step: “Bench-Scale Evaluation of In Situ Ultrasonic Remediation of Contaminated Sediments;” Weaver, L.K.; Ohio State University; February 2011 – January 2013; newly funded

Aquatic Invasive Species Research

Strategic Action: *Support research to understand the biology, ecology, and socio-economic impacts of aquatic invasive species.*

Implementation Step: Matt Thomas and John Hageman will assist researchers using Stone Laboratory as a research venue regarding new and existing aquatic invasive species.

Strategic Action: *Reduce the possibility of future aquatic invasive species introductions by supporting research on new technologies to eliminate aquatic invasive species from ballast water.*

Water Quality Research

Strategic Action: *Support research to better understand point source and nonpoint source water quality issues, including but not limited to phosphorus and other nutrients, toxic substances, pharmaceuticals, and microbial contaminants leading to harmful algal blooms (HABs), anoxic dead zones, and drinking water safety problems.*

Implementation Step: Matt Thomas and John Hageman will assist researchers using Stone Laboratory as a venue for exploring causes and effects of the Lake Erie Dead Zone.

Implementation Step: Matt Thomas and John Hageman will assist researchers using Stone Laboratory as a research venue for exploring other point and nonpoint source water quality issues.

Healthy Coastal Ecosystems Strategy 1B:

Contribute to the development of baseline data, standards, and indicators to support ecosystem-based approaches to land use, water, fisheries, and other resource management within Ohio and Lake Erie, working with programs like NOAA’S Great Lakes Environmental Research Laboratory (GLERL), the International Joint Commission (IJC), the U.S. Environmental Protection Agency (USEPA), the Great Lakes Observing System (GLOS), and others.

Fisheries Data

Strategic Action: *Develop new tools to characterize economically important fisheries at the molecular-genetic level by promoting research to provide fine-scale delineation of key stocks.*

Citizen Data on Restoration

Strategic Action: Support research to conduct applied socio-economic studies on citizen (voter) willingness to pay for environmental amenities and environmental improvements, such as green space preservation, Lake Erie natural resources including fisheries resources, recycling programs, and environmental cleanups.

Implementation Step: Frank Lichtkoppler and Joe Lucente will continue efforts to identify the socio-economic risks and attitudes regarding climate change among specific user groups in the Toledo area, as part of a current NOAA Sectoral Applications Research Project (SARP) grant. They will work with the Great Lakes Sea Grant Network to link this case study to other climate change projects underway as part of this regional project.

Implementation Step: Ohio Sea Grant staff and agents will actively participate, support, and identify potential socio-economic research opportunities as part of the Great Lakes Sea Grant Network. This step includes pursuing additional NOAA Sectoral Applications Research Projects (SARP) grants targeting specific Lake Erie user groups, such as port directors, marina operators, recreationists, etc.

Implementation Step: Melinda Huntley and other Sea Grant agents will explore the feasibility of conducting social science research related to identifying the value Lake Erie watershed citizens place on conservation and preservation efforts. Examples could include identifying the link between interest and active conservation of Lake Erie's shipwrecks and natural areas and/or the willingness of citizens to preserve Lake Erie resources.

Data to Support Observation Programs

Strategic Action: Support research to develop new technologies to remotely measure and forecast biological and physical variables within the Great Lakes and to transmit this information to shoreline facilities, develop a regional repository for the data that is part of a national network, and develop the ability to transmit raw data and data products rapidly to users.

Strategic Action: Participate in the Great Lakes Observing System (GLOS) to ensure that fishery forecasts are incorporated as part of the observation project.

Implementation Step: Frank Lichtkoppler and Tory Gabriel will network with GLOS Director Dr. Jen Read and the GLOS Education and Outreach Committee to integrate the needs for fishery forecast information into GLOS modeling efforts.

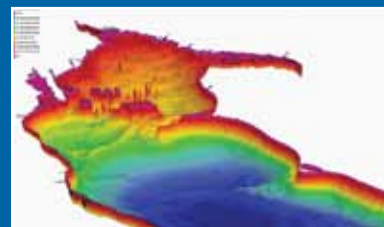
Strategic Action: Provide data and support research to assist the Lake Erie Lakewide Management Plan (LaMP), the Great Lakes Regional Research Information Network (GLRRIN), the International Joint Commission (IJC), Areas of Concern, and others.

Coastal Wetland Quality Indicators

Strategic Action: Support research to define the desired characteristics of functional coastal wetlands to provide standards for natural and mitigated wetland restoration.

Sea Grant Researcher Creates New Lake Erie Model

When it comes to the way water behaves in Lake Erie, there is a big difference between the coastline, where features like tributaries cause currents to swirl and shift, and the open water miles off the shore. Better forecasting of those ebbs and flows could go a long way to helping resource managers prepare for changing water levels and velocities or even track the flow of pollutants. A new model being developed by Ohio Sea Grant researcher Dr. Ethan Kubatko, Assistant Professor in the Department of Civil and Environmental Engineering and Geodetic Science at Ohio State University, may one day do just that.



Creating a grid of 1.5 million triangles that sculpts around the fine details of Lake Erie, Kubatko's three-dimensional model can portray small features like islands, bays, and small tributaries (shown here as pink and red peaks in Lake Erie's western basin).

That ability to reduce the size of the grid in and around anywhere we experience turbulence in the lake, should help better forecast water levels and currents, ultimately minimizing the impact that problems like contaminants, sediment loading, and harmful algal blooms have on the Lake Erie ecosystem and human health.

Healthy Coastal Ecosystems Strategy 1C:

Develop methodologies that can be used to evaluate ecosystem-based management approaches to assess their effectiveness once they are in place and to guide future management efforts, working with the Great Lakes Fishery Commission, the International Joint Commission (IJC), and other international, federal, state, and local partners.

Evaluations of Balanced Growth

Strategic Action: *Work with partners to develop programmatic land use and water quality indicators to measure the effectiveness of the Lake Erie Balanced Growth Initiative.*

Implementation Step: Joe Lucente will assist the Ohio Lake Erie Commission in communicating and assessing indicators of the Ohio Balanced Growth Program and will support pilot communities in the evaluation of these indicators when needed.

Implementation Step: Joe Lucente will assist the Ohio Lake Erie Commission in evaluating and revising Lake Erie Quality Index indicators.



Evaluations of Restoration Methods

Strategic Action: *Evaluate the ecological and economic impacts of artificial reefs and near-shore construction.*

Implementation Step: Dave Kelch, John Hageman, Matt Thomas, Colleen Wellington, and Tory Gabriel will evaluate the long-term ecological and economic impacts of artificial reefs developed on Lake Erie.

Strategic Action: *Evaluate the impacts of displacing fish concentrations and spawning habitat when constructing Lake Erie wind turbines.*

Implementation Step: Dave Kelch, John Hageman, Matt Thomas, and Tory Gabriel will explore and support research of wind turbine impacts on the Lake Erie fishery.



Strategic Action: *Support and encourage research to evaluate the placement of fish shelves and other made-man fish habitat structures in AOC river restoration projects.*

Implementation Step: Dave Kelch will work with the Black River RAP and ECO2 Committee in the development of fish habitat structures in the Lower Black River Mainstream Restoration Project, including post-placement research to evaluate their effectiveness.

Strategic Action: *Support and encourage research to evaluate the impacts of dams, weirs, and other man-made modifications and the effects of their removal or maintenance on fish spawning habitat, sea lamprey populations, and stream quality.*

Implementation Step: Frank Lichtkoppler will work with the U.S. Army Corps of Engineers and the local ad hoc Harpersfield Dam Committee in developing assessments and information needs for the Harpersfield Dam restoration issue.

Evaluations of Fish Management Strategies

Strategic Action: Support cooperative research to evaluate a variety of fish management strategies.

Implementation Step: Frank Lichtkoppler and Tory Gabriel will assist the Ohio Department of Natural Resources Division of Wildlife and other fishery stakeholders in assessing the social and economic implications of existing, proposed, and pending fish management strategies.

Healthy Coastal Ecosystems Goal 2:

Widespread use of ecosystem-based approaches to managing land, water, and living resources in the Lake Erie coastal area.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: *Constituencies have access to data, models, and training that support ecosystem-based planning and management approaches.*

Measurable Objective: Ohio Sea Grant implements five workshops, training modules, and educational products each year.

Measurable Objective: Ohio Sea Grant reaches 5,000 coastal stakeholders with education and outreach activities annually.

Short/Mid-Term Outcome: *Lake Erie coastal residents, resource managers, businesses, and industries have the ability to predict the effects of human activities and environmental change on coastal resources.*

Measurable Objective: As a result of Ohio Sea Grant educational programs, 75 people are trained annually to recognize the potential impacts and effects of human activities and environmental change on coastal resources.

Short/Mid-Term Outcome: *People of all ages understand coastal, ocean, and Great Lakes environments and the need for stewardship of healthy ecosystems.*

Measurable Objective: Ohio Sea Grant will annually reach 5,000 grades 4-12 and adult learners at Stone Laboratory, 1,000 on the Ohio Sea Grant Lake Erie Discussion Board, and 50,000 on the Ohio Sea Grant web site with information about coastal, ocean, and Great Lake environments and the need for stewardship of healthy ecosystems.

Measurable Objective: Annually, Ohio Sea Grant will lead collaboration with educators and partners to adapt ocean literacy principles to Lake Erie and help formal and informal educators use Lake Erie literacy principles and concepts to develop educational curricula.

Ultrasound Waves Could Bust Drugs in Lake Erie Waters



The antibiotics you take to cure a sinus infection are winding up in our drinking water, along with other pharmaceutical drugs like anti-convulsants, mood stabilizers, and sex hormones. Though some can be attributed to people flushing unused medications, most of the drugs in our drinking water are a result of medications excreted from our bodies.

To determine how these drugs might be removed from Lake Erie, Ohio Sea Grant awarded funding to Dr. Linda Weavers, Associate Professor in Ohio State University's College of Engineering, who started by testing two common drug compounds: Cipro, an antibiotic, and ibuprofen, a painkiller. Her clean-up process involves blasting the compounds with ultrasound waves, which create millions of tiny bubbles that expand, contract, and ultimately collapse in a few microseconds. This process creates a chemical that breaks apart the drug compounds.

The next step is to add organic matter to mimic water treated at sewage treatment plants to determine if the organic matter interferes with the chemical process.

Weavers and her team plan to test other types of pharmaceuticals to see how they react to the ultrasounds process. The goal is to evaluate enough different types to predict how individual compounds will react, helping lake managers determine the best way to clean up the Lake Erie watershed.

Healthy Coastal Ecosystems Strategy 2A:

Work with partners within and outside of NOAA to develop data, models, and training activities that support ecosystem-based planning and management approaches and share these with a wide variety of constituents in the Lake Erie watershed.

Clean and Healthy Watersheds

Strategic Action: *Develop proactive strategies for wetland preservation, riparian stream buffer acquisition, conservation easements, and other programs for improving water quality in coastal watersheds and Lake Erie in collaboration with Remedial Action Plan/Areas of Concern committees.*

Implementation Step: Frank Lichtkoppler will work with the Marsh Area Regional Coalition (MARC) to restore, conserve, and protect the Mentor Marsh and the Mentor Marsh Watershed.

Implementation Step: Frank Lichtkoppler will work with the Ashtabula Remedial Action Plan (RAP) to help delist the six beneficial use impairments on the lower Ashtabula River.

Implementation Step: Dave Kelch will work with the Black River RAP/ECO2 subcommittee on restoration and development of the lower main stream of the Black River in Lorain.

Strategic Action: *Assist local groups, agencies, and organizations to develop endorsable watershed development plans in the Lake Erie watershed.*

Implementation Step: Frank Lichtkoppler will work with the Ashtabula River Watershed Steering Committee to restore and protect the upper Ashtabula River watershed.

Implementation Step: All Ohio Sea Grant extension agents will work with local and regional not-for-profit organizations, citizens, and local state and federal agencies to maintain and improve water quality in the watersheds that drain into Lake Erie.

Implementation Step: Melinda Huntley will serve as chairman of the Nature Tourism committee for the Western Lake Erie Basin project, assisting them and facilitating discussions about sustainable tourism opportunities to drive economic development and resource conservation.

Implementation Step: Melinda Huntley will contact each watershed group within the Lake Erie Basin of Ohio and offer assistance and tools for enhancing resource-based tourism.



Strategic Action: Train citizens, coastal officials, extension educators, and planners on balanced growth, best land use practices, and geospatial tools to evaluate watershed land use options for impacts on water quality through the Ohio Coastal Training Program and other partnership efforts.

Implementation Step: Joe Lucente, and other extension agents as needed based on expertise, will participate in the implementation of the Ohio Coastal Training Program strategic plan to train elected officials and planning stakeholders based on core learning priorities as identified through a needs assessment.

Great Lakes that Work Together

Strategic Action: Support and participate in regional efforts through the Great Lakes Commission, the U.S. Environmental Protection Agency (USEPA), and the Council of Great Lakes Governors to bring about restoration and recovery of the Great Lakes ecosystem.

Implementation Step: Dave Kelch and Eugene Braig will continue their appointed positions to the Great Lakes Commission's Aquatic Invasive Species (AIS) Panel in developing sound management practices for AIS and new methods for eliminating AIS from ballast water, as well as preventing the further spread of AIS from impacted areas.

Strategic Action: Participate in the Great Lakes Sea Grant Network research, education, communication, and outreach efforts.

Implementation Step: Frank Lichtkoppler will network with the Great Lakes Sea Grant program leaders to encourage region-wide Sea Grant extension and outreach programming.

Implementation Step: Joe Lucente will serve as the Great Lakes Sea Grant Sustainable Community Development representative for the National Sea Grant Sustainable Coastal Community Development Executive Committee.

Implementation Step: All agents will participate and contribute to Great Lakes Sea Grant Network projects and programs with respect to their areas of expertise. Ohio Sea Grant agents will cooperate in network-wide grant proposals for network-wide activities.

Strategic Action: Facilitate the coordination and networking of multi-agency/multi-organization partnerships to develop and implement research, education, and outreach in Lake Erie and/or the Great Lakes.

Implementation Step: Melinda Huntley will continue to explore the opportunities and benefits of Great Lakes Sea Grant Network involvement in the development of a Great Lakes tourism initiative. The initiative would address the need to enhance the image of the Great Lakes and expand public access, as defined by the Great Lakes Restoration Collaboration and the Brookings Institute.

Implementation Step: Dave Kelch will work with other organizations and GLSGN programs in developing a Great Lakes Shipwreck Trailway to compliment existing Great Lakes trailways.

Your Green Lawn May Be Key to Summertime Dead Zone

A common weed-control product used by many people may be contributing to the growth of harmful algal blooms in Lake Erie, according to Ohio Sea Grant researchers Drs. R. Michael McKay and George Bullerjahn of Bowling Green State University. The pair is studying the impact of glyphosate, a phosphonate and the main ingredient in the most common residential herbicides, on the strains of blue-green algae found in Lake Erie.



Phosphorus has long been known to act as fuel to blue-green algae. Efforts to limit phosphorus loading in the Lake Erie watershed in the 1970s reduced harmful algal blooms and nuisance algae. However, the last 15 years have seen an increase in the growth of the toxic blooms. As this algae dies, sinks to the lake bottom and decomposes, oxygen in nearby water is depleted. This process contributes to the Lake Erie Dead Zone, an oxygen depleted area in the lake's central basin that appears each summer.

McKay and Bullerjahn are now determining exactly what the algae do in a glyphosate-rich environment. If glyphosate is found to be increasing the amount of Lake Erie algae, researchers can create pollution models to account for the additional phosphonates as a phosphorus source. Such models will help determine if the impact of glyphosate use warrants more attention and possible control.



Education and Outreach to Restore Lake Erie

Strategic Action: Support education and outreach to control and reduce the impact of aquatic invasive species.

Implementation Step: Dave Kelch and Eugene Braig will continue to work with the Ohio Aquatic Invasive Species (AIS) Committee on outreach and concerns regarding aquatic invasive species.

Implementation Step: Dave Kelch will continue to serve as the lead specialist for aquatic invasive species efforts within the Ohio Sea Grant College Program.

Strategic Action: Support education and outreach to build public understanding and support for science-based fishery management.

Implementation Step: Tory Gabriel will lead efforts to establish summer educational programming at the Aquatic Visitors Center at Put-in-Bay and develop hands-on training for youth and adults in fishing methods, as well as providing information on scientific fisheries management.

Implementation Step: Dave Kelch will continue to teach fishery management concepts to user groups and through special presentations at boat and sport shows to increase public knowledge and acceptance of how and why the Lake Erie fishery is managed.

Science-Based Information to Support Ecosystem Management

Strategic Action: Lead efforts within the International Joint Commission (IJC) and other regional and state agencies and organizations to understand and model the Lake Erie ecosystem to enhance management of the system.

Strategic Action: Support efforts of the International Association for Great Lakes Research (IAGLR) to encourage scientists to conduct education and outreach to citizens, officials, key leaders, and managers in the Great Lakes community.

Implementation Step: Frank Lichtkoppler will continue to serve as the USA Co-Chair of the International Association of Great Lakes Research (IAGLR) Outreach Committee.

Healthy Coastal Ecosystems Strategy 2B:

Support the development of the Great Lakes Observing System (GLOS), the Great Lakes Sea Grant Network, NOAA Climate Service, Great Lakes Regional Research Information Network (GLRRIN), and other collaborative efforts that advance our capability to predict the effects of human activities and environmental changes on coastal resources in order to take steps to mitigate impacts, best manage a changing environment, and adapt to their effects.

Real-time Observation Systems

Strategic Action: Provide leadership to develop coastal observation systems with Global Earth Observation System of Systems (GEOSS), the Global Ocean Observing System (GOOS), the Integrated Ocean Observing System (IOOS), the Great Lakes Observing System (GLOS), and the National Federation of Regional Associations for Coastal and Ocean Observing (NFRA).

Implementation Step: Jeff Reutter will continue to serve on the NOAA National Global Ocean Observation System (GOOS) Steering Committee, the Great Lakes Observing System (GLOS) Steering Committee, and the National Federation of Regional Associations for Ocean Observing to enhance observation systems, integrate Great Lakes observation needs, and identify opportunities for Ohio Sea Grant and the Great Lakes Sea Grant Network.

Implementation Step: Jeff Reutter will continue to lead efforts within the Council of Great Lakes Research Managers (CGLRM) of the International Joint Commission to develop proposals and strategies for placing monitoring buoys throughout the Great Lakes to improve our physical and biological monitoring and forecasting ability.

Implementation Step: Frank Lichtkoppler will continue to provide leadership to and serve as the Co-Chair of the Great Lakes Sea Grant Network Great Lakes Observing System (GLOS) Education and Outreach Committee to increase the awareness and usability of data by coastal citizens, decision-makers, and researchers.

Implementation Step: Matt Thomas will network with GLOS Education and Outreach and work with emerging technology to help integrate Stone Laboratory's current technology as well as target new technology, partners, and sources of funding for GLOS technology.

Implementation Step: All Ohio Sea Grant extension agents will work with potential Great Lakes Observation System (GLOS) users to determine client needs and desires for climate forecasting and observation information.

Strategic Action: Help implement the Integrated Ocean Observing System (IOOS) as a national program funded by Congress, and the Great Lakes Observing System (GLOS) as the federally funded Great Lakes program within IOOS, and seek appropriate roles for Sea Grant research, education, and outreach within these coastal observation systems.

Implementation Step: Jeff Reutter will develop and lead the NOAA Sea Grant Integrated Ocean Observing System (IOOS) Work Group.

Promising Technology Uses Algae, Sound Waves to Remove Mercury

Mercury, that highly toxic heavy metal found mostly as a by-product of coal-burning electric power plants, presents a challenge to Great Lakes managers because of its tendency to accumulate in the fish we most like to eat. But what if there was a way to safely remove mercury from lake sediment, before it even gets a chance to trek up the food web? Ohio Sea Grant Researchers Dr. Linda Weavers and Dr. Richard Sayre of Ohio State University have developed a process that pairs up an unlikely duo – algae and sound waves – to do just that.



Weavers, Associate Professor in College of Engineering, began by using sound waves to loosen the mercury. Although the process worked well, the loosened mercury began to reattach and settle back into the model sediment. They needed way to pull the mercury out of the water.

Enter Sayre, Professor of Plant, Cellular, and Molecular Biology at Ohio State, who spent nearly 20 years researching the alga, *Chlamydomonas reinhardtii*. By genetically modifying the algae, Sayre increased its intrinsic ability to sequester and bind to heavy metals.

By combining both technologies in a lab setting, Weavers and graduate student Ziqi He have been able to extract 30 percent of the mercury in 30 minutes.

Healthy Coastal Ecosystems Strategy 2C:

Provide life-long learning programs for people of all ages that enhance understanding of Lake Erie, coastal, and Great Lakes environments and promote stewardship of healthy ecosystems.

