

Ohio Sea Grant *2004-2006 Implementation Plan*¹

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including F.T. Stone Laboratory
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¹ Research projects that were initiated between February 1, 2000 – March 31, 2005 are included here. For more information on these projects, visit the research project pages on our web site at: www.sg.ohio-state.edu/OSGRANT/Research/.

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Implementation Plan 2004-06

This Implementation Plan is in an outline format that follows the basic structure of the National Sea Grant Strategic Plan for the period 1995-2005—particularly for the overall goals of the program and the focus on the economy, the environment, and education. The objectives and actions listed herein have been developed locally and clearly demonstrate the manner in which the Ohio Sea Grant College Program addresses both local needs and national priorities. Additional background material on the program, our management policies, and the Lake Erie ecosystem can be found in the “Ohio Sea Grant Strategic Plan 2000-05 and Implementation Plan 2000-02” which can be obtained from our main office or viewed on our web site (www.sg.ohio-state.edu).

Our efforts to implement our Strategic Plan are described by the actions and research projects listed in this document. In some cases the names of the responsible parties within Ohio Sea Grant have been listed to assist us in evaluating progress and assuring clear lines of responsibility. At a minimum, our strategic plan and implementation plan will be formally printed every five years. However, because this is meant to be a living document that is continually undergoing modification and improvement to allow the program to address new issues and opportunities as they arise, dated drafts that are printed in a very simple fashion will be made available between the major five-year printings.

This particular edition of our implementation plan is the final edition prior to the development of our new strategic plan covering the period 2005-10. As such, it shows our current actions, but it includes a complete listing of all of our research and education projects that were initiated during the years of the last strategic plan—2000-05.

The reporting strategy we intend to use to evaluate our effectiveness in accomplishing this plan will follow the pattern we have used for many years, i.e. a reiteration of each goal and objective followed by the research projects we have supported, our actions taken, and the results of the actions.

A comprehensive listing of the outcomes and results of our actions and funded research is beyond the scope of this document. For information on outcomes and results of Sea Grant projects, see updates posted to our project listing (www.sg.ohio-state.edu/PROJECT/PROJLIST.ASP) and the annual “Ohio Sea Grant College Program Progress Report” available from our main office or web site (www.sg.ohio-state.edu).

We believe there is great importance in each of the three major programmatic areas used in this plan: I) Economic Issues, II) Environmental Issues, and III) Education Issues. We have developed outstanding projects and realized notable successes in each of these areas. However, because of rapid changes in the Lake Erie ecosystem, we have placed and will continue to place greater emphasis on understanding and predicting these changes, i.e., providing the science behind ecosystem management.

Strategic and Implementation Plans 2005-10: *Strategy for Development*

In 2000, we completed a Strategic Plan covering the period 2000-05 and an implementation plan covering the period 2000-02 (the national program requires implementation plans to cover two years). These plans were updated in 2002 covering the period 2002-04 and in 2004 (this document) covering the period 2004-06. These plans followed the format of the National Oceanic and Atmospheric Administration (NOAA) Sea Grant Strategic Plan for the period 1995-2005 and included Goals, Objectives, and Actions. The consequent results of these actions are also available.

When NOAA and NOAA Sea Grant developed new strategic plans for the period 2003-08, we felt it was important to revise and update our plans to reflect the format and logic of the national plans to show how national priorities were being addressed locally in Ohio. The major effort in this regard will be to modify our structure to show how our priorities fit into the 11 Sea Grant Thematic Areas.

We also felt it was very important that the new NOAA Strategic Plan include Great Lakes priorities. In this regard, we were instrumental in having a NOAA hearing on Great Lakes priorities moved from Boulder, Colorado to Cleveland, Ohio. We then worked hard to be sure the hearing was well attended and assisted our Congressional Delegation in preparing comments on the plan. We also worked successfully to have Great Lakes issues incorporated into the NOAA Sea Grant Strategic Plan. Having done these things, it was very easy to mold our priorities into those of NOAA and NOAA Sea Grant.

In developing our new plans, we felt it was also important to address the nine priorities of the Great Lakes Governors, the academic plan of The Ohio State University, and the recommendations in the Ocean Commission Report. We partnered with the Great Lakes Commission, Ohio Environmental Protection Agency (OEPA), and the Ohio Department of Natural Resources (ODNR) to host a public hearing in February 2004 at Cuyahoga County Community College to gather input to improve the Governors' priorities. To aid the process to evaluate the Governors' priorities, we also developed a survey on Ohio Sea Grant's web site and were very pleased to have 187 people complete the survey. We also held five focus group meetings with our Sea Grant Advisory Committees and the Director's Advisory Council between November 2004 and January 2005 to gather input for the plan. All of this information was incorporated into this plan and will be incorporated into our new strategic plan.

With regard to the Ocean Commission Report, we worked to be sure the report included Great Lakes issues and priorities. Dr. Reutter was invited to testify before the Commission when they met in Chicago in September 2002. As President of the National Association of Marine Laboratories (NAML), he developed the official NAML comments on the draft report. He also assisted the Governor's Office, our Sea Grant Advisory Committees, and the Friends of Stone Laboratory, in developing their comments, was asked to speak to the Great Lakes Commission about the report and assisted them with their comments (May 4, 2004), and was invited to do Congressional Briefings on the report for the Ohio Congressional Delegation and the Great Lakes Congressional Delegation (May 18, 2004). These briefings resulted in delegation letters being written to the Commission to improve their report and make it easy for Ohio Sea Grant to support its recommendations.

Implementation Plan 2004-06

Economic Leadership

I. Advanced Technology for Commercial Products and Processes

A. Commercial Biotechnology

1. Goal: Support the growth and development of high-tech businesses and industrial processes by creating new products and processes from Ohio's coastal resources using marine (aquatic) biotechnology.

a. Objective: Use marine biotechnology to recover valuable materials from industrial waste streams, disposal facilities, and lake sediments.

(1) Action: Encourage biotechnological research on *Chlamydomonas* for use in removing heavy metals from water and sediments, seek opportunities to commercialize this work, and develop partnerships and/or collaborative agreements with the private sector and state and federal agencies.

Research Projects

Heavy Metal Bioremediation Using Genetically Altered Biomass (project **R/BT-6**), Richard Sayre, The Ohio State University, March 2000-February 2006.

Development of Fluorescent Biosensors for In Situ Trace-Metal Quantification and Biomonitoring (project **R/BT-8**), Richard Sayre, the Ohio State University, June 2003-May 2005.

B. Environmental Technology

1. Goal: Develop technologies that enhance environmental monitoring, improve waste treatment, enhance energy production, and remove contaminants from industrial and agricultural waste streams, lake sediments, and coastal environments.

a. Objective: Develop and disseminate new technologies, including bio-engineered organisms that are safe and capable of detecting, removing, and/or detoxifying contaminants in a cost-effective manner.

(1) Action: Continue to solicit and support research to develop and evaluate new technologies (e.g., sonication) to remove metals from sediment.

Research Project

Advanced Treatment Process for the Removal of Cyanobacterial Toxins from Drinking Water (project **R/PS-31**), Harold W. Walker, The Ohio State University, March 2003-February 2005.

Preliminary Data to Evaluate the Use of Precursor 16S rRNA as an Indicator of Viable Waterborne Pathogens in the Environment (project **R/EM-26-PD**), Daniel B. Oerther, University of Cincinnati, April 2004-March 2005.

b. Objective: Develop and disseminate new technologies to safely and effectively deal with the adverse effects of nuisance biota.

Research Project

Assessment of Antifouling Mechanisms of Non-Toxic Natural Product Antifoulant Incorporated Silicone Coatings (project **R/MB-2**), Bi-min Newby, The University of Akron, September 2002-August 2004.

c. Objective: Disseminate information on new technologies for energy production and assist communities in decision making regarding these technologies.

(1) Action: Participate in discussions regarding wind power in and around Lake Erie and the Great Lakes.

d. Objective: Extend the results of artificial reef research to decision makers considering reef or near-shore construction.

(1) Action: D. Kelch will consolidate information from previous Ohio Sea Grant artificial reef publications into one updated publication, making reference to website sonar images.

II. Seafood Production

A. Commercial & Recreational Fisheries

1. Goal: *Develop better ecosystem models so resource managers can improve fishery forecasts.*

a. Objective: Seek opportunities to collaborate with resource management agencies and assist in the development of improved fishery forecasts and management strategies.

(1) Action: Continue to support and lead ecosystem modeling efforts through the International Joint Commission and its Council of Great Lakes Research Managers.

(2) Action: Develop collaborative programs with the ODNR to assist in the development and evaluation of management strategies.

2. Goal: *Seek new techniques and solutions to assist resource managers in allocating fish equitably.*

a. Objective: Support research and outreach efforts to develop and evaluate a variety of alternative allocation strategies.

(1) Action: Assist management agencies with conflict resolution and gathering user input.

(2) Action: Collaborate with the ODNR Division of Wildlife to identify and evaluate new management strategies.

b. Objective: Maintain a liaison with the commercial fishing industry in Ohio and assist in the development of business opportunities.

(1) Action: D. Kelch, F. Snyder, and J. Hageman will investigate potential research efforts relevant to commercial fisheries issues and market development.

3. Goal: *Assist fisheries managers, industry, and coastal communities in understanding the social, economic, and legal impacts of management strategies.*

a. Objective: Support research and outreach efforts to model alternative fish allocation strategies to maximize the economic impact/benefits of the fishery to Ohio.

B. Sustainable Aquaculture

1. Goal: *Develop growout system technology and increase the fundamental knowledge of animal husbandry in such areas as reproduction, hatchery technology, growth, nutrition, and disease diagnosis and control.*

a. Objective: Cooperate with The Ohio State University Piketon Aquaculture Research and Extension personnel to develop new technologies and inform the Ohio aquaculture industry of advances in fish farming technology to improve decision-making.

(1) Action: F. Snyder and will develop and maintain a working relationship with the OSU Piketon Research and Extension Center to assist in the production and dissemination of educational material and programs for aquaculturists in Ohio.

(2) Action: F. Snyder will serve as an advisor for the OSU Piketon Aquaculture Research and Extension Center's new Bowling Green aquaculture research facility and for projects developed by the OSU Lima Extension Center.

Research Projects

Freshwater Shrimp Production in Southern Ohio (project **R/A-16-PD**); David Apsley, Laura Tiu, & Geoff Wallat; The Ohio State University Extension-South Centers, April-December 2002.

Impact of Latitude on Freshwater Shrimp Culture in Ohio (project **R/A-17-PD**); Donald McFeeters, Laura Tiu, & Geoff Wallat, The Ohio State University Extension-South Centers; Jeffrey M. Reutter, Ohio Sea Grant; May 2003-February 2005.

b. Objective: Increase Ohio's production of farm-raised crayfish and baitfish and assist producers in expanding markets for these products.

(1) Action: All agents will assist those interested in growing fish and other aquatic products to obtain needed information and put them in contact with the Piketon Research and Extension Center.

2. Goal: *Enhance aquaculture through biotechnology by developing heartier fish, healthier feeds, and improved strategies for disease control.*

a. Objective: Support research to develop and evaluate vaccines for fish and shellfish diseases.

Research Project

A combinatorial Approach to Vaccine Development for Fish (project **R/BT-7**), Richard Sayre, The Ohio State University, March 2003-February 2005.

b. Objective: Develop optimal strategies for transgenic research in cultured species.

Research Project

Methods of Intraspecies Embryonic Cell Transfer in Fish (project **R/A-15-PD**), Konrad Dabrowski, The Ohio State University, May 2000-April 2001.

c. Objective: Support research to refine diets to optimize growth, survival, and egg production and quality of cultured animals.

Research Project

Relationship Between Lake Erie Walleye Gamete Viability and Concentrations of Vitamins B1 in Eggs and Sperm (project **R/A-18-PD**); Konrad Dabrowski, Roy Stein, & Jacques Rinchar; The Ohio State University; March 2004-May 2005.

Effect of a Fishmeal-Free Diet on the Growth and PCB Levels of Freshwater Shrimp in Ohio (project **R/A-19-PD**); Donald J. McFeeters, Laura Tiu, & Geoff Wallat; The Ohio State University—Centers at Piketon; May 2004-April 2005.

C. Seafood Technology

1. Goal: Support Hazard Analysis Critical Control Point (HACCP) training for the Ohio seafood industry.

a. Objective: Improve seafood safety and improve HACCP compliance within the Ohio Seafood industry.

- (1) Action:** D. Kelch will conduct HACCP training for the Ohio commercial fishery and aquaculture industries as need.
- (2) Action:** D. Kelch will provide fact sheets and other educational materials as appropriate to seafood industry participants about seafood safety procedures.
- (3) Action:** D. Kelch will develop a fact sheet and other educational materials as appropriate to inform consumers about fish contaminants and other seafood safety issues.

III. Coastal Economic Development

A. Coastal Business Development

1. Goal: Concentrate research and outreach efforts to support business development and retention in:

Fishing, including: sport and charter fishing, tackle manufacturing and sales, bait production and sales, etc.

Extension Project

Fisheries Extension Enhancement: Ohio Sea Grant Fisheries Extension Agent (project **A/EP-9**); Frederick L. Snyder, Frank R. Lichtkoppler, David O. Kelch, & Jeffrey M. Reutter; Ohio Sea Grant, May 2004-April 2006.

a. Objective: Increase profitability in the charter fishing industry through business and technology development and education.

- (1) Action:** F. Snyder will conduct the Ohio Charter Captains Conference annually and F. Lichtkoppler will conduct business surveys every 4-5 years.

b. Objective: Reverse the decline in sport fishing participation and enable fishing businesses to retain clientele.

- (1) Action:** K. Riesen will develop youth-oriented sport fishing education programs to be presented at the Lake Erie Nature and Science Center (LENSC), coastal counties and selected inland locations.
- (2) Action:** K. Riesen will conduct youth fishing education programs and coordinate these with related efforts by the Recreational Boating and Fishing Foundation, ODNR Division of Wildlife, the Great Lakes Sport Fishing Council (GLSFC), and 4-H.
- (3) Action:** Continue to write Twine Line articles and fact sheets of interest to sport anglers.

(4) Action: Conduct seminars about recent changes in Lake Erie and how these changes impact the fishery, fish behavior, and fishing techniques. Other potential topics include fishery biology, fishery management updates, exotic species impacts, and fish consumption advisories.

(5) Action: J. Jentes and extension agents will take the lead in organizing Sea Grant Extension displays at the Cleveland Boat Show, Cleveland Sport Show, etc.

(6) Action: Write and mail periodic news releases on Lake Erie issues and sport fisheries to key leaders, outdoor writers and local media contacts.

c. Objective: Increase the knowledge base and skills of fisheries professionals and help to develop the next generation through the education programs of F.T. Stone Laboratory.

(1) Action: As President-Elect and President of the Ohio Chapter of the American Fisheries Society, E. Braig will work to initiate a student chapter through the faculty of the School of Natural Resources' Forestry, Fisheries, and Wildlife Program at OSU.

(2) Action: J. Hageman and E. Braig will conduct special ichthyoplankton identification workshops to meet the new demand by agency and professional personnel for this skill in response to licensing requirements for power generating facilities to document impacts on the fishery through their water intakes.

(3) Action: Continue to offer undergraduate and graduate fisheries courses at Stone Laboratory and develop scholarships and fellowships to support students in these courses.

d. Objective: Collaborate with the ODNR Division of Wildlife on research and outreach efforts to evaluate management strategies, improve fisheries management, and disseminate results.

(1) Action: Join the ODNR Division of Wildlife on a Management Team for Lake Erie.

(2) Action: F. Snyder, D. Kelch, and F. Lichtkoppler will work on fisheries education and outreach efforts in cooperation with the Division of Wildlife Management Team for Lake Erie.

Research Projects

Genetic Structure of Smallmouth Bass Populations from Nuclear and Mitochondrial and Nuclear DNA (project **R/LR-5**), Carol A. Stepien, Cleveland State University, March 2001-February 2005.

Evaluation of Employing Trace Element Contents of Otoliths as a Natural Tag Using Lake Erie White Bass (*Morone chrysops*) (project **R/LR-6-PD**), John R. Farver & Jeffrey G. Miner, Bowling Green State University, December 2001-November 2002.

Walleye and Yellow Perch Stock Structure in the Great Lakes: A High Resolution DNA Data Base for Fishery Management (project **R/LR-7**), Carol A. Stepien, University of Toledo, March 2004-February 2007.