Reaching THOSE WHO LIVE, WORK, AND PLAY along Lake Erie

Ohio Sea Grant will help Ohio's Lake Erie residents and visitors understand more about Lake Erie and its watershed. By understanding the competing forces for use of Lake Erie and the impacts of choice, Lake Erie residents and visitors have the opportunity to take action to enhance the lake and its watershed through stewardship and engagement in local and regional decisions impacting the lake.

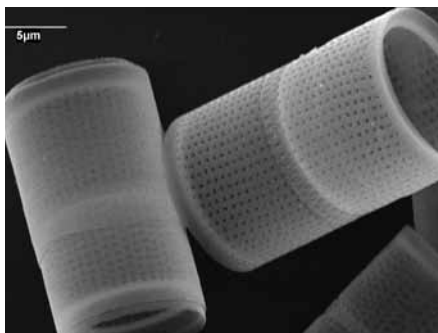
The following strategic actions were developed in partnership with Ohio Sea Grant, the ODNR Office of Coastal Management, Old Woman Creek National Estuarine Research Reserve, and the Ohio Lake Erie Commission within the Lake Erie Partnership Education and Outreach Strategic Plan, developed collaboratively to align with NOAA's education and outreach plan.



Science as a Foundation

Strategic Action: *Develop education and outreach programs and activities based on social science research.*

Implementation Step: Melinda Huntley, Frank Lichtkoppler, and Jill Jentes Banicki will work with other Lake Erie Partnership agencies to identify social science applications and training appropriate for education and outreach activities.



Strategic Action: *Measure the effectiveness of education and outreach activities and programs by achievement of environmental, economic, and social, as well as educational outcomes.*

Implementation Step: Melinda Huntley, Frank Lichtkoppler, and Jill Jentes Banicki will work with other Lake Erie Partnership agencies to develop a mechanism for evaluating partnership education and outreach activities based on Lake Erie quality indicators as monitored by the Ohio Lake Erie Commission.

Increased Awareness about Lake Erie and its Issues

Strategic Action: *Improve interagency education and communications so all staff members are aware of what resources are available at other programs, allowing those seeking assistance to find accurate resources quickly.*

Implementation Step: Melinda Huntley, Frank Lichtkoppler, and Jill Jentes Banicki will continue efforts to define roles and prioritize tasks for the Lake Erie Partnership, a committee designed to leverage and coordinate education and outreach activities between Ohio Sea Grant, the Ohio Lake Erie Commission, Old Woman Creek National Estuarine Research Reserve, and the ODNR Office of Coastal Management.

Implementation Step: Melinda Huntley, Frank Lichtkoppler, and Jill Jentes Banicki will work with the Lake Erie Partnership to develop interagency training and/or printed material to increase awareness of existing programs and technical assistance.

Strategic Action: *Develop, adopt, and disseminate Lake Erie environmental literacy principles and concepts in consultation with educators, scientists, and partners.*

Implementation Step: Melinda Huntley, Frank Lichtkoppler, Lyndsey Manzo, and Jill Jentes Banicki will finalize Lake Erie Literacy Principles.

Implementation Step: Melinda Huntley, Frank Lichtkoppler, Lyndsey Manzo, and Jill Jentes Banicki will assist with the development and adaptation of Great Lakes Literacy Principles as needed.

Partnerships Built to Share Information

Strategic Action: *Partner with museums, natural areas, and nontraditional partners to incorporate messages about Lake Erie and the Great Lakes.*

Implementation Step: Melinda Huntley, Frank Lichtkoppler, Lyndsey Manzo, and Jill Jentes Banicki will work with other Lake Erie Partnership agencies to identify the education and outreach needs of place-based educational venues for incorporating the Lake Erie Literacy Principles into programming and exhibits.

Strategic Action: *Establish a network of informal educators (such as interpreters at natural areas) to identify best practices and learning needs.*

Implementation Step: Melinda Huntley, Frank Lichtkoppler, and Jill Jentes Banicki will work with other Lake Erie Partnership agencies to establish a place-based educators and interpreters network that will allow those along Lake Erie to share ideas, best practices, opportunities, and issues.

Reaching Local Officials and Decision-Makers

The following strategic actions were developed for the Ohio Coastal Training Program, a partnership of Ohio Sea Grant, the ODNR Office of Coastal Management, Old Woman Creek National Estuarine Research Reserve, and the Ohio Lake Erie Commission and are aligned with NOAA's national education and outreach strategic plan.

Informed Decision-Makers who Act to Sustain Lake Erie and Coastal Communities

Strategic Action: *Partner with NOAA and local groups to develop new training programs for educating decision-makers by implementing the strategies identified through the Ohio Coastal Training Program strategic plan.*

Implementation Step: Under the leadership and direction of Jeff Reutter, and working cooperatively through the NOAA Ohio Coastal Training Program (OCTP), all agents will assist when needed, based on their area of expertise, in the development and implementation of education programming to meet the needs of coastal decision-makers.

Sediment Plume Creates Perfect Incubator for *Microcystis* Bloom

The amount of sediment you see flowing into Lake Erie from the Maumee River could predict the size and scale of the late summer harmful algal blooms whose toxins can cause illness or irritation in pets, livestock, and humans. Ohio Sea Grant researcher Dr. Tom Bridgeman from the University of Toledo has found a connection between the two phenomena, determining that the sediment plume creates a perfect incubator for the blue-green algae.

Bridgeman and his graduate student Justin Chaffin collected *Microcystis* samples during a large bloom that took place in 2008. Through testing, they verified that muddiness in the water acts as a protective shield for the cyanobacteria, particularly when breezes mix the water. Direct sunlight and no mixing, however, can actually damage it.

“On calm, sunny days, *Microcystis* became damaged quickly, showing loss of up to 50% of photosynthetic capacity in samples collected between 10 a.m. and 2 p.m.,” Chaffin explains.

The researchers determined that *Microcystis* had plenty of nitrogen but were still phosphorus-deprived, indicating that phosphorus levels determine how much the blue-green algae will grow. The result reveals the importance of identifying the source of phosphorus that has plagued Lake Erie for decades, in addition to improving erosion control to limit the amount of sediment that finds its way into the Maumee River.





Strategic Action: Assist decision-makers in understanding the impact of their decisions on Lake Erie and its watershed.

Implementation Step: The Ohio Coastal Training Program will provide three courses or technical assistance programs annually to increase understanding of land use impacts on Lake Erie and build capacity to implement best practices for planning and development.

Implementation Step: The Ohio Coastal Training Program will provide at least one course annually focused on decision support tools and models that predict land use impacts on water quality.

Strategic Action: Assist decision-makers in acquiring the science-based knowledge and skills necessary to make informed decisions regarding Lake Erie and watershed issues.

Implementation Step: The Ohio Coastal Training Program will offer 10 courses or technical assistance programs annually that focus on storm water and watershed management, balanced growth, sustainable design and construction, renewable energy, and shore erosion management.

Implementation Step: The Ohio Coastal Training Program will develop a climate change toolbox for decision-makers, including science, regional impacts, and adaptation and mitigation measures

Implementation Step: The Ohio Coastal Training Program will incorporate research documenting the water quality performance of storm water practices in materials and online.

Implementation Step: The Ohio Coastal Training Program will offer one course focused on climate change adaptation or mitigation.

Strategic Action: Build the Ohio Coastal Training Program as a resource for science-based training and technical assistance.

Implementation Step: The Ohio Coastal Training Program will create a website to coordinate marketing, provide on-line registration, and serve as a portal to scientific information and tools.

Implementation Step: The Ohio Coastal Training Program will publish an electronic newsletter featuring training programs and decision-support resources.

Implementation Step: The Ohio Coastal Training Program will facilitate one “train the trainer” course for core partners and training providers.

Strategic Action: Provide technical training and assistance to give decision-makers the knowledge and skills needed to protect and conserve Lake Erie and its watershed.

Implementation Step: The Ohio Coastal Training Program will design courses and services that facilitate cross-disciplinary dialogue and problem solving related to land use and storm water management challenges.

Strategic Action: *Enhance the communications between all Ohio Coastal Training Partners regarding training priorities and plans.*

Implementation Step: The Ohio Coastal Training Program core partners will meet quarterly to discuss training needs, priorities, outcomes, and collaboration.

Programs that Meet the Needs of Decision-Makers

Strategic Action: *Collaborate as partners in assessing needs and developing training programs and products.*

Implementation Step: The Ohio Coastal Training Program will develop a program charter defining the roles of core partners.

Strategic Action: *Coordinate efforts to address priority training needs across the Lake Erie watershed.*

Implementation Step: The Ohio Coastal Training Program will establish an external Ohio Coastal Training Program Advisory Council.

Implementation Step: The Ohio Coastal Training Program will develop programs consistent with the initial Ohio Coastal Training Program Needs Assessment conducted in 2003 that identified land use and water quality as priority training needs and local officials as a potentially underserved audience the Lake Erie basin. This is consistent with subsequent needs assessments targeting the training needs of local officials related to key areas.

Implementation Step: The Ohio Coastal Training Program will conduct an evaluation to assess the Ohio Coastal Training Program's impact on decision-making.

Implementation Step: The Ohio Coastal Training Program will assess the training needs of local officials related to grant writing for environmental projects and will pilot one course.

Implementation Step: The Ohio Coastal Training Program will assess decision-maker training and information needs related to climate change.

Creating an Educated Workforce, Now and in the Future

The following strategies represent Ohio Sea Grant's additional education and outreach strategies, beyond those strategies identified through the Lake Erie Coastal Partnership and the Ohio Coastal Training Program.

Stone Laboratory Credit and Field Experience for Undergraduate and Graduate Students

Strategic Action: *Provide educational and training opportunities for undergraduate and graduate students that address real-world problems, opportunities, and management needs.*

Implementation Step: Melinda Huntley, Tory Gabriel, and Matt Thomas will explore the feasibility and implementation of using the Aquatic Visitors

Plants May Offer Solution for Pulling Pollutants out of Soil

Hormones in our water supply are altering the gender of some male fish, causing wide concern about the broader impacts of such contamination. Ohio Sea Grant researcher Dr. Yo Chin, Professor of Geology at Ohio State University, and his graduate student Marcy Card believe that certain plants may be able to absorb hormones directly from the soil and break them down before they reach rivers and lakes.

Chin and Card are looking specifically a form of estrogen called estradiol and a chemical called zeranol that mimics the behavior of estrogen in our bodies. It's often administered to livestock to induce them to grow.



"Preliminary data show that a small group of poplar trees reduce the concentration of zeranol by 80% in just four days," Card explains.

In addition to poplar trees, Chin and Card are planning to look at corn, switch grass, and an aquatic plant. "We'd like to see the chemicals progress from a crop plant into a riparian zone—the interface between land and a stream—and into an aquatic system," Card says.

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



Center and the South Bass Island Lighthouse as sites for conducting research on effective educational approaches at place-based venues.

Strategic Action: *Emphasize and reward undergraduate and graduate training on research projects.*

Implementation Step: Jeff Reutter and Matt Thomas will develop, coordinate, and implement the Research Experience for Undergraduates (REU) Scholarship Program at F.T. Stone Laboratory.

Strategic Action: *Increase minority participation in Stone Laboratory activities.*

Implementation Step: Jeff Reutter, the Friends of Stone Laboratory, John Hageman, Matt Thomas, and all agents will work to encourage minority and underrepresented groups to participate in the educational opportunities available at Stone Laboratory.

Strategic Action: *Increase scholarship support for students and teachers.*

Implementation Step: The Friends of Stone Laboratory and all agents will seek increased scholarship resources for students at Stone Laboratory.

Education for Adults

Strategic Action: *Enhance technical and management skills and overall knowledge among agency and institution managers by developing education and outreach products and programs in the aquatic and social sciences and emerging coastal issues.*

Implementation Step: John Hageman and Matt Thomas will develop and/or disseminate information regarding Stone Laboratory workshops and training to assist wastewater treatment facility staff in identifying and resolving algal issues.



Strategic Action: *Coordinate the Great Lakes Fisheries Leadership Institute to educate emerging leaders in fisheries management, Great Lakes issues, and aquatic science.*

Implementation Step: Tory Gabriel will organize and implement the Great Lakes Fisheries Leadership Institute.

Strategic Action: *Coordinate adult opportunities to learn more about the Great Lakes through F.T. Stone Laboratory.*

Implementation Step: Jeff Reutter, Eugene Braig, John Hageman, and Matt Thomas will provide specialized workshops to train water engineers, private consultants, and other interested parties that request sessions in algae identification, fisheries techniques, ichthyoplankton identification, and other newly emerging topics.

Stone Laboratory Field Experience for K-12

Strategic Action: *Create opportunities for exceptional students to participate in real-world aquatic research and educational experiences.*

Implementation Step: John Hageman will coordinate and implement Stone Laboratory spring and fall hands-on field trip workshops.

Strategic Action: *Coordinate science-based workshops with hands-on laboratory and field experiences for middle school and high school students at Stone Laboratory, the Lake Erie Aquatic Education Visitors Center, and Gibraltar Island as a way to promote the study of STEM by youth.*

Implementation Step: John Hageman, Matt Thomas, and Tory Gabriel will host participants annually at Stone Laboratory, the Aquatic Visitors Center, and other island facilities with a science cruise, labs, hikes, and educational tours.

Educator Training

Strategic Action: *Provide teacher education, development activities, and programs to prepare them to better teach aquatic sciences and meet accountability requirements.*

Implementation Step: Jeff Reutter, Eugene Braig, John Hageman, and Matt Thomas will see that graduate credit courses specifically for teachers are offered at and supported by Stone Laboratory.

Strategic Action: *Provide education and outreach to place-based educators, enabling them to better communicate Lake Erie science and stewardship.*

Implementation Step: Melinda Huntley will conduct a needs assessment of place-based educators, such as those found within museums, natural area visitor's centers, etc., within the Lake Erie region, to identify priority training needs.

Implementation Step: Melinda Huntley will develop a hospitality training module and program for place-based educators and interpreters along Lake Erie to provide information and rewards for exceptional customer service.

Improved Education and Visitor Facilities

Strategic Action: *Improve the facilities and capabilities of Stone Laboratory, including expanding capabilities for distance learning.*

Implementation Step: Jeff Reutter, John Hageman, Matt Thomas, and Tory Gabriel will utilize funds provided by the Ohio General Assembly, the Ohio Board of Regents, and other as-yet-unspecified sources to make improvements to the facilities as funding becomes available.

Strategic Action: *Through a cooperative management agreement with the ODNR Division of Wildlife, manage the Aquatic Visitors Center at Put-in-Bay to provide hands-on training for youth and adults in fishing methods, public fishing access, educational displays in fishery-related sciences, and public lectures by researchers and other experts.*

Implementation Step: Tory Gabriel will manage the Aquatic Visitor Center through an agreement with the ODNR Division of Wildlife and Ohio Sea Grant.

Implementation Step: Matt Thomas will assist in the development of plans and management strategies for the Aquatic Visitors Center.

Stone Lab Hooks Students on Science

Stone Laboratory's Science Field Trip Program started in 1973 with the idea that kids learn science better and retain information longer if they can participate in hands-on activities. "We saw early on that if students are wading in Lake Erie water with nets in their hands, they're going to remember what they learned much better than in a classroom," explains John Hageman, Co-Manager of Stone Lab.

Located on Ohio State University's island campus on Lake Erie, Stone Lab uses the lake as a living laboratory to provide student groups from all over the country with one-of-a-kind, interactive science experiences.

From the kids' perspective, they're Lake Erie scientists for the day. They venture out onto Stone Lab research vessels to take water

samples, and head back to the lab to analyze what they captured. They dissect fish from a trawl they pulled earlier in the day and scour the island for native bird, plant, and reptile species. From their teachers' perspective, Stone Lab is applying science concepts that the students could never fully understand if they were anywhere else.

For many, the experience is the first time kids have ever seen Lake Erie, Ohio's most valuable natural resource. "When they see firsthand all the life that Lake Erie holds, it's hard not to want to preserve and protect it," says Hageman. That may be why so many of the 100,000+ students who have gone through the program over the years, end up returning later in college to take one of Stone Lab's summer courses. Stone Lab incites learning all around.



Strategic Action: *Improve the facilities and capabilities of the Aquatic Visitors Center, Gibraltar Island, and the South Bass Island Lighthouse to serve as place-based learning venues.*

Implementation Step: Melinda Huntley will develop a hospitality training module and program for Stone Laboratory student leaders to provide information and rewards for exceptional customer service.

Implementation Step: Melinda Huntley, Tory Gabriel, Matt Thomas, and Jeff Reutter will continue to enhance and deliver *CSI: Lake Erie* tours in partnership with the National Park Service to link key historical and science-related visitor attractions at Put-in-Bay with messages about Lake Erie.

Implementation Step: Matt Thomas will work with the Friends of Stone Laboratory, other Sea Grant agents, and local partners to develop and train a cadre of volunteer interpretative workers to assist with the staffing of the Aquatic Visitor Center, Lighthouse, and Gibraltar Island tours.



Strategic Action: *Renovate Jay Cooke's Castle at Stone Laboratory for use as a conference center for Ohio Sea Grant's outreach and education programs.*

Implementation Step: Jeff Reutter and the Friends of Stone Laboratory will seek resources to renovate Cooke Castle for use as a conference and educational meeting center.

Strategic Action: *Enhance development and delivery of Lake Erie-related information through programs, exhibit assistance, and presence at the Lake Erie Nature and Science Center.*

Implementation Step: Tory Gabriel and/or Dave Kelch will provide the Lake Erie Nature and Science Center and its visitors with the most up-to-date publications and information regarding Lake Erie.

An Informed Lake Erie Public

Strategic Action: *Increase public knowledge and understanding about Lake Erie, the Great Lakes, the oceans, the aquatic sciences, and the mission of Sea Grant and our research, education, and outreach efforts.*

Implementation Step: All Ohio Sea Grant extension agents will seek out opportunities and/or grants to develop and use social science research for program development.

Implementation Step: All Ohio Sea Grant extension agents will continue to present science-based information and programming as requested by coastal clientele.

Implementation Step: All Ohio Sea Grant extension agents will contribute story ideas and content for Ohio Sea Grant communications efforts, including the *Twine Line* newsletter.

Implementation Step: Melinda Huntley will continue to incorporate Lake Erie and Great Lakes information in all tourism-related communications efforts, including media releases, publications, websites, and itineraries.

Strategic Action: Increase understanding of science-based fisheries management and the sometimes controversial fisheries harvest and management practices needed to ensure sustainability of fisheries resources by providing education and outreach to fisheries resource users and management agencies.

Implementation Step: Dave Kelch and Colleen Wellington will organize and coordinate the Ohio Sea Grant educational display and outreach effort at the Cleveland Boat Show, the Sandusky In-the-Water Boat show, and other venues as appropriate.

Implementation Step: Dave Kelch will continue to teach fishery management concepts to user groups and through special presentations at boat and sport shows to increase public knowledge and acceptance of how and why the Lake Erie fishery is managed.

Strong Network of Sea Grant Extension Agents and Stakeholders

Strategic Action: Strengthen coordination of Ohio Sea Grant Extension.

Implementation Step: All Ohio Sea Grant extension agents will participate in periodic staff meetings, conference calls, and other necessary communications to develop and advance the mission, goals, and objectives of the Ohio Sea Grant College Program.

Implementation Step: All Ohio Sea Grant extension agents will participate in the Great Lakes Sea Grant Network conferences and committees, as well as other regional and national Sea Grant work teams, as appropriate.

Implementation Step: Melinda Huntley will continue to serve as co-leader of the OSU Extension Ohio Tourism Team.

Strategic Action: Increase communications between Ohio Sea Grant agents, their advisory committees, and researchers.

Implementation Step: Frank Lichtkoppler will compile a list of all supporting organizations and individuals, as well as interested stakeholders, in order to develop a frequent communications update on Ohio Sea Grant activities and to maintain ongoing contact

Implementation Step: Jill Jentes Banicki, George Oommen, and Melinda Huntley will develop an Ohio Sea Grant electronic newsletter to provide more frequent communications with Ohio Sea Grant stakeholders and supporters.

Implementation Step: All Ohio Sea Grant Extension agents will attend periodic Ohio Sea Grant staff meetings.

Strategic Action: Maintain high-quality and active advisory committees.

Implementation Step: All Ohio Sea Grant Extension agents will work to rejuvenate their Ohio Sea Grant Extension Advisory Committees by holding periodic meetings, conducting conference calls, and exchanging email, etc.

Online Discussion Board Delivers Answers

What are the current walleye populations in Lake Erie? What impact are algal blooms having on the fishery? What can be done to keep the Asian Carp at bay?

The Lake Erie Discussion Board provides an online venue for fishermen, boaters, and other Lake Erie users to ask questions about the lake and its resources and get answers directly from credible, unbiased Ohio Sea Grant staff members.

Staff members take turns answering questions providing information on fisheries, water quality, lake levels, regulations, and policies, usually within 48 hours. A separate Lake Erie Travel Information forum answers questions for visitors interested in the natural, cultural, and historical sites along the lake.



Unlike with direct e-mail responses, answers shared on the Discussion Board educate a wider audience. One person asking a question allows hundreds of others to learn from the response.

The discussion board averages anywhere from 80,000 to 100,000 hits per month and conversations help Sea Grant agents to identify program needs and priorities for research, outreach, and education. "It's a way for us to monitor the issues the public feels are most important," explains Jeff Reutter, Director of Ohio Sea Grant.

"To take the time to explain the inside of questions is something that isn't offered in many states. Thank you," said one Lake Erie Discussion Board user. Join the conversation at ohioseagrant.osu.edu/discuss.

Healthy Coastal Ecosystems Goal 3:

Restored function and productivity of Lake Erie degraded ecosystems

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: Coastal residents, resource managers, businesses, and industries have access to new approaches and technologies developed to improve the effectiveness of restoring coastal ecosystems.

Measurable Objective: Annually Ohio Sea Grant reaches 5,000 coastal residents, resource managers, business representatives, and industry representatives with information about new approaches and technologies to improve ecosystem management.

Short/Mid-Term Outcome: Coastal residents, resource managers, businesses, and industries learn more about Lake Erie, its natural resources, issues, and opportunities.

Measurable Objective: Annually Ohio Sea Grant helps 5,000 coastal residents and visitors learn more about Lake Erie natural resource, issues, recreation (fishing), and tourism opportunities.

Short/Mid-Term Outcome: Managers draw on both scientific information and the public to prioritize which ecosystems to restore and to set realistic restoration goals.

Measurable Objective: Ohio Sea Grant facilitates the development and dissemination of scientific information within Ohio Remedial Action Plan (RAP) Committees for Ohio's Areas of Concern.



Healthy Coastal Ecosystems Strategy 3A:

Support research to improve the effectiveness of ecosystem restoration and identify promising new restoration approaches and technologies.

New Methods for Removing Contaminants

Strategic Action: Develop and evaluate new technologies to remove and detoxify contaminants by supporting and soliciting research.

Implementation Step: Jeff Reutter will seek ways to support research (eg., sonification) to remove metals from contaminants.

Healthy Coastal Ecosystems Strategy 3B:

Invest in the development and dissemination of new information, policies, technologies, and methods to address water quality degradation, prevent the introduction and spread of aquatic non-native species, and minimize the negative impacts of these on coastal, ocean, and Great Lakes food webs.

Reduced Non-Point Pollution

Strategic Action: Improve Lake Erie water quality by reducing non-point-source run-off and erosion through dissemination of best management practices.

Implementation Step: John Hageman will continue to work with Pheasants Forever to promote effective right-of-way mowing to protect water quality.

Implementation Step: All Ohio Sea Grant Extension agents will work with OSU Extension, local, and state agencies, and urban and rural nonprofit organizations to assist with education and outreach measures that would reduce nonpoint pollution sources, including agriculture, land development, and sustainable citizen behavior.

Elimination of Contaminants

Strategic Action: Disseminate information about new technologies that are safe and capable of detecting, removing, and/or detoxifying contaminants in a cost-effective manner.

Implementation Step: Eugene Braig and Frank Lichtkoppler will develop a system to coordinate science-based information outreach regarding cost-effective methods for detecting and removing Lake Erie contaminants. They will ensure that applicable Ohio Sea Grant extension agents have the tools to communicate with and assist key stakeholders.

Fewer Aquatic Invasive Species

Strategic Action: Provide educational information to elected officials and decision-makers considering aquatic invasive species legislation to allow them to make informed decisions.

Implementation Step: Dave Kelch and Eugene Braig will continue to work with the Ohio Aquatic Invasive Species (AIS) Committee and the Great Lakes Commission to target legislators with AIS information.

Healthy Coastal Ecosystems Strategy 3C:

Provide technical support for citizens, organizations, and businesses that need help with specific mitigation/restoration problems, giving them access to the latest information and techniques.

Preservation Assistance to Communities and Local and Regional Organizations

Strategic Action: Provide technical support, including socio-economic information, to coastal advisory councils, resource managers, and organizations working to protect Lake Erie.

Implementation Step: All Ohio Sea Grant agents will facilitate conversations and needs assessments related to the training needs of community planners and other decision-makers concerning the need for, economic and environmental impacts of, and sources for assistance of resource preservation.

Implementation Step: Frank Lichtkoppler will develop a fact sheet or database detailing agencies and private enterprises currently undertaking mitigation and restoration projects to assist those initiating mitigation or restoration efforts.

Partnership Creates Fact Sheet to Educate Public about HABs

Farm pond owners and Lake Erie enthusiasts with questions about harmful algal blooms (HABs) have a new fact sheet at their fingertips. *Harmful Algal Blooms in Ohio Waters*, written in partnership with Ohio State University Extension, the Ohio Environmental Protection Agency (OEPA), and the Ohio Department of Natural Resources, offers an explanation of the causes, identifying characteristics, and solutions for reducing or preventing HABs like *Microcystis*, *Plectonema*, and *Lyngbya*.

“With HABs recently increasing throughout Ohio, we felt it was important to not only get the information out to the public, but to show what they can do to help prevent blooms from happening in the first place,” says Eugene Braig, Assistant Director of Ohio Sea Grant.

An algal bloom is an abundant or excessive growth of algae. HABs are so named because many produce poisons, or toxins,

that can cause illness or irritation—sometimes even death—in pets, livestock, and humans. They have been found in Lake Erie, the Ohio River, and many inland Ohio water bodies, but they can occur almost anywhere there is water.

Excess nutrients like phosphorus and nitrogen from watershed sources are major contributing factors to HABs. Blooms may be minimized, and some completely avoided, by reducing the nutrients and pollutants added to the water, especially phosphorus and nitrogen.





Implementation Step: Frank Lichtkoppler will develop a database for each coastal county of successful mitigation and restoration projects, including the problem that was addressed, the nature of restoration work, agencies and companies involved, funding sources, and project results to serve as models and case studies for addressing new identified projects.

Implementation Step: Jill Jentes Banicki and the Ohio Sea Grant Communications Staff will develop a PowerPoint presentation to educate the public about coastal mitigation and restoration needs, case studies sharing best practices, and subsequent economic and ecological benefits of efforts.

Reduction of Pollution

Strategic Action: *Reduce non-point pollution by developing and implementing pollution control programs in cooperation with federal, state, and local governments and organizations, including OSU Extension agricultural and horticultural educators.*

Implementation Step: John Hageman and Matt Thomas will continue to support the annual Put-in-Bay Underwater Clean-Up with equipment, logistical support, manpower, and expertise.

Implementation Step: Dave Kelch will assist local and area officials in developing and coordinating new pharmaceutical collection efforts to prevent the release of harmful chemicals and other materials into the Lake Erie watershed

Implementation Step: Dave Kelch will develop educational materials related to the impacts of pharmaceutical contaminants in Lake Erie for distribution during pharmaceutical collection events and boat and sport shows.

Implementation Step: Dave Kelch will develop a PowerPoint presentation related to improper disposal of unwanted pharmaceuticals and their impacts on Lake Erie.

Implementation Step: Dave Kelch will work with other GLSGN specialists to explore funding opportunities for reducing pharmaceutical contamination in the Great Lakes.

Implementation Step: Melinda Huntley will explore the feasibility of introducing a sustainable tourism program to specific industry sectors, such as hotels and/or restaurants, to encourage energy use savings and reduction of waste.

Strategic Action: *Reduce pollution from marinas and boaters through coordination, education programming, and delivery of resources through the Ohio Clean Marinas program.*

Implementation Step: Colleen Wellington and Dave Kelch will conduct workshops to inform Lake Erie marina managers about the Ohio Clean Marinas Program, and they will encourage participation by offering incentives (including technical assistance) to Certified Clean Marinas to minimize marina-based pollution of Lake Erie.

Implementation Step: Colleen Wellington will continue to coordinate the Boat Shrink-Wrap Recycling Program to reduce waste.

Implementation Step: Dave Kelch and Colleen Wellington will assist marinas with plans and techniques to minimize stormwater and wash water runoff into Lake Erie.

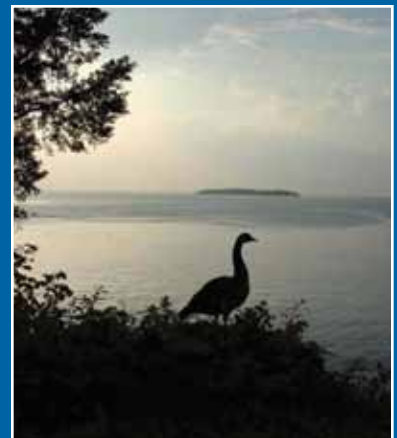
Implementation Step: Dave Kelch will continue to serve as the administrator for the Ohio Clean Marinas Program, assisting in the application for annual Clean Marina grants and other instances as needed.

Computer Model Maps and Predicts Lake Erie Coastlines

Along the eastern coast of Lake Erie in Ohio, where waves can wash away as much as six feet of land each year, living close to the shoreline can put your home in danger of washing away in 10 to 30 years, according to a new computer model created by Ohio Sea Grant researcher Dr. Ron Li, Professor at Ohio State University. The tool can help communities like Painesville, which experiences significant erosion, to determine which areas along their coast may be in particular danger. State, county, and local agencies can also use the model to monitor the problem and continue to regulate the construction of certain structures within those 30-year erosion zones.

“State agencies can use the information for planning to assess if current land-use policies are working,” Li says. “It’s a way for them to protect the land, the people, and their investments.”

By combining two-dimensional QuickBird satellite data with three-dimensional LIDAR laser data, as well as information about water levels, water movement, and the topography of the lake floor, Li’s team was able to make their Erosion Awareness System accurate to within one centimeter. They then created maps with color-coded lines designating where erosion is likely to leave the shoreline 10, 20, and 30 years.



FOCUS AREA –
SUSTAINABLE COASTAL DEVELOPMENT

GOALS	STRATEGIES How Ohio Sea Grant will achieve its goals	SHORT/MID-TERM OUTCOMES and <i>Measurable Objectives</i> What Ohio Sea Grant will achieve within the next four years, and how these achievements will be measured	LONG-TERM OUTCOMES and <i>Performance Measures</i> What Ohio Sea Grant will achieve long-term, and how these achievements will be measured
Sustainable Coastal Development Goal 1: Healthy coastal economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.	<p>Sustainable Coastal Development Strategy 1A: Support research, education, and outreach activities that provide Ohio's coastal communities and elected officials with information, training, and tools to help them enhance working waterfront-related economic activities without diminishing the long-term health of Lake Erie and its coastal resources. These activities include commercial and recreational fishing, tourism, outdoor recreation, renewable energy strategies, port development and marine trades.</p> <p>Sustainable Coastal Development Strategy 1B: Support efforts to preserve and increase public access to Lake Erie beaches and waterfronts through assessments of access needs, analysis of legal issues, technical assistance, and assistance in reducing the number of beach advisories.</p> <p>Sustainable Coastal Development Strategy 1C: Engage Lake Erie coastal communities in planning processes that support the efforts of community leaders to identify and pursue sustainable economic development policies and programs.</p>	<p>Short/Mid-Term Outcome: Local communities have the information and techniques to enhance waterfront-related economic activities and protect the health of the Lake Erie coastal environment. <i>Measurable Objective:</i> By 2013, all Sea Grant-funded research proposals will address stakeholder education and/or outreach components. <i>Measurable Objective:</i> By 2013, 25% of the approximately 150 charter captains participating annually in charter captain conferences and training will report greater profitability due to Sea Grant-related programs and activities. <i>Measurable Objective:</i> By 2012, 50 key statewide tourism industry leaders and agency officials will have participated in training provided by Ohio Sea Grant to create better understanding of the relationship between resource health and economic potential. <i>Measurable Objective:</i> By 2013, 60 marinas within the coastal Ohio area will be certified as Clean Marinas.</p> <p>Short/Mid-Term Outcome: Public access to Lake Erie's beaches and waterfronts is enhanced, preserved, or increased. <i>Measurable Objective:</i> By 2013, a tool will be developed to measure the effectiveness and implementation rate of Ohio Sea Grant research, education, and outreach with community and land-use planners participating in Ohio Sea Grant programs. <i>Measurable Objective:</i> By 2013, Ohio Sea Grant will have assisted with five public access projects along Lake Erie, resulting in 20 additional acres added or maintained for recreational use.</p> <p>Short/Mid-Term Outcome: Lake Erie community leaders are able to identify and pursue sustainable economic development policies and programs. <i>Measurable Objective:</i> By 2013, a needs assessment will have been conducted to identify and prioritize the sustainable development research, training, and information needs of local, state, and federal policymakers. <i>Measurable Objective:</i> By 2013, written policy analysis of at least one emerging issue impacting Lake Erie waterfront development will have been completed. <i>Measurable Objective:</i> By 2013, participant evaluations from legislative events will measure increases in understanding and their intent to apply information to future decisions, and Ohio Sea Grant is gathering further information from participants on specific implementation challenges.</p> <p>Short/Mid-Term Outcome: Lake Erie watershed communities engage in visioning, resource inventories, analysis of development policies, and education of community leaders and citizens. <i>Measurable Objective:</i> By 2013, a plan will have been developed for increasing coastal community awareness and participation in the Ohio Business Retention and Expansion program, as well as other applicable planning products available through OSU. <i>Measurable Objective:</i> By 2013, 10 communities will have been involved in visioning, resource inventories, analysis of development policies, and education of community leaders and citizens with the assistance of Ohio Sea Grant.</p> <p>Short/Mid-Term Outcome: Lake Erie watershed communities are able to analyze the impacts and benefits of balanced growth practices and alternative development scenarios on coastal resources and economies. <i>Measurable Objective:</i> By 2013, three case studies related to implementation of balanced growth will have been developed. <i>Measurable Objective:</i> By 2013, training and technical resources related to sustainable development practices, such as balanced or smart growth, will have been provided to 150 officials in coastal communities.</p>	<p>Long-Term Outcome: Ohio's coastal communities and industries have healthy economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.</p> <p>Long-Term Outcome: Ohio's coastal communities make efficient use of land, energy, and water resources and protect the resources needed to sustain coastal ecosystems and maintain quality of life.</p> <p>Long-Term Outcome: Alternative energy technologies (wave, thermal, current, wind, solar) are evaluated for their environmental and economic impacts and adopted.</p> <p>Long-Term Outcome: Coastal community designs are implemented to improve energy efficiency and reduce carbon emissions.</p> <p>Long-Term Outcome: Ohio's coastal citizens, leaders, and industries work together to balance multiple land uses and optimize environmental sustainability.</p>
Sustainable Coastal Development Goal 2: Coastal communities that make efficient use of land, energy, and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.	<p>Sustainable Coastal Development Strategy 2A: Strengthen Ohio Sea Grant's research activities and Extension capacity to help coastal communities determine the sustainable carrying capacity of their land, water, and other resources through resource assessments, cost-benefit analysis, scenario building, modeling, and other techniques.</p> <p>Sustainable Coastal Development Strategy 2B: Support innovative research on land-use practices and building designs that promote energy and water conservation, coastal Lake Erie related renewable energy technologies, and the creation of other tools to help communities grow in sustainable ways.</p> <p>Sustainable Coastal Development Strategy 2C: Help Lake Erie communities evaluate their ecological footprints and grow in environmentally sustainable ways, focusing on products developed in cooperation with NOAA's Climate Change Program Office, Lake Erie coastal programs, and other partners.</p>	<p>Short/Mid-Term Outcome: Lake Erie coastal communities determine the sustainable carrying capacity of their land, water, and other resources. <i>Measurable Objective:</i> By 2013, a tool, or collection of tools, will have been identified to assist communities in measuring the carrying capacity of their resources.</p> <p>Short/Mid-Term Outcome: Lake Erie coastal communities use a variety of tools and technologies to adopt policies to protect the sustainable ecosystem footprint needed to sustain coastal, marine, and Great Lakes ecosystems and implement community designs that are compatible with carrying capacity of coastal ecosystem and water resources. <i>Measurable Objective:</i> By 2013, Ohio Sea Grant will have evaluated the development of a tool to measure a community's ecosystem footprint.</p> <p>Short/Mid-Term Outcome: Lake Erie communities adopt practices that increase their energy efficiency and decrease use of fossil fuels (i.e. increase in walkability, increase in public transit, decrease in vehicle miles traveled, energy efficient building codes adopted). <i>Measurable Objective:</i> By 2013, three communities will have implemented sustainable practices because of information, training, or assistance provided by Ohio Sea Grant and its partners.</p>	<p><i>Performance Measure:</i> By 2013, 10 coastal communities are engaged in activities (i.e. visioning, resource inventories, analysis of development policies or making informed development decisions that address the sustainability of economic and environmental resources as a result of Ohio Sea Grant's capacity building tools, data, technologies, and/or education of community leaders.</p>
Sustainable Coastal Development Goal 3: Lake Erie coastal citizens, community leaders, and industries that recognize the complex inter-relationships between social, economic, and environmental values in coastal areas and who work together to balance multiple uses and optimize environmental sustainability.	<p>Sustainable Coastal Development Strategy 3A: Work with NOAA's Office of Ocean and Coastal Resource Management, NOAA's Coastal Services Center, the Environmental Protection Agency Offices of Smart Growth, and regional and local partners to disseminate assessment tools, model plans, and ordinances, best management practices, alternative development approaches and other techniques that will enable the citizens of Lake Erie to develop their coastal economies in environmentally sound ways.</p> <p>Sustainable Coastal Development Strategy 3B: Build Ohio Sea Grant's capacity to evaluate cost-benefit trade-offs in the coastal zone through a greater emphasis on socioeconomic research, impact studies, cost/benefit research and other methods of evaluating alternative future scenarios for coastal communities.</p> <p>Sustainable Coastal Development Strategy 3C: Foster regional cooperation and partnerships among local government officials, community stakeholders, and regional planning organizations to promote sustainable growth plans and strategies that protect local and regional natural resources to ensure an abundance of these resources are available for future generations.</p>	<p>Short/Mid-Term Outcome: Lake Erie coastal communities adopt mitigation measures, best management practices, and improved site designs (low-impact development, green building design, natural area planning, wildlife habitat corridors, bio retention areas, vegetative swales in local policies and ordinances). <i>Measurable Objective:</i> By 2013, 50 coastal communities will have been provided information by Ohio Sea Grant and its partners related to mitigation measures, best management practices, and improved site designs, as well as examples of ways these efforts have been integrated into other policies and ordinances.</p> <p>Short/Mid-Term Outcome: Lake Erie coastal communities are able to evaluate cost-benefit trade-off in coastal areas. <i>Measurable Objective:</i> By 2013, at least two new research projects will focus on socio-economic research/outreach cost-benefits for local communities.</p> <p>Short/Mid-Term Outcome: Growth plans, policies, and strategies are developed and adopted to protect local and regional natural resources to serve future generations. <i>Measurable Objective:</i> By 2013, 10 coastal communities will have involved Ohio Sea Grant in their discussions regarding sustainable planning.</p> <p>Short/Mid-Term Outcome: Lake Erie coastal communities adopt and employ comprehensive land use planning and community design technologies that protect valuable coastal resources and minimize the impact of the built environment and sustain coastal environments. <i>Measurable Objective:</i> By 2013, five coastal communities will be involved in the Balance Growth Program or are otherwise incorporating sustainable development principles, such as smart growth, into their comprehensive planning efforts.</p>	<p><i>Performance Measure:</i> By 2013, three coastal communities have adopted/implemented sustainable economic and environmental development practices (i.e., energy efficiency, climate change planning, land use planning, community visioning, recreation, sustainable tourism, balanced growth principles) as a result of Ohio Sea Grant activities.</p> <p><i>Performance Measure:</i> By 2013, Ohio Sea Grant will develop and/or adopt a way to measure the economic impact of sustainable coastal policies and practices.</p>

SUSTAINABLE
COASTAL DEVELOPMENT

SUSTAINABLE
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FOCUS AREA – SUSTAINABLE COASTAL DEVELOPMENT

Within the focus area of SUSTAINABLE COASTAL DEVELOPMENT, the following long-term visions create the basis of the *Ohio Sea Grant Strategic Plan*:

Ohio's coastal communities and industries have healthy economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.

Ohio's coastal communities make efficient use of land, energy, and water resources and protect the resources needed to sustain coastal ecosystems and maintain quality of life.

Alternative energy technologies (wave, thermal, current, wind, solar) are evaluated for their environmental and economic impacts and adopted.

Coastal community designs are implemented to improve energy efficiency and reduce carbon emissions.

Ohio's coastal citizens, leaders, and industries work together to balance multiple land uses and optimize environmental sustainability.