Employing Trace Element Contents of Otoliths for Fish Stock Discrimination and Habitat Use (project **R/LR-8**), John R. Farver & Jeffrey G. Miner, Bowling Green State University, March 2005-February 2008.

- e. Objective:** Help develop the next generation of private-sector citizen fishery leaders through participation in the Great Lakes Fisheries Leadership Institute (GLFLI) and provide leadership of the Ohio and Lake Erie portions of the Institute.
- (1) Action:** K. Riesen will conduct at least one GLFLI program at F.T. Stone Laboratory annually (2005 program on 7-9 October).
- f. Objective:** Increase public understanding of science-based fisheries management and the sometimes-controversial fisheries harvest and management practices needed to ensure sustainability of fisheries resources.
- (1) Action:** K. Riesen will conduct public seminars in all shoreline counties and selected inland areas to keep fisheries resource users abreast of ecological and management information and initiatives.
- (2) Action:** In collaboration with ODNR Division of Wildlife and the Great Lakes Fishery Commission (GLFC), K. Riesen will produce printed and digital programs, fact sheets, news releases, presentations and articles on fish ecology, scientific management principles, multi-state and bi-national management strategies and related biological information. All materials will be available at the web sites of Ohio Sea Grant, ODNR Division of Wildlife, GLFC, and the GLSFC.
- (3) Action:** K. Riesen will serve as LENS's resident Lake Erie expert and develop fisheries related educational displays and seminars for presentation at the Center and at other locations along the shoreline.
- g. Objective:** Increase proficiency among fisheries resource users in identifying and locating sources of fisheries and marine technology information and in using technical information in their own fishing operations.
- (1) Action:** K. Riesen will produce printed and digital programs, fact sheets, news releases, presentations, and articles on fishing technology, methodology, and related biological information.
- (2) Action:** K. Riesen will establish a visible presence at fisheries-related public events, sport and boat shows, and other venues to establish the fisheries agent as a well-known fisheries information source.
- (3) Action:** K. Riesen will work to increase awareness of Lake Erie fishing opportunities, fisheries issues and technical information to audiences in both coastal and inland counties through news releases and seminars.
- (4) Action:** A web-based Lake Erie Discussion Board will be maintained and linked from the Ohio Sea Grant web site to provide timely answers to questions on Lake Erie topics. All agents will participate in answering questions as appropriate to their areas of specialization.

Coastal Recreation, including: boating, swimming, tourism development, diving, sightseeing, birding, hunting, etc.

- h. Objective:** Improve the decision-making process regarding the development and retention of coastal recreation businesses.
- (1) Action:** Each Sea Grant agent will assist marinas, charter fishing firms, dive shops, and other interested businesses in adopting new method, and technologies to improve business performance.
- (2) Action:** J. Lucente will assist the Toledo Area Convention and Visitor's Bureau in the development and publication of the Western Lake Erie Waterfront Guide.

- (3) Action:** Develop and prioritize research and outreach efforts related to the evaluation of coastal recreation in collaboration with management agencies, the private sector, and local governments.
- (4) Action:** Support research and outreach efforts to determine the economic and environmental impacts of various types of coastal recreation to assist resource managers.
- (5) Action:** D. Kelch and F. Lichtkoppler will continue to disseminate the results of their socio-economic research on Lake Erie coastal recreation users, including steelhead anglers on Lake Erie tributaries, to citizens, local officials, resource managers, and the scientific community.
- (6) Action:** F. Snyder and F. Lichtkoppler will continue to provide leadership with Lake Erie Coastal Ohio, Inc. and its mission to develop and advocate for resource-based tourism along the lakeshore.
- (7) Action:** D. Kelch will continue to serve on the Lorain County Visitors Bureau Board of Directors and work on Lake Erie related tourism issues.
- (8) Action:** D. Kelch will collaborate with the Submerged Lands Advisory Committee to mark shipwrecks for divers and continue to serve on the Governor's Submerged Lands Advisory Committee.

Research Project

A comparison of Recreation and Amenity Values in the Lake Erie Basin (project **R/ME-24**), Brent Sohngen & Leroy Hushak, The Ohio State University, March 2001-February 2003.

Education Project: Lake Erie Shipwreck Diver Slates (project **E/MP-3-PD**), Karen Ricker, Ohio Sea Grant, April-September 2002.

- i. Objective:** Enhance Lake Erie and Great Lakes regional tourism efforts to create opportunity for regional branding, increased economic impact, and leveraging increased support for marketing and product development.
 - (1) Action:** Assist with federal designation and implementation of corridor management plan for the Lake Erie Coastal Trail Scenic Byway.
 - (2) Action:** Participate in focus group evaluations of image of Lake Erie and the Great Lakes being conducted by Lake Erie Coastal Ohio, Inc. in early 2005. Assist with dissemination of results and development of strategy to create public awareness campaign based on existing image and challenges.
- j. Objective:** Generate databases of public opinions, attitudes, and values as they relate to marine and aquatic issues to guide future research, education, and outreach activities and to influence management decisions.
 - (1) Action:** Continue socio-economic research with coastal recreational users.
 - (2) Action:** F. Lichtkoppler will partner with others to help conduct applied socio-economic research on citizen (voter) willingness to pay for environmental amenities and environmental improvements such as green space preservation, recycling programs, and environmental cleanups as requested by local authorities and will share the results with citizens, local officials, resource managers, and the scientific community.

- (3) Action:** W. Williams and F. Lichtkoppler will continue to disseminate the results of web-based surveys concerning Great Lakes restoration priorities and Lake Erie protection and restoration plans and with citizens, local and regional officials, resource managers, and other interested persons; these results will continue to shape Ohio Sea Grant's strategic planning process.
- (4) Action:** Share research results with state and regional management agencies and professional associations (e.g., Lake Erie Marine Trades Association) to aid in prioritizing research.

Research Projects

Water Safety Boater Satisfaction Survey (project **R/ME-26**), Leroy J. Hushak, The Ohio State University, January 2000-June 2000.

The Economic Importance of Nature-Based Tourism in Ohio's Lake Erie Tourism Industry: The Case of Ottawa and Erie Counties (project **R/ME-27-PD**), Leroy J. Hushak, The Ohio State University, April 2001-February 2002.

k. Objective: Investigate opportunities for development of new recreational activities and businesses on Lake Erie, e.g., scuba diving and bird watching.

- (1) Action:** Develop an "Underwater Field Guide for Lake Erie" to be used by divers, students, and teachers.
- (2) Action:** Assist Lake Erie Coastal Ohio, Inc. in its efforts to enhance and define opportunities for bird watching in the Lake Erie region, including development of new birding products such as birding cruises; promotion to birding-related tour operators; enhancement of bird watching experiences through interpretation, service improvements, and facility development; and development of a birding trail as part of the Lake Erie Coastal Scenic Byway progression and federal designation.
- (3) Action:** F. Snyder will assist ODNR in transient marina development.
- (4) Action:** F. Snyder and/or F. Lichtkoppler will serve on the board of Lake Erie Coastal Ohio, Inc.
- (5) Action:** J. Hageman will coordinate efforts with Lake Erie Wing Watch to expand participation and economic benefits of bird watching.
- (6) Action:** D. Kelch and Joe Lucente will develop an "Underwater Field Guide for Lake Erie" and /or other appropriate publications to be used by divers, students, and teachers.
- (7) Action:** J. Lucente and D. Kelch will coordinate efforts to enhance the Lake Erie Coastal Trail Scenic Byway, a state-designated route and pending federal America's Byway, with trail incorporating diving opportunities along the lake.

- l. Objective:** Develop a “Wet Circle Tour” (by boat) to compliment the existing circle tour to increase boater satisfaction/pleasure and tourism impact.
 - (1) Action:** Collaborate with the ODNR Division of Watercraft and visitors’ bureaus to increase the availability of transient docks in communities.
- m. Objective:** Provide outreach, education, and assistance to county visitors’ bureaus in the marketing and development of tourism on Ohio’s North Coast.
 - (1) Action:** All Sea Grant Extension agents will develop formal linkages with the visitors’ bureaus in their respective counties, and assist the directors of these bureaus in the development of marketing strategies.
- n. Objective:** Support the Lake Erie marine trades industry and other tourism related businesses.
 - (1) Action:** F. Snyder will provide marina operators with current and appropriate in-water weed control procedures through personal contact, publications, and workshops, as appropriate.
 - (2) Action:** As fishing activity decreases, D. Kelch and J. Lucente will assist fishing businesses to refocus on the development of new business activities focused on non-fishing such as dinner cruises, island cruises, scuba diving, snorkeling, etc.
 - (3) Action:** Each Sea Grant agent will assist marinas, charter fishing firms, dive shops, and other interested businesses in adopting new methods and technologies to improve business performance.

Marine Trades, including: marinas, boat sales, shipping, etc.

- o. Objective:** Increase the profitability of marine businesses through business and technology research, education, and outreach.
 - (1) Action:** F. Lichtkoppler will continue to cooperate with the ODNR Division of Watercraft and the Lake Erie Marine Trades Association (LEMTA) to inventory and report boat sales figures within Ohio.
 - (2) Action:** F. Lichtkoppler will partner with economic researchers to conduct research to upgrade and refine figures on the economic impact of boating in Ohio in cooperation with the ODNR Division of Watercraft and LEMTA and will share/interpret the results for decision makers.
 - (3) Action:** F. Snyder will assist charter fishing operators in incorporating electronic technology into their businesses.

Research Project

Estimating the Spatial and Temporal Benefits of Recreational Boating and Angling in the Lake Erie Basin (project **R/ME-28**), Timothy C. Haab, The Ohio State University March 2002-February 2005.

Extension Projects

International Leadership Development for Coastal Decision Makers (project **A/EP-10-PD**), Joseph Lucente, Ohio Sea Grant, November 2004-January 2005.

Dike 14 Field Guide (project **A/P-7-PD**), Walter Williams, Ohio Sea Grant, April 2005-June 2005.

p. Objective: Increase recreational access to Lake Erie.

(1) Action: Assist coastal communities with planning to upgrade coastal parks, beaches, and marina facilities.

q. Objective: Provide outreach education for local leaders to support the design of local economic development strategies for coastal businesses (tourist, convention, power, municipal, and others) on Ohio's North Coast.

(1) Action: Each Sea Grant Extension agent will initiate contact with county commissioners, mayors, township trustees, chambers of commerce, community improvement corporations, planning commissions, etc. to provide informal outreach education and to assist in providing formal outreach relating to coastal economic development.

(2) Action: W. Williams and J. Lucente will be active members of the Small Business Excel team and conduct at least one Excel program for coastal business each year. Excel teaches basic business management skills for small business managers.

Industrial and Commercial Businesses within the coastal zone and the Lake Erie watershed.

r. Objective: Encourage business expansion and development on brownfield sites.

(1) Action: W. Williams and J. Lucente will continue efforts with the Greater Cleveland Partnership and economic development groups in Toledo to redevelop brownfield sites.

(2) Action: Assist existing businesses with expansion plans to reduce urban sprawl and prevent the development of new brownfield sites caused by business relocations.

Research Project

Developing Industrial Heritage: A Case Study in Toledo and Waterville (project **R/ME-29-PD**); Philip F. Xie, David Groves, Julie Longfelder, & Bill Obenour; Bowling Green State University; May 2002-April 2003.

B. Coastal Community Development

1. Goal: *Conduct environmental and social science research and develop and implement outreach efforts to support sustainable community development and the revitalization of coastal communities.*

a. Objective: Support research and dissemination of information to enhance understanding of how land-use policies structure the demand for and form of lakeshore and near-lakeshore development.

Research Projects

Understanding the Links between Policy and Patterns of Land Use Change in Urbanizing Watersheds: A Spatial Economic Model of Land Use Conversion (project **R/ME-25**), Elena Irwin, The Ohio State University, March 2000-February 2002.

The Influence of Water Quality and Lake Amenities on the Demand for Residential Development around Lake Erie (project **R/ME-30**), Elena Irwin & Tim Haab, The Ohio State University, March 2004-February 2005.

Large Lake Ecosystems: Modeling Interactions Among Human, Biological, and Physical Processes (project **R/EM-27**); David A. Culver, Keith W. Bedford, Elena G. Irwin, & Alan Randall; The Ohio State University; & Jeffrey M. Reutter; Ohio Sea Grant; Sept. 2004-Aug. 2009.

b. Objective: Collaborate/lead efforts with ODNR, OEPA, and local communities to develop watershed management plans for every Lake Erie watershed in Ohio.

(1) Action: Develop collaborative funding options with state agencies to support research that evaluates the economic and environmental impact of a variety of developmental strategies within coastal watersheds.

2. Goal: *Develop and implement strategies to enhance brownfield redevelopment, reduce urban sprawl, protect key environmental features, and reduce pollution from aging industries and communities.*

a. Objective: Continue our successful outreach programs in Cleveland and Toledo emphasizing brownfield redevelopment and business retention and expansion within urban coastal communities.

(1) Action: W. Williams and J. Lucente will provide technical assistance to existing businesses having expansion plans aimed at reducing urban sprawl and preventing the development of new brownfield sites caused by business relocations.

(2) Action: J. Lucente and W. Williams will assist economic development professionals in their respective counties in developing procedures for targeting businesses most able to use aging industrial and warehousing buildings.

(3) Action: W. Williams will write or revise two fact sheets and other publications for developers, lenders, and businesses on Ohio laws governing reuse of brownfield sites, on model brownfield site risk assessment procedures, and on how to measure risk at brownfield sites.

b. Objective: Assist in the conduct of the Ohio Business Retention & Expansion (R&E) Programs in coastal counties.

(1) Action: Sea Grant Extension agents will be involved with the R&E programs conducted within their counties of responsibility.

(2) Action: W. Williams will work with neighborhood or area organizations and develop cluster groups, telephone marketing surveys, electronic surveys, and other tools into urban R&E program procedures.

C. Marine Infrastructure

1. Goal: *Develop safe and effective underwater inspection and survey mechanisms and mount a comprehensive, long-term research effort to meet the technological challenges posed by the aging and obsolescence of marine structures.*

a. Objective: Support research and outreach efforts to develop new technologies to produce quality underwater welds, and to produce and inspect these welds where visibility and environmental conditions are severely limiting.

2. Goal: *Maintain safe and adequate commercial and recreational access to Lake Erie.*

a. Objective: Enable Ohio coastal communities, property associations, and businesses to improve safety, access, and navigation in their waterways.

(1) Action: Assist local communities and businesses with obtaining dredging permits for recreational harbors.

(2) Action: J. Lucente will work with the Toledo-Lucas County Port Authority to investigate funding for a land re-use study of Combined Disposal Facility #3 in Toledo toward a Long-Term Dredged Materials Management Study.

Coastal Ecosystem Health and Public Safety

I. Coastal Ecosystem Health

A. Coastal Ecosystems

1. Goal: *Develop and implement an ecosystem management plan for Lake Erie.*

a. Objective: Develop the necessary scientific information to manage Lake Erie as an ecosystem.

(1) Action: Support and/or lead efforts within the International Joint Commission and other regional and state agencies/groups to understand and model the Lake Erie ecosystem to assist managers and improve management of the system. Included in the modeling efforts will be contaminants, nutrients, aquatic invasive species (AIS), sediment loading, and economic impacts.

Research Projects

Radiocarbon Age Constraints on Lake Erie Record of Climate and Lake Level Change (project **R/ER-57-PD**), Beverly Saylor & Enriqueta Barrera, Case Western Reserve University, February 2000-February 2002.

Effects of Salt Contamination and Exotic Species Invasions on a Large, Freshwater Marsh in the Lake Erie Basin (project **R/ER-56-PD**), Lisa A. Park & Bryce Dingman, University of Akron, March-December 2000.

Advancing the Tissue Residue-Based Risk Assessment: Field and Laboratory Tests of the Critical Body Residue Hypothesis (project **R/PS-25**), Susan W. Fisher, The Ohio State University, March 2000-February 2002.

Effects of Round Goby on Yellow Perch-Amphipod Interactions Within Zebra Mussel Colonies and Macrophyte Beds (project **R/NIS-7**), Maria J. Gonzalez, Miami University, March 2002-February 2005.

Spatial Modeling of the Mentor Marsh and its Watershed: Equipment Grant (project **R/GIS-2-PD**), Craig Davis & Brian Slator, The Ohio State University, March 2000-June 2001.