To evaluate our progress toward these visions, the following represent the ways Ohio Sea Grant will measure our achievements. These performance measures are aligned with the *National Sea Grant Program Strategic Plan*:

Coastal communities are engaged in activities (i.e., visioning, resource inventories, analysis of development policies) or making informed development decisions that address the sustainability of economic and environmental resources as a result of Ohio Sea Grant's capacity building, tools, data, technologies, and/or education of community leaders.

Coastal communities are adopting or implementing sustainable economic and environmental development practices (i.e., energy efficiency, climate change planning, land use planning, community visioning, balanced growth principles, recreation, tourism) as a result of Ohio Sea Grant activities.

Economic impacts are derived from sustainable coastal policies and practices.

Goals for Sustainable Coastal Development

Within the SUSTAINABLE COASTAL DEVELOPMENT focus area, three goals guide Ohio Sea Grant's future activities. These goals include the following:

- Healthy coastal economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.
- Coastal communities that make efficient use of land, energy, and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.
- Coastal citizens, community leaders, and industries recognize the complex inter-relationships between social, economic, and environmental values in coastal areas and work together to balance multiple uses and optimize environmental sustainability.

Each of these goals has a series of short- and mid-term outcomes with measurable objectives that will be used to determine progress in reaching these desired states. These outcomes and measurable objectives are identified following each goal statement.

Sustainable Coastal Development Goal 1:

Healthy coastal economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: *Local communities have the information and techniques to enhance waterfront-related economic activities and protect the health of the Lake Erie coastal environment.*

Measurable Objective: By 2013, all Sea Grant-funded research proposals will address stakeholder education and/or outreach components.

Measurable Objective: By 2013, 25% of the approximately 150 charter captains participating annually in charter captain conferences and training will report greater profitability due to Sea Grant-related programs and activities.

Measurable Objective: By 2012, 50 key statewide tourism industry leaders and agency officials will have participated in training provided by Ohio Sea Grant to create better understanding of the relationship between resource health and economic potential.

Measurable Objective: By 2013, 60 marinas within the coastal Ohio area will be certified as Clean Marinas.

Charter Captains Gain Business Tools to Lure New Customers and Profits

Nearly 800 charter fishing captains do business in Ohio along Lake Erie, and their customers spend more than \$52 million in restaurants, hotels, retail shops, bait shops, and other area businesses. Keeping up with new fishing techniques and business

practices is easier for these Ohio business owners thanks to Ohio Sea Grant's annual Charter Captains Conference.



"The Ohio Charter Captains Conference is designed to strengthen the charter industry through education in business management and regulatory and environmental issues," says Ohio Sea Grant Extension Specialist Fred Snyder. "We discuss marketing and business, marine electronics, laws and regulations. It has become something an entire industry relies on."

That reliance comes from proven outcomes: more than two-thirds of all captains attending one or more Charter Captains Conferences report an increase in their bottom line thanks to information they learned. In addition, 85% report that they've changed the way they do business, bringing in more money to Ohio's economy and providing a better product for visitors who would not otherwise have the chance to get out on the lake to reel in that prized walleye.





Short/Mid-Term Outcome: *Public access to Lake Erie's beaches and waterfronts is enhanced, preserved, or increased.*

Measurable Objective: By 2013, a tool will be developed to measure the effectiveness and implementation rate of Ohio Sea Grant research, education, and outreach with community and land-use planners participating in Ohio Sea Grant programs.

Measurable Objective: By 2013, Ohio Sea Grant will have assisted with five public access projects along Lake Erie, resulting in 20 additional acres added or maintained for recreational use.

Short/Mid-Term Outcome: *Lake Erie community leaders are able to identify and pursue sustainable economic development policies and programs.*

Measurable Objective: By 2013, a needs assessment will have been conducted to identify and prioritize the sustainable development research, training, and information needs of local, state, and federal policymakers.

Measurable Objective: By 2013, written policy analysis of at least one emerging issue impacting Lake Erie waterfront development will have been completed.

Measurable Objective: By 2013, participant evaluations from legislative events will measure increases in understanding and their intent to apply information to future decisions, and Ohio Sea Grant is gathering further information from participants on specific implementation challenges.

Short/Mid-Term Outcome: *Lake Erie watershed communities engage in visioning, resource inventories, analysis of development policies, and education of community leaders and citizens.*

Measurable Objective: By 2013, a plan will have been developed for increasing coastal community awareness and participation in the Ohio Business Retention and Expansion program, as well as other applicable planning products available through OSU.

Measurable Objective: By 2013, 10 communities will have been involved in visioning, resource inventories, analysis of development policies, and education of community leaders and citizens with the assistance of Ohio Sea Grant.

Short/Mid-Term Outcome: *Lake Erie watershed communities are able to analyze the impacts and benefits of balanced growth practices and alternative development scenarios on coastal resources and economies.*

Measurable Objective: By 2013, three case studies related to implementation of balanced growth will have been developed.

Measurable Objective: By 2013, training and technical resources related to sustainable development practices, such as balanced or smart growth,

will have been provided to 150 officials in coastal communities. Ohio Sea Grant will obtain these outcomes through the following strategies:

Sustainable Coastal Development Strategy 1A:

Support research, education, and outreach activities that provide Ohio's coastal communities and elected officials with information, training, and tools to help them enhance working waterfront-related economic activities without diminishing the long-term health of Lake Erie and its coastal resources. These activities include commercial and recreational fishing, tourism, outdoor recreation, renewable energy strategies, port development and marine trades.

Sustainable Development Research and Science

Strategic Action: Determine research priorities related to sustainable waterfront development using regional decision-maker needs assessments, indices of ecosystem qualities, and evaluations of the economic impact potential of projects, such as commercial and recreation fishing, aquaculture, local government development projects, energy development, tourism, and port development.

Implementation Step: Matt Thomas will review the Ohio Coastal Training Program needs assessment and the Lake Erie Quality Index to determine the research needs of key stakeholders.

Implementation Step: Frank Lichtkoppler will coordinate the Ohio Sea Grant Extension Network efforts to identify key research needs in extension agents' industry sectors and communities.

Implementation Step: Frank Lichtkoppler will seek assistance from social scientists to help identify a methodology for measuring the economic benefits of Ohio Sea Grant activities. Where possible, he will seek to work with others to identify the values and impacts of Lake Erie natural resources using appropriate cost benefit tools, such as willingness to pay, travel cost, etc.

Implementation Step: Melinda Huntley will work with the Ohio Department of Development Tourism Division to generate economic impact studies of tourism within coastal counties.

Strategic Action: Ensure Sea Grant research is able to be applied by stakeholders to achieve sustainable waterfront development.

Implementation Step: Eugene Braig will require substantive user engagement in all Ohio Sea Grant-funded research projects and will require that an Ohio Sea Grant Extension agent takes part in all stages of research projects, from problem identification to project implementation.

Implementation Step: Eugene Braig will ensure that training is provided during Ohio Sea Grant research open houses to integrate engagement and outreach into proposals.

Island Guidebook Attracts New Market and its Dollars

More and more people today want to experience the outdoors while on vacation. Thanks to *Explore the Lake Erie Islands: A Guide to*



Nature and History along the Lake Erie Coastal Ohio Trail, more of these visitors will spend their dollars on a Lake Erie Island. The guidebook reveals parks, preserves, stories, and historical sites on U.S. and Canadian Lake Erie islands.

"This publication is beneficial not only to each individual site, but also to the many businesses and communities throughout the region that depend on these visitors for much of their income," says Larry Fletcher, executive director Lake Erie Shores and Islands West.

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

As natural areas become more important to a community's ability to attract visitors, local businesses and decision makers begin to better see their economic value, in addition to their ecological significance.

Strategic Action: Evaluate effectiveness of Sea Grant programs integrating research, education and outreach.

Implementation Step: Frank Lichtkoppler and Joe Lucente will develop instruments to measure the effectiveness and implementation rate of Ohio Sea Grant research, education, and outreach with community and land-use planners participating in programs.



Strategic Action: Anticipate future information needs and conduct research to inform local, state, and federal policy decisions impacting Lake Erie.

Implementation Step: Upon assignment by Jeff Reutter, various Ohio Sea Grant Extension agents will prepare written analysis of economic and environmental implications of existing and pending regional and national policy recommendations (ie., Great Lakes Regional Collaboration, IJC strategies, implementation legislation of the Great Lakes Compact) for Lake Erie coastal communities, as well as for potential researchers.

Implementation Step: Jeff Reutter and all agents will convene, consult, and/or attend research and policy analysis forums to identify potential future challenges and opportunities related to the ecological and economic sustainability of Lake Erie.

Implementation Step: Joe Lucente will lead Ohio Sea Grant efforts to conduct a needs assessment to identify and prioritize sustainable development research and training needs of local, state, and federal policymakers.

Implementation Step: Eugene Braig will tailor a round of research RFPs to meet the information needs of policymakers.

Implementation Step: Ohio Sea Grant will consider funding research and policy analysis to meet the future information needs of policymakers, evaluating and analyzing the economic and ecological impacts of recommended actions within existing and future local, regional, Great Lakes, or national plans to proactively inform policy decisions.

Strategic Action: Support efforts to document the socio-economic values and contributions of Lake Erie and Great Lakes resources on the management and use of Lake Erie and Great Lakes resources.

Implementation Step: Melinda Huntley will continue to serve as chairman of a steering committee designed to assist in the development and implementation of an America's Byways Resource Center Economic Impact Tool for national scenic byway leaders to measure the economic impact of Federal Highway Administration byway designations.

Educated Lake Erie Community Leaders

Strategic Action: Increase the awareness and knowledge levels of elected officials about coastal Great Lakes and Lake Erie sustainable development issues, research-based solutions, and Ohio Sea Grant's role in meeting these challenges.



Implementation Step: All Ohio Sea Grant Extension agents will assist with the Congressional and Legislative Days event every other year to inform state and federal policymakers about issues related to Lake Erie.

Implementation Step: All Ohio Sea Grant Extension agents will assist when needed with developing content for the annual Mayors and Elected Officials Day training workshop at Stone Laboratory.

Implementation Step: Frank Lichtkoppler will develop or adopt a survey to measure knowledge increases and intention to apply knowledge among participants in Sea Grant-coordinated events for local, state, and national policymakers.

Implementation Step: All Ohio Sea Grant agents will provide information and resources to policymakers and elected officials based on their needs for decision making.

Implementation Step: Jeff Reutter and Melinda Huntley will represent Lake Erie ecological issues and tourism industry needs on the Ohio Great Lakes Compact Advisory Board.

Implementation Step: Joe Lucente will partner with the Greater Toledo Area Chamber of Commerce to offer the Toledo Leadership Academy for elected, appointed, and volunteer community leaders.

Implementation Step: Jeff Reutter or Eugene Braig will provide information briefings and program updates at least once a year to the State of Ohio Administration.

Implementation Step: Joe Lucente will develop at least one written policy analysis reflecting a key issue facing local, state, and federal policymakers.

Implementation Step: All Ohio Sea Grant Extension agents will initiate contacts with county commissioners, mayors, township trustees, chamber of commerce directors, economic development leaders, planning commissioners, etc., to increase their awareness of Ohio Sea Grant as a resource, provide informal outreach and education, and assist them in offering formal outreach and education related to coastal economic development.

Implementation Step: John Hageman and Matt Thomas will continue to host elected officials for tours of Stone Laboratory and trips onboard a research vessel to expand their awareness and knowledge of Ohio Sea Grant and Lake Erie.

Implementation Step: All Extension agents will provide sustainable development and leadership training and information for existing and emerging local community leaders.

Lawmakers See, Touch, & Experience Lake Erie



State and federal lawmakers make important decisions every day that ultimately impact our Great Lake. To help these elected officials better understand the issues and cast informed votes, Ohio Sea Grant has hosted State Legislature and Congressional Days since 1982.

Policymakers not only hear about the challenges and opportunities facing the region's environmental health and economy, but they also get the chance to appreciate the lake by participating in interactive events, including those that give them firsthand experience with Ohio Sea Grant's research, education, and outreach activities. The day is also a time to honor some of Ohio Sea Grant's key partners, highlighting the importance of working together for a healthy Lake Erie.

"Our accomplishments at Ohio Sea Grant have been many and significant, but they have all been built around and fostered by strong partnerships involving government, academia, and the private sector," says Dr. Jeff Reutter, Director of Ohio Sea Grant.

"I think it's important to add more programming for Ohio Sea Grant because we're learning more and more about how to take care of our most valuable natural resource, Lake Erie," said Ohio Senator Teresa Fedor. "It is critically important to promote public awareness to enable future funding."

Implementation Step: Joe Lucente will develop a Lake Erie information and sustainability module for local leadership programs to integrate into existing curriculum.

An Economy on the Rise

Strategic Action: Conduct new or enhance existing Ohio business retention and expansion programs within coastal counties.

Implementation Step: All Ohio Sea Grant Extension agents will assist with OSU Ohio Business Retention and Expansion programs being conducted in coastal counties.

Implementation Step: Joe Lucente will lead efforts for increasing coastal awareness and participation in the Ohio Business Retention and Expansion program, as well as other applicable planning products available through Ohio State University.

Implementation Step: Joe Lucente and all agents will work with coastal communities and businesses in an effort to inform and educate them about the benefits of adaptive re-use of former brownfield sites.

More Lake Erie Anglers

Strategic Action: Increase Lake Erie fishing efforts, and subsequently the economic impact of anglers, through statewide and regional education and outreach focused on topics like locations and methods for popular fish species, opportunities for under-utilized sport fish species, and other topics.

Implementation Step: Tory Gabriel will develop programming to increase fishing efforts for under-utilized Lake Erie sport fish species.

Implementation Step: Dave Kelch will continue to conduct programs and seminars related to Lake Erie angling opportunities, methods to prepare under-utilized species for consumption, and updates on the Lake Erie fishery to foster more informed users.

Strategic Action: Develop, coordinate, and conduct education and outreach focused on increasing the public's understanding of fisheries science to increase fishing participation and to increase proficiency among resource users.

Implementation Step: Dave Kelch, Tory Gabriel, and Colleen Wellington will lead OHSG efforts to conduct education and outreach on Lake Erie fisheries, water quality, and other issues at the Cleveland Boat and Sport Shows.

Strategic Action: Develop, coordinate, and conduct education and outreach focused on increasing fishing among under-represented audiences, such as women and youth.

Implementation Step: Tory Gabriel will partner with other OSU Extension agents to organize and instruct 4-H Sea Camp, a program that involves under-represented audiences like women and youth in hands-on fishery programming.



Strategic Action: Support an emerging tributary steelhead fishery through research, education, and outreach.

Implementation Step: Dave Kelch will work to promote the Ohio steelhead fishery via presentations, media releases, and *Twine Line* articles.

Strategic Action: Help develop the next generation of fisheries professionals and anglers through educational programming and activities at F.T. Stone Laboratory and Ohio State University.

Implementation Step: Tory Gabriel will serve as an instructor for PAES 140: Lake Erie Sport Fishing, a course offered through Stone Laboratory to increase sport fishing.

Strategic Action: Conduct research to improve Lake Erie fish habitats and populations in coastal Lake Erie marinas by placing structures to promote both fish concentration and spawning habitat.

Implementation Step: Tory Gabriel and Colleen Wellington will explore the potential to increase fish habitat structures at commercial marinas.

Charter Captains Making a Profit

Strategic Action: Increase profitability and sustainability in the charter fishing industry through business and technology development and education.

Implementation Step: Tory Gabriel will conduct an annual charter captains conference with information, training, and resources related to business management, technology development, market analysis and development, and promotional strategies.

Implementation Step: Tory Gabriel will help charter fishing and other marine businesses to incorporate new technologies that will strengthen their profit margins, efficiency, or ability to meet customer expectations.

Implementation Step: Tory Gabriel will assist the charter fishing industry in developing new marketing strategies directed at under-represented audiences.

Implementation Step: Tory Gabriel, Dave Kelch, and Matt Thomas will explore the feasibility of expanding charter industry operations to include SCUBA diving charters.

Strategic Action: Support research to define the economic impact of the charter fishing industry.

Implementation Step: Tory Gabriel and Colleen Wellington, with the assistance of Frank Lichtkoppler, will conduct social science surveys and assist in developing and implementing the 2010 Ohio Lake Erie Charter Industry Survey.

Implementation Step: Frank Lichtkoppler will assist Tory Gabriel and Colleen Wellington in reporting the results of the 2010 Ohio Lake Erie Charter Industry Survey in written and oral peer-reviewed venues.

Study Offers Snapshot of Ohio Charter Industry

In 2006, charter fishing clientele spent an estimated \$12.8 million on charter fees. They spend another \$11 to \$13 million each year in nearby restaurants, hotels, and retail shops. Keeping track of spending trends provides an important look at the Ohio charter fishing industry and its contributions to the economy of Lake Erie communities.



Since 1985, Ohio Sea Grant has led a continuing study to do just that, with the most recent results being published in the October 2008 edition of *Fisheries*, the peer-reviewed magazine of the American Fisheries Society.

Most recently, Sea Grant Extension Specialists Frank Lichtkoppler, Fred Snyder, and Kelly Riesen saw an increase in the number of charter trips per firm, from 42.1 in 2002 to 44.7 in 2006. The charter business is generally a secondary source of income for most Ohio charter captains.

Lake Erie charter fishing continues to bring natural resource-based tourism dollars into local lakefront communities. The results from the survey help identify training needs that can be addressed at Ohio Sea Grant's annual Ohio Charter Captains Conference. This conference provides education to charter captains, strengthening their bottom lines and ability to attract clients. And the more clients who fish Lake Erie, the more local businesses benefit from increased spending.

Diversified and Healthy Tourism Economy

Strategic Action: *Support research, education and outreach to tourism industry leaders and agency officials in the State of Ohio to enhance their understanding and ability to implement resource-based sustainable tourism strategies.*

Research Implementation Step: “Socio-Economic Impacts of Birdwatching along the Great Lakes,” Xie, P.; Bowling Green State University; February 2010-January 2011; newly funded.

Implementation Step: Melinda Huntley will provide information, training and assistance to state agency officials and staff to enhance their understanding and improve the effectiveness of partnerships with the state’s tourism industry.

Implementation Step: Melinda Huntley will coordinate and co-lead the Ohio Tourism Leadership Academy, a year-long leadership development curriculum that seeks to better prepare future state tourism leaders by informing them of sustainable tourism responsibilities, enhancing their communications skills, introducing them to key decision-makers, and educating them on the challenges and opportunities of creating a strong tourism industry.

Implementation Step: Melinda Huntley will develop nature-based tourism learning tools and modules, including fact sheets, video recordings, and other materials designed to enhance the ability of Ohio’s tourism industry and resource providers to create exceptional nature-based tourism experiences.

Implementation Step: Melinda Huntley will routinely provide new information and content for the Ohio Tourism Toolbox, a collaborative project between Ohio Sea Grant, OSU Extension, and the Ohio Department of Development.

Implementation Step: Melinda Huntley will provide workshops and training to the state’s tourism industry on developing resource-based tourism projects, becoming a resource for elected officials, enhancing the roles and responsibilities of tourism within local communities, and other topics as needed and defined.

Implementation Step: Dave Kelch will continue to serve on the Lorain County Visitors Bureau Board of Directors, providing input on Lake Erie-related tourism possibilities and promotions, including the fall and winter steelhead fishery.

Implementation Step: All Ohio Sea Grant Extension agents will develop formal linkages with the visitors’ bureaus in their respective counties to assist with developing marketing strategies and to provide research, education, and outreach as needed by industry members.



Strategic Action: Explore developing a Great Lakes tourism initiative to promote sustainable tourism in the Great Lakes and enhance the Great Lakes image and long-term economic vitality.

Implementation Step: Melinda Huntley will continue to work with Great Lakes state tourism leaders to explore the development of a Great Lakes Tourism Initiative. The initiative will address the need to enhance the image of the Great Lakes and expand public access as defined by the Great Lakes Restoration Collaboration and the Brookings Institute.

Strategic Action: Develop new regional products to enhance the demand and quality of resource-based experiences.

Implementation Step: Melinda Huntley will work with the Ohio Department of Natural Resources Division of Wildlife to create new products to both promote and enhance birding in the coastal region.

Implementation Step: Dave Kelch, Joe Lucente, Matt Thomas, and Melinda Huntley will work toward enhancing the shipwreck experience within the coastal region by promoting the Ohio shipwreck website and publication.

Implementation Step: Melinda Huntley will coordinate and manage the Lake Erie Coastal Ohio Trail scenic byway.

Implementation Step: Melinda Huntley will complete the development of an Ohio, Michigan, and Pennsylvania collaborative project to promote maritime heritage sites along national scenic byways.

Strategic Action: Provide education, information and training to Ohio's coastal tourism businesses and visitors bureaus.