Modeling Smallmouth Bass Consumption of Round Goby in Lake Erie: Implications for Predator Growth and Contaminant Transfer (project **R/ER-55**); Roy Stein, Elizabeth Marschall, Susan W. Fisher, & Gene W. Kim; The Ohio State University; March 2000-February 2005.

Preliminary Tests of Seiches on Plant Litter Decomposition and Macroinvertebrates in Great Lakes Coastal Wetlands (project **R/ER-59-PD**), Ferenc A. de Szalay, Kent State University, May 2000-May 2001.

Digestive Physiology as it relates to Food Preference as a Mechanism Explaining Differential Bioaccumulation of Lipophilic Pollutants Among Benthic Invertebrates (project **R/PS-27-PD**), Robert H. Findlay, Miami University, June 2000-May 2001.

Cyanotoxins in the Great Lakes: Is Microcystis Toxin Production Linked to Iron Deficiency? (project **R/ER-58-PD**), Michael L. McKay, Bowling Green State University, August 2000-May 2001.

A model for Internal Chemical Loading in Lake Erie (project **R/EM-21-PD**), Gerald Matisoff, Case Western Reserve University, August 2000-July 2001.

Larval Fish Flux Between Metzger Marsh and Lake Erie (project **R/EM-25-PD**), David L. Johnson & Kelly Krupa, The Ohio State University, May 2001-December 2002.

Preliminary Evaluation of a New Technique for Linking Picoplankton Community Structure with Function in Aquatic Environments (project **R/EM-24-PD**), Daniel B. Oerther, University of Cincinnati, January-December 2002.

Great Lakes Limnology: Interactions Among Physics, Chemistry, and Biology in a Large Lake (project **R/ER-62-PD**), David A. Culver, The Ohio State University, March 2002-March 2003.

Origin and Fate of the Organic Matter Exchanged Between Coastal Wetlands and the Great Lakes (project **R/EM-22**), Virginie Bouchard, The Ohio State University, March 2002-August 2005.

Importance of the Microbial Food Web in C- Through the Base of the Food Web in Great Lakes Plankton Communities (project **R/ER-60**), Robert T. Heath, Kent State University, March 2002-February 2005.

Role of Detritivores in PCB Trophodynamics in the Western Basin of Lake Erie (project **R/PS-28**), Robert H. Findlay, Miami University, March 2002-February 2004.

Heritability of Heat Tolerance in the Zebra Mussel, *Dreissena polymorpha*, in the Great Lakes (project **R/ZM-31-PD**), Curt L. Elderkin & David J. Berg, Miami University, April 2002-March 2003.

Movement Patterns and Hibernation Sites of the Lake Erie Water Snake (project **R/ER-64-PD**), Richard B. King, Northern Illinois University, May 2002-June 2003.

Trophic Transfer of Heavy Metals to Top Predators: Quantifying the Role of Non-Native Species (project **R/ER-61-PD**), Roy Stein & Elizabeth Marschall, The Ohio State University, June 2002-June 2003.

Distribution and Abundance of Fishes in Native and Non-Native Macrophytes in Old Woman Creek Estuary (project **R/ER-29-PD**), D. Derek Aday, The Ohio State University, June 2003-May 2005.

Habitat Preference and Behavioral Interactions Between Round Goby and Yellow Perch (project **R/NIS-8-PD**), Maria J. Gonzalez, Miami University, June 2003-June 2004.

Development of a Rapid Surveillance Method for Annual Mayfly Surveys in Lake Erie (project **R/ER-66-PD**), Kenneth A. Kreiger, Heidelberg College, July 2003-June 2004.

Influence of Landscape Hierarchies on Food Web Structure in a Lower Great Lakes River System (project **R/ER-68-PD**); Lance Williams, Victoria Campbell-Arvai, & Marsha Williams; The Ohio State University, November 2003-December 2004.

Lake Erie Watersnake Recovery Plan Implementation (project **R/ER-69-PD**), Richard King, Northern Illinois University, March 2004-February 2005.

Field and Laboratory Tests of the Microbial Shunt Hypothesis of Phosphorus Availability in the Great Lakes (project **R/ER-67**), Robert T. Heath, Kent State University, March 2005-February 2007.

Mercury in the Water and Phytoplankton of Western Lake Erie (project **R/PS-36**), W. Berry Lyons, The Ohio State University, March 2005-February 2007.

2. Goal: *Achieve watershed level management to control tributary loading and habitat protection for all Lake Erie tributaries in Ohio.*

a. Objective: Quantify the impacts of human activities on the aquatic environment and transfer the information to managers to influence the decision-making process at the local community and watershed levels.

(1) Action: Collaborate with management agencies to identify and prioritize research efforts within the Ohio Sea Grant College Program that support watershed management plans.

(2) Action: Assist citizen advisory councils and resource managers with the interpretation of research/scientific information to develop watershed protection, best management practices, and tourism development programs.

3. Goal: *Support research and outreach efforts to develop the technical ability to improve and rejuvenate damaged ecosystems and put the technology to use.*

a. Objective: Develop and implement nonpoint source pollution control programs (including beach and underwater clean-up events) in cooperation with federal, state, and local governments.

(1) Action: J. Hageman will continue leadership of underwater cleanup efforts at Put-in-Bay.

b. Objective: Reduce runoff of sediment, contaminants, and nutrients from farmland into Lake Erie.

(1) Action: F. Snyder will provide active support and assistance to the Lake Erie Buffer Initiative to reach interagency goals established for new buffers and filter strips.

c. Objective: Evaluate natural processes and alternative rejuvenation strategies (including wetland mitigation and biotechnologies) to improve damaged ecosystems.

(1) Action: Support/encourage research to evaluate the impacts of dams, weirs, and other man-made modifications and the effects of their removal on fish spawning habitat and stream quality.

(2) Action: Define the desired characteristics of functional coastal wetlands.

(3) Action: F. Lichtkoppler will work with the Mentor Marsh Board to improve the Mentor Marsh ecosystem function and values.

Research Projects

Wetland Renovation in East Harbor State Park, Lakeside-Marblehead, OH: Water Control (project **R/ER-63-PD**), Craig B. Davis, The Ohio State University, September 2002-August 2003.

Photodegradation of Agricultural Herbicides in Lake Erie Coastal Wetlands (Project **R/PS-29**), Yu-Ping Chin, The Ohio State University, March 2003-February 2005.

Supplemental Funding for Equipment (project **R/PS-33-PD**), Yu-Ping Chin, The Ohio State University, March 2003-February 2004.

The Fish Assemblage of Metzger Marsh: Continued Assessment of the Effects of Restoration (project **R/ER-65-PD**), David L. Johnson & Eugene C. Braig, The Ohio State University, June 2003-May 2004.

Reduction of Agricultural Pesticides in the Sediments of a Coastal Lake Erie Wetland (project **R/PS-35**), Yu-Ping Chin, The Ohio State University, March 2005-February 2007.

d. Objective: Develop educational programs and materials on zebra mussels and other AIS and serve as the "Aquatic Invasive Species Information Center" for Ohio.

(1) Action: Our "Aquatic Invasive Species Information Center" will be located in the Sea Grant office on The Ohio State University campus. Coordination and communication will be developed with other agencies to avoid duplication of effort. We will provide the communication link between researchers and the private sector.

(2) Action: F. Snyder will be responsible for determining which fact sheets and other publications relating to zebra mussels and other AIS are to be developed or revised.

e. Objective: Reduce the possibility of future introductions of AIS.

(1) Action: Support research on new technologies to eliminate AIS introductions from ballast water.

(2) Action: Provide educational information to elected officials and decision makers considering AIS legislation to allow them to make more informed decisions.

(3) Action: F. Snyder will conduct AIS-HACCP training workshops in Ohio and other states to promote the adoption of HACCP procedures in live fish transfer.

(4) Action: F. Snyder will assist in the development of new knowledge about AIS introductions. He will take the lead in developing outreach education to train Ohio citizens to monitor inland waters for zebra mussels and all waters for the Eurasian ruffe and the round goby.

(5) Action: All Sea Grant agents will assist the research efforts of zebra mussel and other AIS researchers in data collection activities and transfer research findings to recreational and industrial clientele on the Great Lakes and on inland waters.

(6) Action: F. Lichtkoppler and F. Snyder will work with the Great Lakes Network, Pet Industry Joint Advisory Council, and others to develop a national campaign to reduce aquarium introductions of non-native organisms.

(7) Action: Agents will continue to work with the Great Lakes Sea Grant Network to develop AIS extension and outreach grant proposals and will network with other Sea Grant Program agents to implement AIS grant projects.

B. Coastal and Great Lakes Habitats

1. Goal: Support research efforts to develop the technical ability (including biotechnology) to improve and rejuvenate habitats that have been lost or damaged with particular emphasis on Areas of Concern (AOC), and implement these results to improve Lake Erie habitats and assist Remedial Action Plans (RAP).

a. Objective: Develop and implement Special Area Management Plans (SAMP) for coastal regions in collaboration with the ODNR Coastal Management Program.

(1) Action: F. Lichtkoppler will continue to network with the Mentor Area Regional Coalition (MARC) and continue work on the SAMP for the Mentor Area in cooperation with the ODNR Coastal Management Program.

b. Objective: Develop and evaluate new technologies to remove and/or detoxify contaminants in AOCs.

Research Projects

Sonochemical Desorption of Mercury Laden Sediments, (project **R/PS-26**); Linda K. Weavers, Samuel J. Traina, & Patrick G. Hatcher; The Ohio State University, March 2000-February 2005.

Sonochemical Desorption and Destruction of Contaminant Mixtures from Sediments (project **R/PS-30**), Linda K. Weavers, The Ohio State University, March 2003-February 2005.

Molecular Assessment of the Potential for in Situ PCB Bioremediation (project **R/PS-32-PD**), George S. Bullerjahn & R. Michael McCay, Bowling Green State University, January 2002-February 2003.

Evaluation of Dewatering Strategies for PCB-Contaminated Sediments in the Great Lakes Region (project **R/PS-34**); Patrick J. Fox, John J. Lenhart, & Linda K. Weavers; The Ohio State University; March 2004-February 2006.

c. Objective: Assist local RAP Councils and the OEPA in the RAP process for Ohio AOCs.

(1) Action: All Sea Grant Extension agents will participate as appropriate with RAP Councils and provide RAP Council members with information that will advance the remedial work of each council.

(2) Action: F. Lichtkoppler will continue to assist the Ashtabula River Partnership in its effort to clean up (dredge) the Ashtabula River.

(3) Action: F. Snyder and J. Lucente will support efforts in the Maumee RAP process.

d. Objective: Conduct educational programs on the role of wetlands in the emergence of new habitat, mitigation of pollutants, and in the siting of substitute wetland sites.

(1) Action: F. Snyder and F. Lichtkoppler will work with groups concerned with wetland management, including wildlife related issues, to identify optimum management approaches for coastal wetlands.

2. Goal: Develop programs, in cooperation with federal, state, and local governments, to quantify and minimize the impact of AIS and to control and prevent their introduction into coastal and Great Lakes waters.

a. Objective: Minimize the spread of AIS from Great Lakes' waters into Ohio's inland waters.

(1) Action: Continue outreach/education programs for the live bait industry and angling public to prevent AIS spread.

Outreach Project

Aquatic nuisance species research and outreach: reducing the risk of ANS transfer by baitfish supply through the HACCP process, (project **A/NIS-5**), Frederic L. Snyder, Ohio Sea Grant Extension, October 2001-September 2003.

b. Objective: Enable Ohio's live bait industry to comply with new and pending regulations designed to control the spread of AIS and to help the industry implement a system for certifying bait species to be AIS-free.

(1) Action: Collaborate with the ODNR Division of Wildlife and the Great Lakes Sea Grant Network to develop a HACCP-style live bait inspection and certification procedure that can be adopted by the live bait industry.

C. Sustainable Development

1. Goal: *Promote sustainable development through research and outreach efforts to assess the links between ecology and economic development.*

a. Objective: Improve the decision-making process in support of sustainable development within the Lake Erie coastal zone.

(1) Action: Develop a training program for coastal managers at Stone Laboratory and/or one of our partner organizations along the Ohio shoreline.

2. Goal: *Provide accurate, unbiased information on the potential economic and social impacts of current and proposed land use and other development plans, policies, and regulations.*

3. Goal: *Assist decision-makers in evaluating the effectiveness of policies intended to prevent, manage, and improve environmental problems in the coastal zone and the Lake Erie watershed.*

a. Objective: Develop proactive strategies for wetland preservation, riparian stream buffer acquisition, and other programs for improving water quality in coastal watersheds and Lake Erie in collaboration with local watershed action groups.

(1) Action: Assist coastal advisory councils (Grand River Partners, Chagrin River Partners, Ashtabula River Foundation, Portage River Basin Council, Maumee River RAP, Ohio Lake Erie Commission [OLEC], Great Lakes Commission, et al.) working to protect and improve Lake Erie tributaries and their drainage basins.

(2) Action: F. Snyder will represent Ohio Sea Grant on the Ohio Lake Erie Buffer Team and will conduct public awareness programs regarding buffers in Ohio and other Great Lakes states.

(3) Action: J. Hageman will coordinate a cooperative arrangement between the State Council of Pheasants Forever and the Ohio Department of Transportation to manage state roadside right of ways by planting native prairie plant species and delaying mowing until after small game nesting seasons. This action will improve Lake Erie water quality by reducing non-point source run-off and erosion and decrease roadside maintenance costs for taxpayers.

Research Project

Developing a spatial watershed model to predict the effects of watershed policies on coastal water quality and habitat change (project **R/EM-23**), Jay F. Martin, The Ohio State University, March 2003-February 2005.

b. Objective: Assist with the development of proactive strategies for improved water quality in Lake Erie.

(1) Action: All agents will disseminate information on land use planning and land use impacts on water quality to interested citizens and public officials.

c. Objective: Decrease nonpoint source pollution from marinas and boaters through increased participation in the Ohio Clean Marinas and Clean Boater programs.

(1) Action: D. Kelch, J. Reutter, J. Jentes, and L. Hushak will collaborate with the ODNR Division of Soil and Water Conservation, Office of Coastal Management, and Division of Watercraft; Ohio Department of Health; OEPA; Ohio Department of Commerce, State Fire Marshall Division; U.S. Coast Guard; U.S. Army Corps of Engineers; LEMTA; Greater Cleveland Boating Association; local health departments; local fire marshals; and private-sector stakeholders to conduct educational training/certification workshops, develop marina incentive programs, and coordinate marina certification site visits through the Ohio Clean Marinas and Clean Boater programs.

(2) Action: Gary Comer will be hired as the new Ohio Clean Marina Coordinator.

(3) Action: L. Hushak and J. Jentes will collaborate with the ODNR Division of Watercraft in developing an on-line Clean Boater Pledge Program in combination with on-line watercraft registration.

II. Public Safety

A. Coastal Conditions and Hazards

1. Goal: *Develop new technologies to measure and forecast physical conditions and parameters including: water levels, sediment loading and transport, currents, wave heights, and shoreline processes.*

a. Objective: Support research projects to develop and evaluate new technologies to measure water levels, currents, wave heights, etc.

Research Projects

Monitoring Lake Level Changes Using Satellite Altimetry and GPS-Buoys (project **R/CE-5**), C. K. Shum & Christopher Jekeli, The Ohio State University, March 2000-February 2003.

Bottom Boundary Layer Measurements Over Biological Substrates (project **R/ES-6-PD**), Timothy C. Granata, The Ohio State University, June 2000-May 2001.

Examining the Effects of Lake Water Level Variations on Sediment Resuspension (project **R/ES-7**), Diane L. Foster, The Ohio State University, March 2003-February 2005.

Application of GFO-1 Radar Altimeter Data to Global Change Studies (project **R/CE-8**), C.K. Shum & Yuchan Yi, The Ohio State University, July 2002-June 2004.

Design and Installation of a GPS-Equipped Buoy in Lake Erie for Real-Time Interior Lake Water Level Measurements (project **R/CE-9-PD**), C.K. Shum, The Ohio State University, October 2002-February 2003.

b. Objective: Encourage and lead National, Great Lakes and Ohio Sea Grant involvement in and development of Global Earth Observation System of Systems (GEOSS), the Global Ocean Observation System (GOOS), the Integrated Ocean Observation System (IOOS), the Great Lakes Observation System (GLOS), and the National Federation of Regional Associations (NFRA).

(1) Action: J. Reutter will develop and lead the NOAA Sea Grant IOOS Work Group.