Implementation Step: Dave Kelch, Joe Lucente, and Melinda Huntley will identify and communicate diving resources to augment *Shipwrecks and Maritime Tales along the Lake Erie Coastal Ohio Trail* to encourage visitors bureaus and tourism industry front-line employees to better serve the diving consumer.

Implementation Step: Melinda Huntley will provide recommendations and information for marketing strategies to coastal visitors bureaus that are aligned with resource-based opportunities through quarterly updates.

Implementation Step: Melinda Huntley will develop group tour itineraries linking Lake Erie maritime heritage sites for visitors bureaus to use in packaged tour promotional efforts.

Implementation Step: Melinda Huntley will coordinate birding field trips and workshops for visitors bureau staff and front-line employees of tourism businesses to familiarize these stakeholders with birders' expectations, information needs, and motivations.

Putting Shipwrecks on the Map Boosts Local Economies

Averaging just 62 feet in depth, Lake Erie is the shallowest of the Great Lakes, making it no wonder that you would find quite a few shipwrecks dotting its floor. But would you believe 1,700?

"People are amazed when they discover that Lake Erie has the most shipwrecks of any of the Great Lakes," says Ohio Sea Grant Extension's Dave Kelch. To increase local spending by divers and other visitors, Kelch and fellow Extension Educator Joe Lucente researched shipwrecks accessible from Ohio ports, thanks to a grant from the Ohio Lake Erie Commission and the Ohio Department of Natural Resources' Office of Coastal Management.

Twenty-eight shipwrecks are showcased on a brochure and at the Lake Erie Shipwrecks & Maritime Tales website at ohioshipwrecks.org. The website features a map pinpointing each Lake Erie shipwreck, as well as historical images and stories, underwater video clips, and descriptions of what divers can see.

The key to the project has been successful partnerships between Sea Grant and six area organizations. Representatives from the Peachman

Lake Erie Shipwreck Research Center in Vermilion, Bowling Green State University's Historical Collection of the Great Lakes, the Ohio Historical Society, as well as scuba experts from the Maritime Archaeological Survey Team and Cleveland Underwater Explorers worked with Extension to identify the sunken ships.



Russ MacNeil



Implementation Step: Melinda Huntley will identify market research needs of tourism businesses and visitors bureaus, existing research summaries, and/or opportunities for research needed by the industry.

Implementation Step: Melinda Huntley and Jill Jentes Banicki will coordinate a regional library of high quality images to be used by the tourism industry in sharing the Lake Erie story.

Implementation Step: Melinda Huntley will coordinate at least one training session for a specific tourism stakeholder audience.

Strategic Action: *Provide the education, information, and training needed by coastal resource managers to enhance the visitor experience, protect the environment as it faces increased use, and better connect with the tourism industry.*

Implementation Step: Melinda Huntley will provide education, information, and training for coastal resource managers to enhance the visitor experience, protect the environment as it faces increased use, and better connect with the tourism industry.

Strategic Action: *Enhance existing and develop new programs and products that reflect and motivate the coastal Ohio tourism industry's commitment to sustainability, including the Ohio Clean Marina and Clean Boater programs.*

Thriving Lake Erie Ports and Harbors

Strategic Action: *Increase profitability and sustainability of coastal Ohio's ports and harbors.*

Implementation Step: Colleen Wellington will assist the Great Lakes Shallow Harbor Coalition in working for the operations and maintenance dredging of Ohio's harbors.

Implementation Step: Dave Kelch will work with the Lorain Port Authority and the Black River RAP ECO2 committee to foster economic development and tourism along with environmental preservation and reclamation.

Implementation Step: Melinda Huntley will work with local harbor businesses looking to expand product offerings to enhance revenue.

Implementation Step: Joe Lucente will work on the Toledo HarborLands Initiative to use dredged spoils to create habitat and keep harbors open.

A Boating Industry Full of Promise

Strategic Action: *Increase profitability and sustainability of the Lake Erie marine trades industry through business and technology research, education, and outreach.*

Implementation Step: Colleen Wellington will summarize data on Ohio boat titles, new and transferred, which can be used by boat dealers when planning their purchases.

Implementation Step: Colleen Wellington and Frank Lichtkoppler will continue to cooperate with OSU Extension, the Ohio Department of Natural Resources (ODNR) Division of Watercraft, and the Lake Erie Marine Trades Association (LEMTA) to inventory and report boat sales figures within Ohio.

Implementation Step: Colleen Wellington and Frank Lichtkoppler will partner with economic researchers to upgrade and refine figures on the economic impact of boating in Ohio and develop a summary paper of the boat title sales data project for the period 1993 to present, in cooperation with the Ohio Division of Watercraft and the Lake Erie Marine Trades Association.

Strategic Action: *Support research to enhance our understanding of bioluminescence, biofouling, biocorrosion, biofilm function, and symbiosis in order to develop antifouling and anticorrosion products, and network with other Great Lakes Sea Grant programs to develop and disseminate new information.*

Collaboration with other Experts

Strategic Action: *Use specialists and editors from all program areas in Ohio State University Extension to create a comprehensive and functioning sustainable development outreach team.*

Implementation Step: Joe Lucente will network with OSU Extension Community Development educators and other professionals to advance balanced growth program efforts.

Implementation Step: Melinda Huntley and Joe Lucente will work with OSU Extension to coordinate marketing materials for sustainable community tools produced by OSU Extension and the university that are appropriate for coastal communities.

Implementation Step: All Ohio Sea Grant Extension agents will work to network with OSU Extension faculty and staff to conduct educational programs in the Lake Erie watershed.

Sustainable Coastal Development Strategy 1B:

Support efforts to preserve and increase public access to Lake Erie beaches and waterfronts through assessments of access needs, analysis of legal issues, technical assistance, and assistance in reducing the number of beach advisories

Increased Public Access

Strategic Action: *Promote increased access and appropriate use of coastal resources that can be linked to an increased economic impact and improved quality of life.*

Boat Shrink-Wrap Recycling Program Guards Against Waste

Every year in Ohio, hundreds of thousands of pounds of shrink wrap are removed from boats as warm weather ushers in a new boating season. Much of this material used to end up in landfills. In 2006, the Ohio Clean Marinas Program and Mondo Polymer Technologies Inc. partnered to launch the Boat Shrink-Wrap Recycling Program, giving marina owners and boaters a cost-effective and eco-friendly way to dispose of their boat shrink wrap.

Today, more than 117 marinas serve as shrink-wrap collection points all along Ohio's Lake Erie coast, keeping more than one million pounds of shrink wrap and greenhouse plastic out of area landfills to date. That plastic, in turn, has been made into roughly 150,000 guardrail spacer blocks—enough to protect nearly 200 miles of Ohio highway with reusable material that costs taxpayers less. The effort has been so successful that five other states—New York, Pennsylvania, Michigan, Maryland, and Delaware—have contracted with Mondo to have their own shrink wrap recycled in the Buckeye State.

In July 2009, the Shrink-Wrap Recycling Program received a Great Lakes Outreach Superior Programming Award from the Great Lakes Sea Grant Network. The award recognizes a multi-program or single state multi-partner initiative that has helped solve a problem of major importance in the Great Lakes basin.





Implementation Step: Melinda Huntley will coordinate the identification of existing and proposed public access areas to Lake Erie, as well as the challenges and issues related to increased access.

Implementation Step: Frank Lichtkoppler will work with researchers at OSU and other universities to update the economic impact data of beach visitation along the Lake Erie shoreline.

Implementation Step: Frank Lichtkoppler and Melinda Huntley will assist the Lake County Coastal Planning Committee in implementing the Lake County Coastal Development Plan to increase public access to Lake Erie.

Implementation Step: Colleen Wellington will lead the Extension agents in developing a *Lake Erie Coastal Community Guide to Waterfront Access*, incorporating best practices, key issues, and solutions and tools for increasing access.

Implementation Step: Melinda Huntley will coordinate activities to increase participation in beach activities, thus increasing economic impacts.

Clean and Healthy Beaches

Strategic Action: *Identify needs and facilitate delivery of research, education, and outreach to beach managers along Lake Erie.*

Implementation Step: Frank Lichtkoppler will work with Sonia Joseph at the NOAA Center for Excellence & Human Health to investigate the need for and coordinate an educational needs assessment of beach managers.

Implementation Step: Melinda Huntley will work with the Cuyahoga County Board of Health and the Ohio Health Department to explore new ways to provide user-friendly beach monitoring.

Implementation Step: Melinda Huntley will work with the Cuyahoga County Board of Health to develop training programs and training products for beach managers, as well as to promote the use of beaches.

Implementation Step: All agents will network with Sonia Joseph at the NOAA Center for Excellence & Human Health to relay information regarding potential health impacts of algae blooms and other potential health issues, so citizens may make informed decisions about safely swimming in Lake Erie.

Implementation Step: All agents, as appropriate, will network with Sonia Joseph at the NOAA Center for Excellence & Human Health to develop and present programs to train natural resource and health managers, lake associations, and local government officials on algal ecology, blue-green algae identification, monitoring and analytical techniques, health and animal health risks, and communicating and engaging the media and public.



Strategic Action: Assist coastal communities with planning to enhance coastal parks, beaches, and marina facilities.

Implementation Step: All Ohio Sea Grant Extension agents will work with coastal communities to enhance coastal parks, beaches, and marina facilities.

Sustainable Coastal Development Strategy 1C:

Engage Lake Erie coastal communities in planning processes that support the efforts of community leaders to identify and pursue sustainable economic development policies and programs.

Choices Based on the Environment and the Economy

Strategic Action: Increase understanding of the economic and environmental consequences of land, energy, and water use decisions and coastal building design choices among government leaders and business owners.

Research Implementation Step: “Leveraging Natural Amenities for Sustainable Development in the Great Lakes Region,” Partridge, M. and Irwin, E.; Ohio State University; February 2010 – January 2013; newly funded.

Implementation Step: Joe Lucente will implement educational programming to help decision-makers understand the economic and environmental consequences of land, energy, and water use decisions and coastal building design choices.

Strategic Action: Increase understanding and the ability to implement balanced growth practices among local officials to achieve sustainable waterfront development.

Implementation Step: Joe Lucente will provide training and technical assistance to help local officials implement balanced growth practices.

Implementation Step: Joe Lucente will lead Ohio Sea Grant in conjunction with the Ohio Lake Erie Commission in developing case studies related to implementation of balanced growth.

Plans for the Future

Strategic Action: Assist coastal communities in planning for a sustainable future.

Implementation Step: Joe Lucente will identify and network with appropriate existing OSU Extension programs that deal with community development, such as the Exurban Change program, and help communities make sustainable decisions.

Implementation Step: Melinda Huntley will coordinate development of a Lake Erie Coastal Ohio Trail Phase II implementation plan for the Lake Erie coast.

Ohio Tourism Team Opens the Toolbox



Tourism is big business in Ohio, bringing in \$38 billion each year from a wide variety of businesses, including hotels, attractions, and restaurants. In 2008, Ohio State University Extension's Ohio Tourism Team recognized the key to tourism's continued growth lies in encouraging new business ventures and in educating business owners and destination marketers to strengthen product development. The Ohio Tourism Toolbox at ohiotourism.osu.edu brings together information to help foster those connections, making it available in one online resource.

The Ohio Tourism Team worked directly with the Ohio Department of Development's Tourism Division, which provided match funding to an OSU Extension grant. Together, the group assembled links to resources on a number of topics, including starting a new business, taking advantage of collaborative marketing opportunities, identifying trends, gathering community input, and creating new products. New material is constantly being created by team members, such as a training video on nature-based tourism and expert podcasts on the use of social media.

“We envision the Ohio Tourism Toolbox to be ever-changing to keep pace with the ever-changing needs of this dynamic industry,” says Melinda Huntley, Ohio Sea Grant Tourism Program Director. “Our goal is to make this an industry resource that can be used to create an even stronger Ohio.”



Implementation Step: Frank Lichtkoppler will network with the Coastal Services Center and the Coastal Training Program to provide Extension agent training to upgrade group facilitation and other skills.

Implementation Step: When appropriate, Ohio Sea Grant Extension agents will provide training and technical support to assist communities with development of watershed balanced growth plans that protect Lake Erie and maximize economic vitality and quality of life with Ohio Coastal Training Program Partners.

Implementation Step: When appropriate, Ohio Sea Grant extension agents will collaborate and/or lead efforts with the Ohio Department of Natural Resources (ODNR), the Ohio Environmental Protection Agency (OEPA), the Ohio Lake Erie Commission, OSU Extension, and local communities to develop watershed management plans for every Lake Erie watershed in Ohio.

Sustainable Coastal Development Goal 2:

Coastal communities that make efficient use of land, energy, and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: Lake Erie coastal communities determine the sustainable carrying capacity of their land, water, and other resources.

Measurable Objective: By 2013, a tool, or collection of tools, will have been identified to assist communities in measuring the carrying capacity of their resources.

Short/Mid-Term Outcome: Lake Erie coastal communities use a variety of tools and technologies to adopt policies to protect the sustainable ecosystem footprint needed to sustain coastal, marine, and Great Lakes ecosystems and implement community designs that are compatible with carrying capacity of coastal ecosystem and water resources.

Measurable Objective: By 2013, Ohio Sea Grant will have evaluated the development of a tool to measure a community's ecosystem footprint.

Short/Mid-Term Outcome: Lake Erie communities adopt practices that increase their energy efficiency and decrease use of fossil fuels (i.e., increase in walkability, increase in public transit, decrease in vehicle miles traveled, energy efficient building codes adopted).

Measurable Objective: By 2013, three communities will have implemented sustainable practices because of information, training, or assistance provided by Ohio Sea Grant and its partners.



Ohio Sea Grant will obtain these outcomes through the following strategies:

Sustainable Coastal Development Strategy 2A:

Strengthen Ohio Sea Grant's research activities and Extension capacity to help coastal communities determine the sustainable carrying capacity of their land, water, and other resources through resource assessments, cost-benefit analysis, scenario building, modeling, and other techniques.

Ability to Understand Sustainability

Strategic Action: *Develop or access education and outreach materials to encourage sustainable waterfront development by determining sustainable carrying capacity.*

Implementation Step: Joe Lucente will explore the development of a way to determine sustainable carrying capacity of our resources in cooperation with the Ohio Coastal Training Program, Old Woman Creek National Estuarine Research Reserve, the ODNR Office of Coastal Management, the NOAA Coastal Services Center, and the Ohio Lake Erie Commissions.

Sustainable Coastal Development Strategy 2B:

Support innovative research on land-use practices and building designs that promote energy and water conservation, coastal Lake Erie-related renewable energy technologies, and the creation of other tools to help communities grow in sustainable ways.

Renewable Energy

Strategic Action: *Provide research, education, and outreach on renewable energy technologies.*

Implementation Step: Jeff Reutter will seek support to use Stone Laboratory as an experimental and demonstration facility for green building technologies, including solar energy as well as weighing the potential impacts of wind energy on migratory birds.

Implementation Step: Jeff Reutter, Eugene Braig, John Hageman, and Matt Thomas will arrange for the installation of solar panels on the Laboratory classroom building and replace all incandescent light bulbs with florescent light bulbs.

Implementation Step: Eugene Braig will adapt Ohio Sea Grant's RFP cycle to include a focus on academic research on land-use practices and building designs that promote energy and water conservation, coastal Lake Erie related renewable energy technologies, and the creation of other tools to help communities grow in sustainable ways.

Implementation Step: All Ohio Sea Grant Extension agents will disseminate information, provide training, and participate in discussions regarding new technologies for energy production, as well as assist communities in making decisions regarding these technologies (i.e., solar, wind energy).

Cleaning Up Lake Erie, One Marina and Boater at a Time

Ohio Clean Marinas boost profits while improving Lake Erie. Through a partnership with Ohio Sea Grant, the Lake Erie



Marine Trades Association, and the Ohio Department of Natural Resources, the Ohio Clean Marinas Program has certified 42 Lake Erie marinas, with 28 marinas pledged to be certified in the next year. It's a process that benefits marina communities and the entire Lake Erie ecosystem, according to Colleen Wellington, program coordinator.

"The primary benefit of the Clean Marinas Program for marinas is an enhanced image," she says. "Nationwide, 30% of Clean Marina operators attribute an increase in dock sales to their participation in the program."

Wellington explains that Lake Erie benefits from the program through a reduction in non-point source pollution thanks to the guidelines required of certified Clean Marinas. "Marinas are not substantial pollution generators, but because of their proximity to the shore, their activities impact the lake.



Boaters, too, can help clean up Lake Erie by becoming an Ohio Clean Boater and taking the Clean Boater Pledge, available online at

ohiocleanboater.osu.edu and at any certified Clean Marina. The pledge encourages individuals to be environmental stewards by following Best Boater Practices to keep oil, sewage, toxic boat cleaning and maintenance products, plastics, cigarette butts and other trash, fishing gear, and invasive species out of the water.



Sustainable Coastal Development Strategy 2C:

Help Lake Erie communities evaluate their ecological footprints and grow in environmentally sustainable ways, focusing on products developed in cooperation with NOAA's Climate Change Program Office, Lake Erie coastal programs, and other partners.

Measurements of Community Ecological Footprints

Strategic Action: Evaluate the development of a tool to measure a community's ecosystem footprint.

Implementation Step: Provide assistance to communities in identifying their ecological footprints and develop programs to minimize impact.

Implementation Step: John Hageman and Matt Thomas will determine the carbon footprint of Stone Laboratory and publicize our efforts and progress to reduce it.

Implementation Step: Joe Lucente will investigate ways to adopt or develop a methodology to measure the ecological footprints of coastal communities.

Sustainable Coastal Development Goal 3:

Lake Erie coastal citizens, community leaders, and industries that recognize the complex inter-relationships between social, economic, and environmental values in coastal areas and who work together to balance multiple uses and optimize environmental sustainability.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: Lake Erie coastal communities adopt mitigation measures, best management practices, and improved site designs (low-impact development, green building design, natural area planning, wild habitat corridors, bio retention areas, vegetative swales) in local policies and ordinances.

Measurable Objective: By 2013, 50 coastal communities will have been provided information by Ohio Sea Grant and its partners related to mitigation measures, best management practices, and improved site designs, as well as examples of ways these efforts have been integrated into other policies and ordinances.

Short/Mid-Term Outcome: Lake Erie coastal communities are able to evaluate cost-benefit trade-off in the coastal area.

Measurable Objective: By 2013, at least two new research projects will focus on socio-economic research/outreach cost-benefits for local communities.

Growth plans, policies, and strategies are developed and adopted to protect local and regional natural resources to serve future generations.

Measurable Objective: By 2013, 10 coastal communities will have involved Ohio Sea Grant in their discussions regarding sustainable planning.

Short/Mid-Term Outcome: Lake Erie coastal communities adopt and employ comprehensive land-use planning and community design techniques that protect valuable coastal resources and minimize the impact of the built environment and sustain coastal environments.

Measurable Objective: By 2013, five coastal communities will be involved in the Balanced Growth Program or are otherwise incorporating sustainable development principles, such as smart growth, into their comprehensive planning efforts.

Sustainable Coastal Development Strategy 3A:
Work with NOAA's Office of Ocean and Coastal Resource Management, NOAA's Coastal Services Center, the Environmental Protection Agency Offices of Smart Growth, and regional and local partners to disseminate assessment tools, model plans, and ordinances, best management practices, alternative development approaches and other techniques that will enable the citizens of Lake Erie to develop their coastal economies in environmentally sound ways.

Best Management Practices

Strategic Action: Provide information to coastal communities related to mitigation measures, best management practices, and improved site designs, as well as examples of how these efforts have been integrated into other policies and ordinances.

Implementation Step: Ohio Sea Grant will support or fund research, education, and outreach on performances of sustainable coastal development best management practices and distribute results.

Implementation Step: Ohio Sea Grant will support or fund projects that look at product life-cycle costs and full cost analysis of environmental functions.

Implementation Step: Joe Lucente will develop or adopt model ordinances and sample plans and provide education and outreach to community stakeholders for implementation.

Implementation Step: Joe Lucente will work with the Ohio Lake Erie Commission to help promote model ordinances and plans.

Sustainable Coastal Development Strategy 3B:
Build Ohio Sea Grant's capacity to evaluate cost-benefit trade-offs in the coastal zone through a greater emphasis on socio-economic research, impact studies, benefit/cost research and other methods of evaluating alternative future scenarios for coastal communities.

Researcher to Determine Economic Impact of Birdwatching in Ohio

The shores of Lake Erie provide an important resting place for migratory birds as they journey south each fall and north each spring. Where there are birds, there are birdwatchers, bringing with them considerable spending power.

"Ohio's 2.4 million birdwatchers are usually Baby Boomers with an average individual income over \$50,000," says Ohio Sea Grant researcher Dr. Philip Xie, Associate Professor in the School of Human Movement, Sport, and Leisure Studies at Bowling Green State University. "One-third of that population has at least one college degree. It's a high-end market."

In the coming year, Xie plans to find out how much these birdwatchers are impacting the Ohio economy. The information he uncovers could be used by resource managers, conservation groups, local officials, and tourism organizations to improve and preserve natural areas, enticing new visitors—and their dollars—to the Buckeye State.

Xie's study will focus on six sites near Lake Erie. "We'll ask how much are they spending on transportation, food, accommodations, and equipment while they're here. We'll also ask for feedback on what they like and what they'd like to see improved."

By exploring the expectations of birders, Xie's research can help resource managers, local governments, and tourism groups hone their facilities and programming to satisfy a variety of visitors. Preliminary data will be available in spring 2011.



Economic Research to Identify Impacts and Values

Strategic Action: Enhance delivery of socio-economic research to address needs of coastal communities.

Implementation Step: Frank Lichtkoppler will lead all agents in seeking resources to update previous estimates of the values of Lake Erie natural resources, such as fisheries, beaches, natural areas, public access to Lake Erie, amenities desired by coastal residents and visitors, etc.

Implementation Step: Frank Lichtkoppler will lead all agents in networking with economic professors in the Ohio State University College of Food, Agriculture, and Environmental Science to provide real-life issues and applied research questions that could benefit from benefits/cost analysis.

Implementation Step: All Ohio Sea Grant Extension agents will seek projects that enhance the economic value of Lake Erie and improve management of Lake Erie, including projects that can create jobs and enhance economic activity through improved practices, product creation, and specialized training. Human dimension studies and proposals documenting the economic value of Lake Erie natural resources and the impact of cleanups to Lake Erie Areas of Concern will also be encouraged.

Cost-Benefit Analysis to Help Make Decisions

Strategic Action: Increase Ohio Sea Grant's capabilities to provide accurate benefits/cost analysis estimates for local issues.

Implementation Step: Joe Lucente will work with OSU economists and the Great Lakes Sea Grant Community Development agents to explore the potential for developing an Extension agent workshop on conducting benefits/cost analysis and other economic tools for community decision-making.

Identification of Barriers to Sustainable Development

Strategic Action: Network with other agencies (such as the EPA, the Ohio Lake Erie Commission, Old Woman Creek National Estuarine Research Reserve, etc.) interested in balanced growth to identify issues and impediments to implementing balanced growth in the Lake Erie coastal zone.

Implementation Step: Joe Lucente will work closely with the Ohio Lake Erie Commission to identify barriers to balanced growth, expand Extension agent knowledge of these barriers, and outline methods for overcoming them.



Russ MacNeil



Sustainable Coastal Development Strategy 3C:

Foster regional cooperation and partnerships among local government officials, community stakeholders, and regional planning organizations to promote sustainable growth plans and strategies that protect local and regional natural resources to ensure an abundance of these resources are available for future generations.

Collaborative Research

Strategic Action: Foster and coordinate research that will identify and solve basic ecological questions relevant to the Lake Erie ecosystem through collaborative networks, such as the Lake Erie Millennium Network and the Great Lakes Regional Research Information Network (GLRRIN).

Implementation Step: Jeff Reutter will continue to lead GLRRIN and other cooperative efforts to coordinate Great Lakes research.

Sustainable Development Education

Strategic Action: Leverage existing programs and partnerships for the ability to communicate sustainable coastal development principles and projects

Implementation Step: Joe Lucente and Melinda Huntley will develop a Lake Erie and sustainable development module for existing leadership training programs.

Implementation Step: John Hageman and Matt Thomas will incorporate sustainable growth principles in the course curriculum at Stone Laboratory.

Implementation Step: All Ohio Sea Grant Extension agents will promote regional cooperation among Great Lakes Sea Grant Programs through the Great Lakes Research and Outreach Consortium.

Collaborative Strategies to Strengthen Education and Outreach

Strategic Action: Develop a joint education and outreach strategic plan for the "Lake Erie Partnership," representing Ohio Sea Grant, Old Woman Creek National Estuarine Research Reserve, ODNR's Coastal Management Program, and the Ohio Lake Erie Commission.

Implementation Step: Melinda Huntley, Frank Lichtkoppler, and Jill Jentes Banicki will represent Ohio Sea Grant on the Lake Erie Partnership.

Strategic Action: Collaborate with coastal partners in implementing the decision-maker education and outreach strategies identified by the Ohio Coastal Training Program.

Implementation Step: Joe Lucente will represent Ohio Sea Grant on the Ohio Coastal Training Program.

Ohio Tourism Leadership Academy Provides Tools to Move Ohio Forward

Tourism is big business for Lake Erie communities, contributing more than \$10 billion in direct spending. The health of the Lake Erie tourism industry is vital for Ohio, as it represents nearly a third of total tourism economic impact.

Policy decisions made by state industry leaders contribute to the health of the industry, yet these industry leaders are often not prepared to take on the tasks. Recognizing the powerful role tourism industry leaders could play if they were armed with the necessary tools, contacts, and knowledge to make informed decisions, the Ohio Travel Association launched the Ohio Tourism Leadership Academy in 2008. This training ground for state leaders is led by Diana Thompson, Executive Director for the Miami County Visitors Bureau, and Melinda Huntley, Tourism Director for Ohio Sea Grant Extension and past president of the Ohio Travel Association.

Leadership Academy class members focus on five key topics: arts and culture, economic development, natural resources and outdoor recreation, legislative advocacy, and heritage and culture. Discussions center on the issues and opportunities facing those who manage these areas in Ohio, and they help build partnerships and foster new ideas.

Since graduating in October, the 16 members of the 2009 Inaugural Class have already applied what they've learned, with 80% of participants accepting or pursuing tourism leadership roles.



FOCUS AREA – SAFE AND SUSTAINABLE SEAFOOD SUPPLY

GOALS	STRATEGIES How Ohio Sea Grant will achieve its goals	SHORT/MID-TERM OUTCOMES and <i>Measurable Objectives</i> What Ohio Sea Grant will achieve within the next four years, and how these achievements will be measured	LONG-TERM OUTCOMES and <i>Performance Measures</i> What Ohio Sea Grant will achieve long-term, and how these achievements will be measured
Safe and Sustainable Seafood Supply Goal 1: Sustainable fisheries to meet public demand.	Safe and Sustainable Seafood Supply Strategy 1A: Use Ohio Sea Grant’s research, extension, education, and communication capabilities to develop and disseminate essential knowledge about natural and human threats to the long-term viability of Lake Erie and Great Lakes fisheries, to identify ways to minimize these threats, and to use ecosystem-based fisheries management and other innovative approaches to accomplish these goals. Safe and Sustainable Seafood Supply Strategy 1B: Conduct integrated research, education, and outreach activities to support a viable domestic aquaculture industry with acceptable environmental impacts, in ways that are consistent with national objectives and that build on the leadership role Ohio Sea Grant plays in this area. Safe and Sustainable Seafood Supply Strategy 1C: Work with Great Lakes Fishery Commission, the Ohio Division of Wildlife, the National Sea Grant Program Office, other international, federal, provincial and state partners, and fishing industries to enhance the management and productivity of Lake Erie’s fisheries.	Short/Mid-Term Outcome: Natural and human threats to the long-term viability of Lake Erie’s fish populations are minimized. <i>Measurable Objective: By 2013, 1,000 stakeholders will have attended education programs that identify causes and control measures for minimizing the stresses to Lake Erie fisheries.</i> <i>Measurable Objective: By 2013, Ohio Department of Natural Resources will have an updated Ohio Aquatic Invasive Species Management Plan.</i> Short/Mid-Term Outcome: A viable domestic aquaculture industry with acceptable environmental impacts is supported. <i>Measurable Objective: By 2013, Ohio Sea Grant will assist in the development of a comprehensive education and outreach strategy with the aquaculture industry.</i>	Long-Term Outcomes: Ohio’s sport and commercial fisheries harvest and produce fish responsibly and efficiently. Long-Term Outcome: Lake Erie’s fisheries and Ohio’s aquaculture industry are sustainable and safe. Long-Term Outcome: Consumers make seafood purchasing choices that support a safe, valuable, and sustainable fishery. <i>Performance Measure: By 2013, Ohio Sea Grant will have reached 5,000 people with education and outreach related to the Lake Erie fishery.</i> <i>Performance Measure: By 2013, By 2013, Ohio Sea Grant will work with the Ohio Department of Natural Resources and other partners to update a statewide Ohio Aquatic Invasive Species Management Plan.</i>
Safe and Sustainable Seafood Supply Goal 2: A healthy Lake Erie fishery that harvests, produces, processes and/or markets fish products responsibly and efficiently.	Safe and Sustainable Seafood Supply Strategy 2A: Engage harvesters, recreational fishermen, aquaculturists, and managers in the development of research and management innovations related to the condition, use, and conservation of the Lake Erie and Great Lakes natural resources on which they depend. Safe and Sustainable Seafood Supply Strategy 2B: Support research, development, and transfer of new technologies to keep Lake Erie and Ohio fisheries financially competitive and environmentally responsible.	Short/Mid-Term Outcome: Anglers are knowledgeable, employ efficient fishing techniques, and understand the rationale behind fishing regulations. <i>Measurable Objective: By 2013, 1,000 fishermen will have participated in hands-on training to learn more about efficient fishing regulations.</i> Short/Mid-Term Outcome: Lake Erie and Ohio fish availability and fisheries profitability increase. <i>Measurable Objective: By 2013, Ohio Sea Grant will investigate the feasibility of developing at least two new Lake Erie or aquaculture fish products.</i>	
Safe and Sustainable Seafood Supply Goal 3: Informed consumers who understand the importance of healthy ecosystem and sustainable harvesting practices to the future of our Lake Erie fisheries, who appreciate the health benefits of fish consumption, and who understand how to evaluate the safety of the fish they catch.	Safe and Sustainable Seafood Supply Strategy 3A: Enhance training and technical assistance programs related to the application of standards for safe handling, preservation, and preparation of Lake Erie fish. Safe and Sustainable Seafood Supply Strategy 3B: Develop educational programs and materials that enhance the American public’s understanding of what is required to maintain a sustainable Lake Erie fishery and to build the public awareness of differences in the quality, safety, and nutritional benefits of sport-caught fish so they will be informed advocates and consumers. Safe and Sustainable Seafood Supply Strategy 3C: Work in close coordination with the Great Lakes Fishery Commission, Ohio Department of Natural Resources Division of Wildlife, and other partners to develop information portals that give access to factual information on the Lake Erie fishery.	Short/Mid-Term Outcome: Lake Erie fish consumers have an increased knowledge of the nutritional benefits of seafood products, know how to judge seafood safety and quality, and can apply this knowledge to make better choices when they purchase fish. <i>Measurable Objective: By 2013, 1,000 people will have been reached with information on preserving and preparing freshly caught Lake Erie fish.</i> Short/Mid-Term Outcome: Information portals are available to provide information related to Lake Erie fish safety and benefits, nutrition, and sustainability. <i>Measurable Objective: By 2013, the Ohio Lake Erie Discussion Board will have informed 4,000 individuals who visit to read posts and will have 200 registered users.</i>	

FOCUS AREA –

SAFE AND SUSTAINABLE SEAFOOD SUPPLY

Within the focus area of SAFE AND SUSTAINABLE SEAFOOD SUPPLY, the following long-term visions create the basis of the Ohio Sea Grant Strategic Plan:

Ohio's sport and commercial fisheries harvest and produce fish responsibly and efficiently.

Lake Erie's fisheries and Ohio's aquaculture industry are sustainable and safe.

Consumers make seafood purchasing choices that support a safe, valuable, and sustainable fishery.

To evaluate our progress toward these visions, the following represent the ways Ohio Sea Grant will measure our achievements.

Anglers and citizens reached through education and outreach related to and promoting the Lake Erie fishery.

Reduction of threats to Lake Erie's fishery, such as aquatic invasive species, and emerging issues, such as viruses and disease.

Goals for Safe and Sustainable Seafood Supply

Within the SAFE AND SUSTAINABLE SEAFOOD SUPPLY focus area, three goals have been created to guide Ohio Sea Grant's future activities. These goals include the following:

- Sustainable fisheries that meet public demand.
- A healthy Lake Erie fishery that harvests, produces, processes, and/or markets fish products responsibly and efficiently.
- Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices for the future of our Lake Erie fisheries, appreciate the health benefits of fish consumption, and understand how to evaluate the safety of the fish they catch.

Each of these goals has a series of short- and mid-term outcomes with measurable objectives that will be used to determine progress in reaching these desired states. These outcomes and measurable objectives are identified following each goal statement.

Safe and Sustainable Seafood Supply Goal 1: Sustainable fisheries to meet public demand.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: *Natural and human threats to the long-term viability of Lake Erie's fish populations are minimized.*

Measurable Objective: By 2013, 1,000 stakeholders will have attended education programs that identify causes and control measures for minimizing the stresses to Lake Erie fisheries.

Measurable Objective: By 2013, ODNR will have an updated Ohio Aquatic Invasive Species Management Plan.

Short/Mid-Term Outcome: *A viable domestic aquaculture industry with acceptable environmental impacts is supported.*

Measurable Objective: By 2013, Ohio Sea Grant will assist in the development of a comprehensive education and outreach strategy with the aquaculture industry.

Safe and Sustainable Seafood Supply Strategy 1A: Use Ohio Sea Grant's research, extension, education, and communication capabilities to develop and disseminate essential knowledge about natural and human threats to the long-term viability of Lake Erie and Great Lakes fisheries, to identify ways to minimize these threats, and to use ecosystem-based fisheries management and other innovative approaches to accomplish these goals.

Mitigation of Aquatic Invasive Species

Strategic Action: *Reduce aquatic invasive species in live fish shipments by educating haulers, including aquaculturists and bait dealers.*

Implementation Step: Dave Kelch and Eugene Braig will ensure the new Ohio aquatic invasive species management plan includes management objectives for aquaculture and pond fish procurement from states outside of Ohio.

Implementation Step: Dave Kelch and Colleen Wellington will reduce the possibility of future aquatic invasive introductions by educating marinas and boaters involved in the Clean Marinas program.

Implementation Step: Dave Kelch and Eugene Braig will participate on state and regional aquatic invasive species committees to develop a new Ohio Rapid Response Plan and re-write the current Ohio Aquatic Invasive Species Management Plan.

Implementation Step: Dave Kelch and Eugene Braig will develop education and outreach for bait dealers to help them in identifying non-native invasive species.

Aquatic Visitors Center Teaches the Next Generation about Lake Erie

There's nothing like being around a group of kids as they watch a smallmouth bass gobble up a round goby—especially if the kids caught the goby themselves. “It’s like a rollercoaster. Everybody screams, and they love it,” says Tory Gabriel, Fisheries Program Manager for Ohio Sea Grant Extension. “It gives us a chance to teach a little lesson about the food web.”



Gabriel is working to develop new education programs like these at the Aquatic Visitors Center on South Bass Island, which once operated as a state fish hatchery and for more than 15 years served as an education center for the Ohio Department of Natural Resources (ODNR) Division of Wildlife. Ohio Sea Grant took over management of the center in 2009.

In addition to free fishing opportunities for children, the center allows visitors to look at Lake Erie water under microscopes, learn about the historic hatchery and Lake Erie, and take part in hands-on science programs on Saturday afternoons. Nearly 12,000 visitors experience the Aquatic Visitors Center every year. “It’s a real opportunity for us to teach the next generation about the importance of protecting Lake Erie,” says Dr. Jeff Reutter, director of Ohio Sea Grant and Stone Laboratory.





Enhanced, Healthy Wild Fishery

Strategic Action: Support research, education, and outreach activities related to Viral Hemorrhagic Septicemia (VHS) and emerging diseases, as well as their impacts on the Lake Erie fishery, including partnering with the Ohio Department of Agriculture to raise angler and boater awareness of the disease, transportation restrictions, implications to the fishery, and the public's role in containing this disease.

Implementation Step: Tory Gabriel and Eugene Braig will oversee research, education, and outreach related to VHS and other emerging diseases and their impact on the Lake Erie and inland fishery.

Implementation Step: Tory Gabriel will develop education and outreach to assist bait dealers in responding to consumer questions regarding bait supply.

Implementation Step: Tory Gabriel will monitor policy decisions and provide expert information as needed regarding bait delivery and availability.

Strategic Action: Identify new techniques and/or research to identify and manage Lake Erie fish stocks.

Implementation Step: Dave Kelch will encourage the addition of fish concentrations and spawning habitat as a mitigation procedure when constructing wind turbines in the nearshore waters of Lake Erie.



New Ways to Reach Visitors with Fishery Information

Strategic Action: Incorporate exhibits and educational programming relating to the health of the fisheries within the Aquatic Visitors Center at Put-in-Bay.

Implementation Step: Tory Gabriel and Matt Thomas will work together to oversee exhibit development and educational programming at the Aquatic Visitors Center.

Safe and Sustainable Seafood Supply Strategy 1B:

Conduct integrated research, education, and outreach activities to support a viable domestic aquaculture industry with acceptable environmental impacts, in ways that are consistent with national objectives and that build on the leadership role Ohio Sea Grant plays in this area.

New Products and Markets

Strategic Action: Seek external partnerships to support the development of new products and markets using underutilized Lake Erie species.

Implementation Step: Dave Kelch will seek external partnerships to provide the development of new products and enhance the marketing of underutilized Lake Erie fish species.

Strategic Action: Provide technical information and assistance to new aquaculturists.

Implementation Step: Tory Gabriel will explore the feasibility of a research project comparing the productivity of a hardy bait species produced through aquaculture versus more fragile wild-caught bait species.

Improved Productivity of Aquaculture

Strategic Action: Support research projects to advance aquaculture in Ohio.

Implementation Step: Dave Kelch and Tory Gabriel will seek opportunities to increase Lake Erie bait fish populations while enhancing economic development in Ohio through aquaculture.

Safe and Sustainable Seafood Supply Strategy 1C:

Work with Great Lakes Fishery Commission, the Ohio Division of Wildlife, the National Sea Grant Office, other international, federal, provincial, and state partners, and fishing industries to enhance the management and productivity of Lake Erie's fisheries.

Leadership for Lake Erie's Fishery

Strategic Action: Transition the Fisheries Extension Education effort from a temporary program into a mainstream priority effort within the Ohio Sea Grant Extension Program and make the Fisheries Extension effort a part of future Ohio Sea Grant omnibus grant proposals.

Implementation Step: Frank Lichtkoppler, Dave Kelch, Eugene Braig, Jeff Reutter, and Tory Gabriel will oversee the transition of the Fisheries Extension Education effort.

Strategic Action: Continue to provide leadership and/or support to GLRRIN, the IJC Council of Great Lakes Research managers, Bi-national Executive Committee, the Great Lakes Commission, the Lake Erie Technical Committee, and the Lake Erie LaMP to accomplish this strategy.

Implementation Step: Frank Lichtkoppler and Jeff Reutter will provide leadership and support to Great Lakes organizations and committees to enhance the management and productivity of Lake Erie's fisheries.

Safe and Sustainable Seafood Supply Goal 2:

A healthy Lake Erie fishery that harvests, produces, processes and/or markets fish products responsibly and efficiently.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: Anglers are knowledgeable, employ efficient fishing techniques, and understand the rationale behind fishing regulations.

Measurable Objective: By 2013, 1,000 fishermen will have participated in hands-on training to learn more about efficient fishing techniques.

Short/Mid-Term Outcome: Lake Erie and Ohio fish availability and fisheries profitability increase.

Measurable Objective: By 2013, Ohio Sea Grant will investigate the feasibility of developing at least two new Lake Erie or aquaculture fish products.

Faster-Growing Yellow Perch Could Make Aquaculture More Viable



Fish farmers interested in growing yellow perch may soon have a faster-growing option that could also decrease pressure on wild populations, thanks to Ohio Sea Grant researcher Hanping Wang at the OSU South Centers in Piketon. By selectively breeding the fish, Wang has developed yellow perch stocks that grow 28% to 42% faster than the typical fish and have potential to reach market size of 8.5 inches in just one year. This is a serious improvement over typical yellow perch, which often take two years to arrive at the same size, and could reduce costs for care and feeding of the fish by 30% to 40%.

Only increasing the profit margin for farmers will allow them to compete with the millions of pounds of yellow perch harvested from Lake Erie each year. It is worth the effort, however, to ensure that wild yellow perch populations remain sustainable, particularly as demand for fish as a lean protein increases along with the ever-growing human population.

The next step for Wang's fish will be to test them on a commercial scale. If the trial-run farmers see yellow perch that reach market size more quickly, the number of farms growing yellow perch for food could rise substantially in the next several years.

Safe and Sustainable Seafood Supply Strategy 2A:

Engage harvesters, recreational fishermen, aquaculturists and managers in the development of research and management innovations related to the condition, use, and conservation of the Lake Erie and Great Lakes natural resources they depend on.