(2) Action: J. Reutter will continue to serve on the National GOOS Steering Committee, the GLOS Steering Committee, and the NFRA.

c. Objective: Support the NFRA and other groups seeking federal funding for IOOS within the federal budgets of NOAA and Office of Naval Research.

d. Objective: Lead efforts to develop a leadership role for Sea Grant in GOOS, IOOS and regional association education and outreach programs and find the appropriate role for Sea Grant re-search within these programs.

(1) Action: J. Reutter will continue to lead national and regional efforts through the Sea Grant IOOS Work Group and the Great Lakes Sea Grant Network to see that Sea Grant's expertise is recognized and utilized.

e. Objective: Collaborate/lead efforts with NOAA's Great Lakes Environmental Research Lab (GLERL) and International Joint Commission (IJC) to develop a buoy system within the Great Lakes as part of GLOS.

(1) Action: J. Reutter will continue to lead efforts within the Council of Great Lakes Research Managers (CGLRM) of IJC to develop proposals and strategies to place monitoring buoys throughout the Great Lakes to improve our physical and biological monitoring and forecasting ability.

f. Objective: 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.

g. Objective: Develop an outreach program to identify potential users of GLOS, determine their needs, and help the general public and users understand the implications, uses, and values of a high-tech observation system for Lake Erie, the Great Lakes, and the oceans.

(1) Action: All agents will work with potential GLOS users to help determine client needs and desires for GLOS information.

2. Goal: *Reduce damage associated with storms, water level changes, and erosion.*

a. Objective: Improve the ability of local governments and emergency management agencies to alert citizens and businesses to threats stemming from storms and fluctuating water levels.

(1) Action: Provide news releases, alerts, web pages, and personal assistance to agencies and local officials on critical storm and water level information, including the Great Lakes Forecasting System.

(2) Action: Conduct workshops to inform local emergency response agencies and interested citizens about increased potential for flooding and erosion under high water conditions.

b. Objective: Support research to create new technologies for disaster remediation and prevention and develop techniques for risk assessment and cost-benefit analysis.

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

(1) Action: F. Snyder will develop an outreach program to assist local governments in understanding permit processes, funding sources, and engineering alternatives for channel improvement, dredging, and hazard removal.

d. Objective: Increase boater awareness of navigation hazards associated with fluctuating lake levels.

(1) Action: All agents will provide information on lake levels, navigation hazards, and safe boating skills to the public.

(2) Action: D. Kelch will teach safe boating skills and identification of navigation hazards at 4-H Sea Camp.

B. Safety at Sea

1. Goal: Focus research, education, and outreach efforts to make boating and recreational, scientific, and commercial diving safer.

a. Objective: Increase safety for underwater welders.

(1) Action: Support research efforts to reduce welding stress by simplifying the process and reducing the time required to make quality welds.

Objective: Increase safety for recreational and scientific divers.

(2) Action: Implement a Diving Safety Program for Stone Laboratory and all Ohio Sea Grant research.

(3) Action: D. Kelch and J. Lucente will develop and disseminate diving safety information.

Research Project

Development of a Robust Underwater Process Using the “Smart Shroud” System for Permanent Offshore Structure Repairs (project **R/OE-15**), Chon L. Tsai & Baojian Liao, The Ohio State University, March 2000-February 2002.

b. Objective: Cooperate with the ODNR Divisions of Watercraft and Wildlife to encourage safe boating practices—particularly for duck hunters and users of small boats and personal watercraft.

(1) Action: Collaborate with the ODNR Division of Watercraft on surveys and evaluations to identify boating safety issues and problem areas.

(2) Action: All agents will disseminate boating safety information.

Education and Human Resources

I. Technically Trained Workforce

A. Scientists, Engineers, and Educators

1. Goal: Produce highly skilled graduates to fill the need for environmentally focused scientists, engineers, and educators in the workforce.

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

(1) Action: Continue to recruit and provide support for undergraduate and graduate students.

(2) Action: Expand information technologies used at Stone Laboratory to include distance learning capability, video, and data sharing for teaching.

(3) Action: Enhance Stone Laboratory curriculum using spatial referencing and remote imaging technologies.

(4) Action: All agents will provide teaching support on Lake Erie issues, environmental economics, and coastal geologic resources to college students and classes. Such support may be through the use of guest instruction, visits or workshops at Stone Laboratory, or the use of curricula developed at Stone Laboratory.

(5) Action:* FOSL will increase funding for scholarships at Stone Laboratory.

(6) Action:* Provide teaching support on Lake Erie issues, environmental economics, and coastal geologic resources to college students and classes. Such support may be through the use of guest instruction, visits, or workshops at Stone Laboratory, the use of curricula developed at Stone Laboratory, or the use of support from the Friends of Stone Laboratory to hire visiting professors.

- (7) Action:*** FOSL will develop new research endowments to support undergraduate and graduate student research.

Management Projects

Ohio Sea Grant Ship Time 2003-04 (project **M/P-09**), Jeffrey M. Reutter, Ohio Sea Grant, August 2003-July 2006.

F.T. Stone Laboratory: A Proposal to Enhance Facilities and Equipment (project **M/P-10**), Jeffrey M. Reutter, Ohio Sea Grant, July 2002-June 2005.

b. Objective: Emphasize and reward undergraduate and graduate training on research projects.

(1) Action: Provide this information to investigators developing proposals for Ohio Sea Grant and use student training as a criterion in selecting projects for funding.

c. Objective: Encourage undergraduate and graduate training and educational programming in both formal and non-formal settings.

(1) Action: Promote and encourage outstanding applicants to fellowship programs, e.g., Knauss Fellowships.

(2) Action: Generate new sources of support for students, e.g., through sponsored or applied research.

(3) Action:* FOSL will increase funding for Research Fellowships for graduate and undergraduate students and student scholarships.

(4) Action: Develop a fellowship/internship program with agencies, local decision-makers, and museums for graduate and undergraduate students.

(5) Action: Assist educators to enhance their awareness and utilization of the resources of Stone Laboratory and Sea Grant.

Education Project

Ohio Sea Grant Summer Student Internship (project **E/OCF-1-PD**), Frank R. Lichtkoppler, Ohio Sea Grant Extension & Tim O. Matson, Cleveland Museum of Natural History, May-October 2000

Sea Grant Fellows

Samantha Romanello (E/I-12), February 2000-January 2001

Jennifer Skidmore (E/I-13), February 2000-January 2001

Sapna Batish (E/I-14), February 2001-January 2002

Melissa Haltuch (E/I-15), February 2001-January 2002

Felix Martinez (E/I-16), February 2003-January 2004

LeAnn Southward (E/I-17), February 2004-January 2005

Gene Wook Kim (E/I-18), February 2005-January 2006

2. Goal: *Strengthen the human resources of OSU Extension and Ohio Sea Grant Extension.*

a. Objective: Improve the technical training and capabilities of extension staff.

(1) Action: F. Lichtkoppler and F. Snyder will mentor and assist extension coworkers in the OSU promotion and tenure process.

(2) Action: All agents will continue to upgrade their technical skills.

(3) Action: F. Lichtkoppler will participate in the International Association for Great Lakes Research Annual Conferences and share the information gained with clientele and co-workers.

B. Resource Managers

1. Goal: *Improve the ability of managers and decision-makers to understand and address Great Lakes and coastal issues through education and outreach programs.*

a. Objective: Enhance technical and management skills among agency and institution managers by developing education and outreach products and programs in the aquatic and social sciences and emerging coastal issues.

(1) Action: Increase the range of summer offerings at Stone Laboratory to include resource management topics.

(2) Action: Organize an environmental economics and/or an education/ extension /outreach seminar at the annual International Association for Great Lakes Research Conference.

(3) Action: Educate and inform resource managers and key decision-makers of the most up-to-date research based information on Lake Erie through the use of research seminars, publications, workshops, and the Sea Grant extension services.

(4) Action:* Develop and/or host educational seminars or field trips that focus on environmental problems facing Lake Erie and the State of Ohio, including partnering with the Friends of Stone Laboratory on their annual winter lecture and summer open house.

(5) Action: Contribute to the National Science Foundation's (NSF) Digital Library system with products related to teaching and learning about freshwater environments.

Outreach Project

Report on Sea Grant-supported Non-Indigenous Species Projects (project **A/NIS-6**), Jeffrey M. Reutter and Jill Jentes, Ohio Sea Grant, March 2003-Feb. 2005.

b. Objective: Demonstrate the long-term impact of formal education programs conducted by Ohio Sea Grant.