Input from Stakeholders

Strategic Action: Ohio Sea Grant will engage harvesters, recreational fishermen, aquaculturists, and managers using advisory committees, public discussion boards, and input from state agencies and emerging leaders.

Implementation Step: All Ohio Sea Grant Extension agents will use Ohio Sea Grant advisory committees and Tory Gabriel will oversee the Fisheries Extension Advisory Committee to identify research, education, and outreach priorities related to Lake Erie and Ohio fisheries.



Implementation Step: Tory Gabriel and Dave Kelch will collaborate with the ODNR Division of Wildlife on projects and programs related to the Lake Erie fishery.

Implementation Step: All agents and Jill Jentes Banicki will enhance marketing efforts of the Great Lakes Fisheries Leadership Institute to increase awareness of this opportunity.

Safe and Sustainable Seafood Supply Strategy 2B:

Support research, development, and transfer of new technologies to keep Lake Erie and Ohio fisheries financially competitive and environmentally responsible.

New Technologies to Improve Aquaculture Industry

Strategic Action: Enhance production of cultured species through research, education, and outreach.



Safe and Sustainable Seafood Supply Goal 3:

Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our Lake Erie fisheries, who appreciate the health benefits of fish consumption, and who understand how to evaluate the safety of the fish they catch.

The following reflects the short- and mid-term outcome desired by Ohio Sea Grant:

Short/Mid-Term Outcome: Lake Erie fish consumers have an increased knowledge of the nutritional benefits of seafood products, know how to judge seafood safety and quality, and can apply this knowledge to make better choices when they purchase fish.

Measurable Objective: By 2013, 1,000 people will have been reached with information on preserving and preparing freshly caught Lake Erie fish.

Short/Mid-Term Outcome: Information portals are available to provide information related to Lake Erie fish safety and benefits, nutrition, and sustainability.

Measurable Objective: By 2013, the Ohio Lake Erie Discussion Board will have informed 40,000 individuals who visit to read posts and will have 200 registered users.

Safe and Sustainable Seafood Supply Strategy 3A:

Enhance training and technical assistance programs related to the application of standards for safe handling, preservation, and preparation of Lake Erie fish.

Increased Knowledge of Proper Fish Preparation and Preservation

Strategic Action: Education and outreach efforts will provide information on preserving and preparing freshly caught fish.

Implementation Step: Dave Kelch, John Hageman, Tory Gabriel, and Eugene Braig will provide outreach education through public presentations, printed materials, and displays on preserving and preparing Lake Erie fish.

Safe and Sustainable Seafood Supply Strategy 3B:

Develop educational programs and materials that enhance the American public's understanding of what is required to maintain a sustainable Lake Erie fishery and to build the public's awareness of differences in the quality, safety, and nutritional benefits of sport caught fish so they will be informed advocates and consumers

Balanced Messages

Strategic Action: Provide a balanced message about the consumption of Lake Erie fish, including health benefits and safety.

Implementation Step: Dave Kelch, John Hageman, Tory Gabriel, and Eugene Braig will provide balanced messages about consumption of Lake Erie fish during sports and boat shows, public presentations, seminars, and in printed materials.

Safe and Sustainable Seafood Supply Strategy 3C:

Work in close coordination with the Great Lakes Fish Commission, ODNR's Division of Wildlife, and other partners to develop information portals that give access to factual information on the Lake Erie's fishery.

Increased Communication with Consumers.

Strategic Action: Continue to maintain the Lake Erie Discussion Board.

Implementation Step: Dave Kelch will coordinate the Ohio Sea Grant Discussion Board activities and Tory Gabriel, John Hageman, Colleen Wellington, Eugene Braig, and others will rotate in responding to client questions.

Otoliths May Provide Map of Fish Migration

New Ohio Sea Grant research could help fishery managers determine where they should focus their fish habitat conservation efforts in the Great Lakes. And the answer may lie in little ear stones fish use for balance.

Drs. John Farver and Jeffrey Miner from Bowling Green State University are investigating whether the otolith, a bone-like structure in the heads of fish, could track where sport and commercial fish spawn and travel during their life. "Otoliths are distinctive because they incorporate trace metals as the fish



grows that reflect the chemistry of the environment in which the fish are living. Like tree rings, otoliths grow more in the summer, but they also record what is in the fishes' environment at that moment in time.

Different locations in Lake Erie have a different water chemistry signature—identifiers that are unique to that specific area of the lake at that specific time. If the researchers can match an otolith's chemical make-up with that of a specific area in Lake Erie, they will be able to use these water signatures to track the migration of the fish throughout its lifetime.

This information could help fishery managers beyond just better mapping. "If we know that a specific area of Lake Erie is contaminated with heavy metals and we know that it's a key spawning habitat for walleye or yellow perch, our hope is that fishery managers and elected officials will use this information to prioritize conservation and clean-up efforts," concludes Farver.

FOCUS AREA – HAZARD RESILIENCE IN COASTAL COMMUNITIES

GOALS	STRATEGIES How Ohio Sea Grant will achieve its goals	SHORT/MID-TERM OUTCOMES and <i>Measurable Objectives</i> What Ohio Sea Grant will achieve within the next four years, and how these achievements will be measured	LONG-TERM OUTCOMES and <i>Performance Measures</i> What Ohio Sea Grant will achieve long-term, and how these achievements will be measured
Hazard Resilience in Coastal Communities Goal 1: Widespread understanding of the risks associated with living, working, and doing business along the Lake Erie coast.	<p>Hazard Resilience in Coastal Communities Strategy 1A: Conduct research to assess Lake Erie and Great Lakes hazard-related risks and increase the availability and usefulness of hazard-related information and forecasting for citizens, industries, and decision makers in coastal communities.</p> <p>Hazard Resilience in Coastal Communities Strategy 1B: Work with marine commercial enterprises to assess the risks associated with doing business in the Lake Erie and Great Lakes area in the context of coastal storms, lake effect storms, shore erosion, climate-related changes, lake level changes, tributary flooding, ice damage, and dramatic changes in port and international trade activities.</p> <p>Hazard Resilience in Coastal Communities Strategy 1C: Work with NOAA Climate Change Program, NOAA's National Weather Service, the Sea Grant Climate Change Network, the Great Lakes Sea Grant Network, the Ohio State University Climate Team, scientific organizations, and other public and private sector partners to develop comprehensive education and literacy programs on the immediate and long-term effects of climate-related changes and other hazardous events on human safety and property along the coast and how to prepare for surviving them.</p>	<p>Short/Mid-Term Outcome: Lake Erie decision makers benefit from improved risk communication (i.e., better understanding of emergency forecasting, evacuation plans, rip current hazards, climate change, etc. and understand the benefits of coastal hazard risk planning. Measurable Objective: <i>By 2013, 100 decision makers will have received information and training regarding coastal hazard risk planning (i.e., better understanding of emergency forecasting, evacuation plans, rip current hazards, climate change, etc.)</i></p> <p>Short/Mid-Term Outcome: Lake Erie decision makers are aware of existing and available hazard-related data and resources (i.e. wave gauge, water level gauge, weather station data, etc.) Measurable Objective: <i>By 2013, a tool will be developed to measure how much decision makers have improved their ability to assess risk vulnerability and apply the knowledge obtained through education and outreach efforts of Ohio Sea Grant and it partners.</i></p>	<p>Long-Term Outcomes: Lake Erie residents are aware of and understand the physical processes that produce hazards and climate change and the implications of those events for their communities.</p>
Hazard Resilience in Coastal Communities Goal 2: Community capacity to prepare for and respond to hazardous events.	<p>Hazard Resilience in Coastal Communities Strategy 2A: Help public and private decision makers and local emergency management agencies create and adopt policies, plans, and ordinances to reduce risks, manage catastrophic events, and speed recovery.</p> <p>Hazard Resilience in Coastal Communities Strategy 2B: Create and disseminate, in partnership with NOAA's National Weather Service and other entities, integrated demographic and coastal hazard information databases that help measure human vulnerability in specific coastal regions, support hazard-related planning activities, and facilitate disaster relief efforts.</p>	<p>Short/Mid-Term Outcome: Lake Erie communities have access to and the ability to utilize data and innovative and adaptive tools and techniques to minimize hazard risks (i.e., planning and construction best management practices, standards, resiliency index, retrofits, flood-zone maps, and freeboard). Measurable Objective: <i>By 2013, a comprehensive inventory of tools and techniques for coastal communities will be developed.</i></p> <p>Short/Mid-Term Outcome: Lake Erie decision makers have the capacity to apply data and resources to hazard planning and response. Measurable Objective: <i>By 2013, at least three trainings will be conducted for Lake Erie decision makers that provide the information needed to apply data, tools, and resources (i.e., GIS application, land-use planning).</i></p> <p>Short/Mid-Term Outcome: Lake Erie decision makers have the knowledge and skills to assess risk vulnerability and respond with appropriate policies and regulations. Measurable Objective: <i>By 2013, a tool will be developed to measure how much decision makers have improved their ability to assess risk vulnerability and apply the knowledge obtained through the education and outreach efforts of Ohio Sea Grant and its partners.</i></p> <p>Short/Mid-Term Outcome: Lake Erie opinion leaders and decision makers take proactive measures to ensure that hazards, risks, and vulnerabilities are communicated to property owners and perspective purchasers. Measurable Objective: <i>Where appropriate, training for Lake Erie opinion leaders and decision makers include audience-appropriate information for them to communicate to property owners and perspective purchasers.</i></p>	<p>Long-Term Outcome: Lake Erie communities address social and environmental barriers to improve the community's ability to mitigate and respond to natural hazards.</p> <p>Long-Term Outcome: Lake Erie communities are able to effectively respond to coastal catastrophes.</p> <p>Performance Measure: <i>By 2013, 20 coastal communities and 1,000 citizens have been provided with information and/or trained in local hazard resiliency and hazard mitigation tools, techniques, and best practices.</i></p> <p>Performance Measure: <i>By 2013, 10 coastal communities and 200 citizens have adopted and/or implemented hazard resiliency practices to prepare for and respond to/minimize coastal hazardous events.</i></p> <p>Performance Measure: <i>By 2013, 15 public beach managers report using Ohio Sea Grant-provided communication tools and information regarding rip currents to train lifeguards and beach personnel.</i></p>
Hazard Resilience in Coastal Communities Goal 3: Effective response to coastal catastrophes.	<p>Hazard Resilience in Coastal Communities Strategy 3A: Work with NOAA's National Weather Service, the Great Lakes Observing System (GLOS), Coastwatch, and other partners to make hazard-related data and data-derived products available and relevant to support decision making during crisis events.</p> <p>Hazard Resilience in Coastal Communities Strategy 3B: Contribute to the nation's rapid response capability by developing ways to mobilize Sea Grant's national network of scientific and technical expertise to inform response strategies on Lake Erie and the Great Lakes.</p> <p>Hazard Resilience in Coastal Communities Strategy 3C: Make Ohio Sea Grant's local knowledge and contacts available to work with federal, state, regional, and local agencies, non-governmental organizations and international partners on Lake Erie and the Great Lakes that have hazardous event responsibilities, to facilitate the speed and quality of response to these crises.</p>	<p>Short/Mid-Term Outcome: Lake Erie communities and non-governmental organizations apply best available hazard and climate change information, tools, and technologies to maximize community resiliency to natural hazards. Measurable Objective: <i>By 2013, a needs assessment will be conducted with at least three stakeholder groups on their needs for climate change information and tools.</i></p>	

FOCUS AREA –

HAZARD RESILIENCE IN COASTAL COMMUNITIES

Within the focus area of HAZARD RESILIENCE IN COASTAL COMMUNITIES, the following long-term visions create the basis of the Ohio Sea Grant Strategic Plan:

Lake Erie residents are aware of and understand the physical processes that produce hazards and climate change and the implications of those events for their communities.	Lake Erie communities address social and environmental barriers to improve the community’s ability to mitigate and respond to natural hazards.
	Lake Erie communities are able to effectively respond to coastal catastrophes.

To evaluate our progress toward these visions, the following represent the ways Ohio Sea Grant will measure our achievements. These performance measures are aligned with the National Sea Grant Program Strategic Plan:

Coastal communities and citizens who have been provided with information and/or have been trained in local hazard resiliency and hazard mitigation tools, techniques, and best practices.	Coastal communities and citizens who have adopted and/or implemented hazard resiliency practices to prepare for and respond to minimize coastal hazardous events.
	Beach managers who use Ohio Sea Grant information regarding rip currents for training lifeguards and beach personnel.

Goals for Hazard Resilience in Coastal Communities

Within the HAZARD RESILIENCE IN COASTAL COMMUNITIES focus area, three goals have been created to guide Ohio Sea Grant's future activities. These goals include the following:

- Widespread understanding of the risks associated with living, working, and doing business along the Lake Erie coast.
- Community capacity to prepare for and respond to hazardous events.
- Effective response to coastal catastrophes.

Each of these goals has a series of short- and mid-term outcomes with measurable objectives that will be used to determine progress in reaching these desired states. These outcomes and measurable objectives are identified following each goal statement.

Hazard Resiliency in Coastal Communities Goal 1: Sustainable fisheries to meet public demand.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: Lake Erie decision-makers benefit from improved risk communication (i.e. better understanding of emergency forecasting, evacuation plans, rip current hazards, etc.) and understand the benefits of coastal hazard risk planning.

Measurable Objective: By 2013, 100 decision-makers will have received information and training regarding coastal hazard risk planning (i.e., better understanding of emergency forecasting, evacuation plans, rip current hazards, climate change, etc.).

Short/Mid-Term Outcome: Lake Erie decision-makers are aware of existing and available hazard-related data and resources (i.e., wave gauge, water level gauge, weather station data, etc.)

Measurable Objective: By 2013, a tool will be developed to measure how much decision-makers have improved their ability to assess risk vulnerability and apply the knowledge obtained through the education and outreach efforts of Ohio Sea Grant and its partners.

Hazard Resiliency in Coastal Communities Strategy 1A:

Conduct research to assess Lake Erie and Great Lakes hazard-related risks and increase the availability and usefulness of hazard-related information and forecasting for citizens, industries, and decision-makers in coastal communities.

Partnerships Pool Resources to Clean Up Ashtabula River



The Ashtabula River dredging project was completed in 2009, making the river one of the cleanest, deepest harbors in Lake Erie. The project moved 635,000 cubic yards of contaminated sediment, including 25,000 tons of polychlorinated biphenyls (PCBs) and other pollutants, to a specially equipped landfill.

"A lot of people worked very long and very hard to see the dredging completed," says Ohio Sea Grant Extension's Frank Lichtkoppler. "The Ashtabula River Partnership (ARP) members came together to make this happen."

The Ashtabula River was designated as one of 43 Areas of Concern by the International Joint Commission (IJC) in 1987. Although a Remedial Action Plan to clean up the river was published in 1991, no real progress was made until the community itself, along with partners including Ohio Sea Grant, chose to organize the ARP in 1994. Funding for the project was found in 2002, and dredging began in October 2007.

With the dredging accomplished, the ARP is now working to restore the environment around the river and hopes to have the site removed from the IJC's list of contaminated Areas of Concern in the next few years. Beyond the obvious environmental benefits of dredging the river, having the deep draft available will allow for increased shipping traffic, and a cleaner river should help provide new opportunities for local marinas and businesses.



Research to Assess Risks

Strategic Action: Support research to create new technologies for disaster remediation and prevention and develop techniques for risk assessment and cost/benefit analysis.

Strategic Action: Improve the ability of state and local governments to identify and remove coastal navigation hazards and to understand the impact of water level fluctuations.

Implementation Step: All Ohio Sea Grant Extension agents will contribute to the identification and prioritizing of key hazard-related risks, such as shore erosion, flooding, toxic algal blooms, and rip currents.

Safety Education

Strategic Action: Increase safety for recreational and scientific divers through education and outreach.

Implementation Step: Matt Thomas will supervise a safe diving program for the Ohio State University and will oversee diving research programs at Stone Laboratory.

Strategic Action: Enhance the safety of ice fishermen through education and outreach.

Implementation Step: John Hageman and Dave Kelch will provide ice fishing safety information to the public through programming and communications efforts that may include media releases on ice conditions in the western basin, talks at sport and boat shows, a fact sheet, timely entries on the OHSG discussion board, and/or other appropriate techniques.

Forecasts for the Future

Strategic Action: Partner with agencies to develop techniques to detect and forecast climate and ecosystem changes that occur over decades to examine how these changes may affect individuals and communities.

Implementation Step: Frank Lichtkoppler will lead the climate change endeavors for the Ohio Sea Grant Program and will work with other agencies to maximize efforts.

Education

Strategic Action: Incorporate hazard resiliency information, including climate change and its impacts, into Stone Laboratory programming.

Implementation Step: Jeff Reutter, John Hageman, and Matt Thomas will explore expanding Stone Laboratory programming to include hazard resiliency information through curriculum development, public lectures, public tours, and expansion of existing outreach programming.

Hazard Resiliency in Coastal Communities Strategy 1B:

Conduct work with marine commercial enterprises to assess the risks associated with doing business in the Lake Erie and Great Lakes area in the context of coastal storms, lake effect storms, shore erosion, climate-related changes, lake level changes, tributary flooding, ice damage, and dramatic changes in port and international trade activities.

Identification of Economic Impacts of Coastal Hazards

Strategic Action: *Work with public agencies, private industry, individuals, and groups to increase the awareness and action on threats and opportunities to economic activity in the coastal zone.*

Implementation Step: Frank Lichtkoppler will communicate findings and implications of the Toledo case study to all Ohio Sea Grant Extension agents to provide them with information to share with coastal decision-makers.

Hazard Resiliency in Coastal Communities Strategy 1C:

Conduct work with the NOAA Climate Change Program, NOAA's National Weather Service, the Sea Grant Climate Network, the Great Lakes Sea Grant Network, the Ohio State University Extension Climate Team, scientific organizations, and other public and private sector partners to develop comprehensive education and literacy programs on the immediate and long-term effects of climate-related changes and other hazardous events on human safety and property along the coast and how to prepare for and survive them.

Education to Respond to Change

Strategic Action: *Assist with outreach and education on climate change mitigation and adaptation in Lake Erie and the Great Lakes region.*

Implementation Step: Frank Lichtkoppler will coordinate Sectorial Applications Research Program (SARP) activities to coordinate education and outreach efforts throughout the Great Lakes.

Implementation Step: Frank Lichtkoppler, Melinda Huntley, Jill Jentes Banicki, Dave Kelch, and Joe Lucente will network with researchers at OSU, GLERL, other universities, and other Great Lakes Sea Grant Network programs to seek out NOAA SARP and other funding for climate change education, research, and outreach.

Implementation Step: Frank Lichtkoppler, Jill Jentes Banicki, and Melinda Huntley will coordinate climate change education activities by serving on the Ohio State University Extension Climate Change Team.

Implementation Step: All Ohio Sea Grant Extension agents will incorporate information about climate change impacts, mitigation, and adaptation into presentations where appropriate.

Model Predicts Fate of Contaminants during Remediation Efforts

With five environmental Areas of Concern on Lake Erie, communities need to know which clean-up options are best for their harbors. Often, the choices come down to capping the area or dredging out the contaminated sediment, but it isn't always clear which process is best. A new computer model created by Ohio Sea Grant researchers Drs. Patrick Fox and John Lenhart of Ohio State University's College of Engineering allows agencies to input the characteristics of the sediment in their harbor to determine exactly how it will behave.

Fox and Lenhart determined that communities must pay attention to the release of very small particles, which are often able to get through filters and presses and often have contaminants attached to them. This mobility causes problems in both types of remediation.



When a cap is created, the small particles get stirred up and many wind up in the capping layer itself rather than being isolated below, allowing the particles to escape. As for dredging, it turns out that in physically removing the sediment, you end up widely disbursing the contaminant because it's difficult to completely contain small particles.

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

Strategic Action: Collaborate with Ohio Coastal Training Program partners to train communities on climate change adaptation planning and mitigation.

Implementation Step: When applicable based on expertise area, all Ohio Sea Grant Extension agents will assist the Ohio Coastal Training Program in training community leaders on climate change adaptation planning and mitigation.

Hazard Resiliency in Coastal Communities Goal 2: Community capacity to prepare for and respond to hazardous events.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: Lake Erie communities have access to and the ability to utilize data and innovative and adaptive tools and techniques to minimize hazard risks (i.e. planning and construction BMPs, standards, resiliency index, retrofits, flood-zone maps, and freeboard).

Measurable Objective: By 2013, a comprehensive inventory of tools and techniques for coastal communities will be developed.

Short/Mid-Term Outcome: Lake Erie decision-makers have the capacity to apply data and resources to hazard planning and response.

Measurable Objective: By 2013, at least three trainings will be conducted for Lake Erie decision-makers that provide the information needed to apply data, tools, and resources (i.e. GIS application, land-use planning).

Short/Mid-Term Outcome: Lake Erie decision-makers have the knowledge and skills to assess local risk vulnerability and respond with appropriate policies and regulations.

Measurable Objective: By 2013, a tool will be developed to measure how much decision-makers have improved their ability to assess risk vulnerability and apply the knowledge obtained through the education and outreach efforts of Ohio Sea Grant and its partners.

Short/Mid-Term Outcome: Lake Erie opinion leaders and decision-makers take proactive measures to ensure that hazards, risks, and vulnerabilities are communicated to property owners and perspective purchasers.

Measurable Objective: Where appropriate, training for Lake Erie opinion leaders and decision-makers includes audience-appropriate information for them to communicate to property owners and perspective purchasers.

Hazard Resiliency in Coastal Communities Strategy 2A:

Conduct Help public and private decision-makers and local emergency management agencies create and adopt policies, plans, and ordinances to reduce risks, manage catastrophic events, and speed recovery.

Technical Assistance and Expertise

Strategic Action: When new policy decisions are made, Ohio Sea Grant will participate in local community efforts to lend expertise.

Implementation Step: All Ohio Sea Grant Extension agents may be called upon to participate in community efforts about their areas of expertise when new policy decisions emerge.

Strategic Action: Enhance public knowledge of new policies and potential implications through education and outreach activities.

Implementation Step: All Ohio Sea Grant Extension agents may be called upon to provide information about their areas of expertise when new policy decisions emerge.

Hazard Resiliency in Coastal Communities Strategy 2B:

Conduct Create and disseminate, in partnership with NOAA's National Weather Service and other entities, integrated demographic and coastal hazard information databases that help measure human vulnerability in specific coastal regions, support hazard-related planning activities, and facilitate disaster relief efforts.

Assistance in Protecting Property

Strategic Action: Through the Lake Erie Partnership and the Ohio Coastal Training Program, assist the Ohio Coastal Management Program and the Ohio Department of Natural Resources with training and dissemination of information on shore erosion best management practices, as well as coastal and floodplain hazards.

Implementation Step: All Ohio Sea Grant Extension agents through the Lake Erie Partnership and Ohio Coastal Training Program will assist the Ohio Coastal Management Program and the Ohio Department of Natural Resources with training and dissemination of information on shore erosion best management practices, as well as coastal and floodplain hazards.

Hazard Resiliency in Coastal Communities Goal 3: Effective response to coastal catastrophes.

The following reflect the short- and mid-term outcomes desired by Ohio Sea Grant:

Short/Mid-Term Outcome: Lake Erie communities and non-governmental organizations apply best available hazard and climate change information, tools, and technologies to maximize community resiliency to natural hazards.

Measurable Objective: By 2013, needs assessments will be conducted with at least three stakeholder groups on their needs for climate change information and tools.

New Collaborative Projects Help Region Grasp Climate Issue

News reports about climate change continue to flood our airways. For many of us, understanding what climate change is and how it will affect our surroundings can be overwhelming. Two new efforts launched this year, however, could make deciphering that information a lot easier.

The OSU Climate Change Outreach Team began in 2009 as a partnership among several Ohio State departments, Extension, and Ohio Sea Grant to get climate change information out to the general public.

"When people hear about climate change, many don't really know how



it will affect different aspects at home—Ohio's agriculture, plants and animals, Lake Erie," explains Dr. Brent Sohngen, Professor in Ohio State's Department of Agricultural, Environmental, and Development Economics. "With the incredible resources we have across the University, we realized we could help localize the climate change issue and fill in those gaps."

Over the past year, the team has created a web site with climate change resources and a webinar series to bring together experts from around the region to teach the public about climate-related topics. Other products will follow in the next year including a public web site designed by Ohio Sea Grant.

Teaching Great Lakes communities how to prepare for climate change is also at the heart of another collaborative Sea Grant project. Part of a joint venture with NOAA, the Great Lakes Sea Grant Network will create three to five training workshops in at the end of 2010 to help Great Lakes coastal communities learn to adapt to a changing climate.

Hazard Resiliency in Coastal Communities

Strategy 3A:

Conduct Work with NOAA's National Weather Service, the Great Lakes Observing System (GLOS), Coastwatch, and other partners to make hazard-related data and data-derived products available and relevant to support decision-making during crisis events.

Information Needed to React

Strategic Action: *Upon request, assist local governments and emergency management agencies in alerting citizens and businesses to threats stemming from storms and fluctuating water levels by providing news releases, alerts, web pages, and personal assistance on critical storm and water level information, including data from the Great Lakes Forecasting System.*



Implementation Step: All Extension agents will, upon request, assist local governments and emergency management agencies in alerting citizens and businesses to threats stemming from storms and fluctuating water levels by providing news releases, alerts, web pages, and personal assistance on critical storm and water level information, including data from the Great Lakes Forecasting System.

Implementation Step: Joe Lucente will be the Ohio Sea Grant representative to the Extension Disaster Education Network (EDEN) and will work to keep Extension agents up to date on disaster preparedness.

Implementation Step: Frank Lichtkoppler will network with the Lake County Extension office to assist in disaster emergency preparedness related to the safe operation of the Perry Nuclear Power Plant.

Implementation Step: All Extension agents will work to help identify the types of hazard-related data and data-derived products needed by local clientele that should be developed by GLOS.

Implementation Step: Frank Lichtkoppler and all Extension agents will seek NOAA and other funding to identify and help develop hazard-related data and data-derived products.

Strategic Action: *Conduct needs assessments of appropriate stakeholders on their decision-making needs during crisis events and climate changing conditions.*

Implementation Step: All Extension agents will conduct needs assessments of appropriate stakeholders on their decision-making needs during crisis events and climate changing conditions.

Hazard Resiliency in Coastal Communities Strategy 3B:

Conduct Contribute to the nation's rapid response capability by developing ways to mobilize Sea Grant's national network of scientific and technical expertise to inform response strategies and activities on Lake Erie and the Great Lakes.

Partnerships to Adapt to a Changing World

Strategic Action: *Participate, support and provide leadership for Great Lakes efforts.*

Implementation Step: Frank Lichtkoppler will participate in, support, and provide leadership for the Great Lakes Sea Grant Network and the Sea Grant Program Leaders Assembly.

Implementation Step: A new Ohio Sea Grant Education Coordinator and Jill Jentes Banicki will participate in, support, and provide leadership for Centers of Ocean Science Education Excellence (COSEE) Great Lakes.

Implementation Step: Jeff Reutter will participate, support, and provide leadership for the Great Lakes Region Research and Information Network (GLRRIN).

Hazard Resiliency in Coastal Communities Strategy 3C:

Make Ohio Sea Grant's local knowledge and contacts available to work with federal, state, regional, and local agencies, non-governmental organizations and international partners on Lake Erie and in the Great Lakes that have hazardous event responsibilities, to facilitate the speed and quality of response to these crises.

Partnerships to Enhance Reach and Effectiveness

Strategic Action: *Coordinate and lead the collaborative Lake Erie Partnership to unify and leverage efforts among a minimum of four Lake Erie related organizations and agencies.*

Implementation Step: Jeff Reutter will work with executive officials at the Ohio Lake Erie Commission, Old Woman Creek National Estuarine Research Reserve, and the ODNR Office of Coastal Management to provide direction to the Lake Erie Partnership committee.

Preparing Coastal Communities for Climate Change

Even a few inches in lake level change makes a big difference to commercial transportation on the Great Lakes, said several respondents at the first Sea Grant NOAA Sectorial Applications Research Program (SARP) focus groups held in the Toledo area in 2009. Knowing how climate change could impact the Great Lakes is important to planning for the coastal infrastructure construction repair and replacement.



Sea Grant is working to help identify user needs and bring global climate change effects to the local and regional level. The initial focus groups and surveys found there is a need for specific information on how a wide range of climate variables (individually or linked) might impact current and future business, equipment, infrastructure, and a host of social and environmental concerns.

Survey and focus group respondents were interested in knowing more about potential impacts of long-term climate change on their organization or work yet most respondents were not looking more than 1 to 5 years into the future.

Investing in new marinas and new ships is very expensive and port and marina people want solid reliable information for decision making. Stormwater managers and community planners need reliable local/regional information. Economic Benefit/cost analysis on a regional or local level is desired for local infrastructure planning.

ANTICIPATED OUTCOMES

Some of the major outcomes we anticipate during the four years of this proposal are arranged by NOAA Sea Grant Focus Area. Evidence will be collected to determine if people are behaving or thinking differently or if groups, institutions, or people have used the information provided by Ohio Sea Grant. We will also assess if information or technology transfer by Ohio Sea Grant Extension has had impacts on policy, law, regulation, or institutional development and if Ohio Sea Grant Extension actions have contributed to the health of a resource or the viability of an industry or have had economic and/or social impacts. Among these projected outcomes are:

I. FOCUS AREA – Healthy Coastal Ecosystems

A. Goal: Sound scientific information to support ecosystem-based approaches to managing the Lake Erie coastal environment.

1. Baseline data, standards, and indicators developed by Ohio Sea Grant and its partners are used to support ecosystem-based approaches.
Ohio Sea Grant will actively solicit applied ecosystem research and seek to support at least one research project annually that will assist ecosystem managers.
2. Methodologies are developed and used to evaluate ecosystem-based management approaches and guide future management efforts.
Ohio Sea Grant will facilitate at least one effort annually to identify research priorities for the Binational Executive Committee.
3. Planners and decision-makers know how to minimize impacts of land use, resource extraction, and other human activities on the ecosystem.
Ohio Sea Grant will facilitate at least one effort annually to identify the information and training needs of community planners and other decision-makers.
By 2014, in partnership with the Ohio Coastal Training Program and other partners, 10 land use planners and decision-makers will receive technical training to increase their abilities to implement best land use practices and balanced growth principles.
By 2014, in partnership with the Ohio Coastal Training Program and other partners, 50 land use planners and other decision-makers will be trained annually to use geospatial analysis tools for strategic conservation planning and assessing the potential impacts of land use patterns on water quality and natural resources.

B. Goal: Widespread use of ecosystem-based approaches to managing land, water, and living resources in the Lake Erie coastal area.

1. Constituencies have access to data, models, and training that support ecosystem-based planning and management approaches.
Ohio Sea Grant implements five workshops, training modules and educational products each year.
Ohio Sea Grant reaches 5,000 coastal stakeholders and visitors with education and outreach activities annually.
2. Lake Erie coastal residents, resource managers, businesses, and industries have the capability to predict the effects of human activities and environmental change on coastal resources.
As a result of Ohio Sea Grant educational programs, 75 people are trained annually to recognize the potential impacts and effects of human activities and environmental change on coastal resources.
3. People of all ages understand coastal, ocean, and Great Lakes environments and the need for stewardship of healthy ecosystems.
Annually, Ohio Sea Grant reaches 5,000 grade 4 thru adult learners at Stone Laboratory, 2,000 on the Ohio Sea Grant Lake Erie Discussion Board, and 50,000 on the Ohio Sea Grant web site with information about the coastal, ocean, and Great Lake environments and the need for stewardship of healthy ecosystems.
Annually, Ohio Sea Grant will lead collaboration efforts with educators and partners to adapt ocean literacy principles to Lake Erie and help formal and informal educators use Lake Erie literacy principles and concepts to develop educational curricula.

C. Goal: Restored function and productivity of Lake Erie degraded ecosystems

1. Coastal residents, resource managers, businesses, and industries have access to new approaches and technologies developed to improve the effectiveness of restoring coastal ecosystems.
Annually, Ohio Sea Grant reaches 5,000 coastal residents, resource managers, business representatives, and industry representatives with information about new approaches and technologies to improve ecosystem management.
2. Coastal residents, resource managers, businesses, and industries learn more about Lake Erie natural resources, issues, and opportunities.
Annually, Ohio Sea Grant helps 5,000 coastal residents learn more about Lake Erie natural resource, issues, recreation (fishing), and tourism opportunities.
3. Managers draw on both scientific information and the public to prioritize which ecosystem to restore and to set realistic restoration goals.
Ohio Sea Grant facilitates the development and dissemination of scientific information within Ohio Remedial Action Plan (RAP) Committees for Ohio's Areas of Concern.

II. FOCUS AREA - Sustainable Coastal Development

A. Goal: Healthy coastal economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.

1. Local communities have the information and techniques to enhance waterfront-related economic activities and protect the health of the Lake Erie coastal environment.
By 2014, all Sea Grant-funded research proposals will address stakeholder education and/or outreach components.
By 2014, 30% of the approximately 150 charter captains participating annually in charter captain conferences will report greater profitability due to Sea Grant-related programs and activities.
By 2014, 50 key statewide tourism industry leaders and agency officials will have participated in training provided by Ohio Sea Grant to create better understanding of the relationship between resource health and economic potential.
By 2014, 60 marinas within the coastal Ohio area will be certified as Clean Marinas.
2. Public access to Lake Erie's beaches and waterfronts is enhanced, preserved, or increased.
By 2014, a tool will be developed to measure the effectiveness and implementation rate of Ohio Sea Grant research, education, and outreach with community and land-use planners participating in programs.
By 2014, Ohio Sea Grant will have assisted five public access projects along Lake Erie, resulting in 20 additional acres added or maintained for recreational use.
3. Lake Erie community leaders are able to identify and pursue sustainable economic development policies and programs.
By 2014, a needs assessment will have been conducted to identify and prioritize the sustainable development research, training, and information needs of local, state, and federal policymakers.
By 2014, written policy analysis of at least one emerging issue impacting Lake Erie waterfront development will have been completed.
By 2014, participant evaluations from legislative events will measure increases in understanding and their intent to apply information to future decisions, and Ohio Sea Grant will gather further information from participants on specific implementation challenges.
4. Lake Erie watershed communities engage in visioning, resource inventories, analysis of development policies, and education of community leaders and citizens.
By 2014, a plan will have been developed for increasing coastal community awareness and participation in the Ohio Business Retention and Expansion Program, as well as other applicable planning products available through OSU.
By 2014, 10 communities will have been involved in visioning, resource inventories, analysis of development policies, and education of community leaders and citizens with the assistance of Ohio Sea Grant.

5. Lake Erie watershed communities are able to analyze the impacts and benefits of balanced growth practices and alternative development scenarios on coastal resources and economies.
By 2014, three case studies related to implementation of balanced growth will have been developed.
By 2014, training and technical resources related to sustainable development practices, such as balanced or smart growth, will have been provided to 150 officials in coastal communities.

B. Goal: Coastal communities that make efficient use of land, energy, and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.

1. Lake Erie coastal communities determine the sustainable carrying capacity of their land, water and other resources.
By 2014, a tool, or collection of tools, will have been identified to assist communities in measuring the carrying capacity of their resources
2. Lake Erie coastal communities use a variety of tools and technologies to adopt policies to protect the sustainable ecosystem footprint needed to sustain coastal, marine, and Great Lakes ecosystems and implement community designs that are compatible with the carrying capacity of coastal ecosystem and water resources
By 2014, Ohio Sea Grant will have evaluated the development of a tool to measure a community's ecosystem footprint.
3. Lake Erie communities adopt practices that increase their energy efficiency and decrease use of fossil fuels (i.e. increase in walkability, increase in public transit, decrease in vehicle miles traveled, energy efficient building codes adopted).
By 2014, three communities will have implemented sustainable practices because of information, training, or assistance provided by Ohio Sea Grant and its partners.

C. Goal: Lake Erie coastal citizens, community leaders and industries that recognize the complex inter-relationships between social, economic, and environmental values in coastal areas and who work together to balance multiple uses and optimize environmental sustainability.

1. Lake Erie coastal communities adopt mitigation measures, best management practices, and improved site designs (low impact development, green building design, natural area planning, wild habitat corridors, bio-retention areas, vegetative swales) in local policies and ordinances.
By 2014, 50 coastal communities will have been provided information by Ohio Sea Grant and its partners related to mitigation measures, best management practices, and improved site designs, as well as examples of how these efforts have been integrated into other policies and ordinances.
2. Lake Erie coastal communities are able to evaluate cost/benefit trade-off in the coastal area.
By 2014, at least two new research projects will focus on socio-economic research and outreach and/or cost/benefits for local communities.
3. Growth plans, policies, and strategies are developed and adopted to protect local and regional natural resources to serve future generations.
By 2014, 10 coastal communities will have involved Ohio Sea Grant in their discussions regarding sustainable planning.
4. Lake Erie coastal communities adopt and employ comprehensive land use planning and community design techniques that protect valuable coastal resources and minimize the impact of the built environment and sustain coastal environments.
By 2014, five coastal communities will be involved in the Balanced Growth Program or will be otherwise incorporating sustainable development principles, such as smart growth, into their comprehensive planning efforts.

III. FOCUS AREA – Safe and Sustainable Seafood Supply

A. Goal: Sustainable fisheries to meet public demand.

1. Natural and human threats to the long-term viability of Lake Erie's fish populations are minimized.
By 2014, 1,000 stakeholders will have attended education programs that identify causes and control measures for minimizing the stresses to Lake Erie fisheries.
By 2014, ODNR will have an updated Ohio Aquatic Invasive Species Management Plan.
2. A viable domestic aquaculture industry with acceptable environmental impacts is supported.
By 2014, Ohio Sea Grant will assist in the development of a comprehensive education and outreach strategy with the aquaculture industry.

B: Goal: A healthy Lake Erie fishery that harvests, produces, processes, and/or markets fish products responsibly and efficiently.

1. Anglers are knowledgeable, employ efficient fishing techniques, and understand the rationale behind fishing regulations.
By 2014, 1,000 anglers will have participated in hands-on training to learn more about efficient fishing techniques.
2. Lake Erie and Ohio fish availability and fisheries profitability increase.
By 2014, Ohio Sea Grant will investigate the feasibility of developing at least two new Lake Erie or aquaculture fish products.

C: Goal: Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our Lake Erie fisheries, who appreciate the health benefits of fish consumption, and who understand how to evaluate the safety of the fish they catch.

1. Lake Erie fish consumers have an increased knowledge of the nutritional benefits of seafood products, know how to judge seafood safety and quality, and can apply this knowledge to make better choices when they purchase fish.
By 2014, 1,500 people have been reached with information on preserving and preparing freshly caught Lake Erie fish.
2. Information portals are available for information related to Lake Erie fish safety and benefits, nutrition, and sustainability.
By 2014, the Ohio Lake Erie Discussion Board will inform 90,000 individuals annually who visit to read posts and will have 400 registered users.

IV. FOCUS AREA – Hazard Resilience in Coastal Communities

A. Goal: Widespread understanding of the risks associated with living, working, and doing business along the Lake Erie coast.

1. Lake Erie decision-makers benefit from improved risk communication (i.e. better understanding of emergency forecasting, evacuation plans, rip current hazards, etc.) and understand the benefits of coastal hazard risk planning.
By 2014, 100 decision-makers will have received information and training regarding coastal hazard risk planning (i.e. better understanding of emergency forecasting, evacuation plans, rip current hazards, climate change, etc.).
2. Lake Erie decision-makers are aware of existing and available hazard-related data and resources (i.e. wave gauge, water level gauge, weather station data, etc.).
By 2014, a tool will be developed to measure how much decision-makers have improved their ability to assess risk vulnerability and apply the knowledge obtained through the education and outreach efforts of Ohio Sea Grant and its partners.

B. Goal: Community capacity to prepare for and respond to hazardous events.

1. Lake Erie communities have access to and the ability to utilize data and innovative and adaptive tools and techniques to minimize hazard risks (i.e. planning and construction BMPs, standards, resiliency index, retrofits, flood-zone maps, and freeboard).
By 2014, a comprehensive inventory of tools and techniques available for coastal communities will be developed.
2. Lake Erie decision-makers have the capacity to apply data and resources to hazard planning and response.
By 2014, at least three trainings will be conducted for Lake Erie decision-makers that provide the information needed to apply data, tools, and resources (i.e., GIS application, land-use planning).
3. Lake Erie decision-makers have the knowledge and skills to assess local risk vulnerability and respond with appropriate policies and regulations.
Eighty percent (80%) of those Lake Erie decision-makers participating in training report increased knowledge and skills to assess local risk vulnerability.
4. Lake Erie opinion leaders and decision-makers take proactive measures to ensure that hazards, risks, and vulnerabilities are communicated to property owners and perspective purchasers.
Where appropriate, training for Lake Erie opinion leaders and decision-makers includes audience-appropriate information for them to communicate to property owners and perspective purchasers.

C. Goal: Effective response to coastal catastrophes.

1. Lake Erie communities and non-governmental organizations apply best available hazard and climate change information, tools, and technologies to maximize community resiliency to natural hazards.
By 2014, needs assessments will be conducted with at least three stakeholder groups on their needs for climate change information and tools.
By 2014, 15 public beach managers will report using Ohio Sea Grant-provided information regarding rip currents to train lifeguards and beach personnel.

Stone Laboratory

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