(1) Action: Seek support to initiate a focused follow-up of students and substantive evaluation program for formal education efforts at Stone Laboratory.

C. Technical Training

1. Goal: *Make Ohio marine industries and businesses both more environmentally aware and more profitable.*

a. Objective: Provide training on new technologies and management practices for the private sector.

(1) Action: W. Williams will continue providing technical workshops and seminars to showcase new technologies and research.

b. Objective: Educate and inform citizens of the most up-to-date research-based technical information on Lake Erie.

(1) Action: All agents will help inform citizens on current Lake Erie technical issues, problems and opportunities

c. Objective: Provide a forum to inform and educate veterinarians about the current animal health issues facing aquaculturists in Ohio and the rest of the Midwest.

Outreach Project

Aquaculture Health Issues Seminar and Panel Discussion (project A/AS-11-PD), Donald McFeeters & Geoff Wallat, The Ohio State University-Centers at Piketon, February-April 2001.

II. Environmentally and Scientifically Informed Citizenry

A. Pre-College Education

1. Goal: *Improve K-12 science education in Ohio and the nation through curriculum development, teacher training, technology transfer, and the development of hands-on educational opportunities for students.*

a. Objective: Expand opportunities for teacher education and development.

Education Projects

Escape from Exotics: Break out of your Classroom Routine by Exploring the Interesting World of Exotic Aquatic Species (project **E/NIS-3**), Rosanne W. Fortner, The Ohio State University, October 2001-September 2003

Expanding Delivery Modes for Education about Great Lakes Systems (project **E/TER-2**), Rosanne W. Fortner, The Ohio State University, March 2002-February 2006.

Great Lakes Teacher Education: High Tech/High Touch Learning (project **E/TER-3**), Rosanne W. Fortner, The Ohio State University, March 2005-February 2007.

b. Objective: Develop and institutionalize a Master's program for in-service teacher education using primarily Stone Laboratory summer courses.

(1) Action: Seek support to develop distance learning capability, video, and data sharing for teaching at Stone Laboratory.

c. Objective: Increase knowledge levels and interest in aquatic science students.

(1) Action: J. Hageman will continue to provide a unique, exciting aquatic science workshop experience to over 5,000 grade 4-12 students, offering hands-on lessons about Lake Erie, the Great Lakes, and the oceans.

(2) Action: Develop a workshop program that could be taken to schools that either choose not to, or are unable to come to Stone Laboratory.

(3) Action: Develop a follow-up survey program, to evaluate the effectiveness and/or impact of the workshop program on students' environmental awareness, choice of college and/or major, choice of recreational activities, and their ultimate choice of careers.

(4) Action: All agents will assist local school programs, youth outdoor education efforts, and 4-H /youth camping programs with Lake Erie education and related outdoor information.

(5) Action: D. Kelch will conduct a survey of past Sea Camp participants to estimate long-term benefits of Sea Camp participation.

(6) Action: D. Kelch will continue to work with 4-H Sea Camp through teaching, resource acquisition, and support development.

(7) Action: Sea Grant will host an autumn, on-site open house for high school students, their parents, and teachers to foster an interest in summer science courses offered at Stone Laboratory.

(8) Action: Sea Grant will host an autumn, on-site Demonstration Saturday for teachers (grades 4-12) to foster an interest in Stone Laboratory's field trip/workshop programs.

d. Objective: Create opportunities for exceptional students to participate in real-world aquatic research and educational experiences.

(1) Action: Continue and expand the use of single-day and week-long shadowing experiences for selected students.

(2) Action: Continue and expand the Ohio Sea Grant Summer Student Internship work-study program.

(3) Action:* FOSL will continue to judge at State Science Day and award scholarships to at least six students per year.

e. Objective: Improve the facilities and capabilities of Stone Laboratory and increase scholarship support for students and teachers.

(1) Action: Encourage continued support for Stone Laboratory from the existing support groups.

(2) Action: Develop a strategic plan to seek new sources of support for Stone Laboratory.

B. Informal Education

1. Goal: *Increase public understanding of science and environmental, Lake Erie, Great Lakes, and marine issues through lectures, museum programs, youth programs, the mass media, and emerging communication technologies.*

a. Objective: Increase utilization and understanding of Sea Grant research results and educational contributions.

(1) Action: Develop an annual or biennial Sea Grant research conference where current projects will be reviewed and summarized in a style understandable and enjoyable for the public and the media.

(2) Action: Seek support for hosting a regional Great Lakes Education Summit for K-12 and non-formal education leaders.

(3) Action: Establish an Ohio coastal training program (Stone Laboratory, LENSC, University of Toledo, Old Woman Creek National Estuarine Research Reserve [NERR], Great Lakes Science Center, etc).

b. Objective: Increase the awareness and knowledge level of elected officials about coastal, Great Lakes, and Lake Erie issues.

(1) Action: Develop and/or host educational seminars or field trips that focus on environmental problems facing Lake Erie and the State of Ohio.

(2) Action: Each agent will collaborate in developing and/or hosting educational seminars or field trips for elected officials that focus on environmental problems facing Lake Erie and the State of Ohio.

(3) Action: Organize and host Ohio Sea Grant's State Legislature/Congressional Day educational programs.

(4) Action: Develop educational and informative programs for newly elected State Legislators, a growing audience in the Legislature brought about by term limits.

(5) Action: Collaborate with the Old Woman Creek NERR and the Ohio Coastal Program to develop a Coastal Training Institute.

(6) Action: J. Lucente will partner with the Greater Toledo Area Chamber of Commerce to establish a "Leadership Institute" for training local elected, appointed, and volunteer community leaders in leadership development.

c. Objective: 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.

- (1) Action:** Collaborate with Lake Erie Coastal Ohio in a partnership with WGTE (PBS Station in Toledo) to produce an hour-long documentary on Lake Erie, its evolution, impact on our history, and future. Stewardship will be a key message. Program will be completed by November, 2005. Phase Two of this project is development of curriculum materials for 4th and 6th grade that follow content of video.
- (2) Action:** Develop and update the Ohio Sea Grant exhibit for use at regional and local fishing and boating shows, staff the exhibit, and respond to Lake Erie user requests for information generated by the shows.
- (3) Action:*** FOSL will assist in the development and construction of a new educational kiosk for tourists passing the Research Building at Stone Laboratory.
- (4) Action:*** FOSL will continue to collaborate with Sea Grant and the OLEC to host their annual summer open house at Gibraltar Island.
- (5) Action:*** FOSL will assist the Office of Resident Halls in the development of historic markers for Stone Laboratory and the South Bass Island Lighthouse.
- (6) Action:** Maintain high quality, active Sea Grant advisory Committees to assist with information dissemination efforts.
- (7) Action:** Develop high quality articles, ideas, and information for the Ohio Sea Grant newsletter, Twine Line.
- (8) Action:** Investigate the development of a Lake Erie 4-H project for Ohio youth.
- (9) Action:** Host at least six Elder Hostel groups at Stone Laboratory.
- (10) Action:** Expand and improve our web site as a major outreach element of the program.

Outreach Project

2004 Ohio Sea Grant Calendar (project **A/P-6-PD**), Karen Ricker, Ohio Sea Grant, March 2003-February 2004.

d. Objective: Renovate Jay Cooke's Castle at Stone Laboratory for use as a conference center for Ohio Sea Grant's outreach/education program.

- (1) Action:** Support fund raising efforts through the Friends of Stone Laboratory, private donors, and the State Legislature to complete exterior and interior renovations of the building.

e. Objective: Assist Lake Erie anglers, old and new, to have more productive, enjoyable, and safe outings on Lake Erie and thereby increase utilization of the resource.

- (1) Action:** K. Riesen will develop youth-oriented sport fishing education programs to be presented at the LENSFC, coastal counties, and selected inland locations.
- (2) Action:** K. Riesen will conduct youth fishing education programs and coordinate these with related efforts by the Recreational Boating and Fishing Foundation, ODNR Division of Wildlife, the GLSFC, and 4-H.
- (3) Action:** Continue to write Twine Line articles and fact sheets of interest to sport anglers.
- (4) Action:** Conduct seminars about recent changes in Lake Erie and how these changes impact the fishery, fish behavior, and fishing techniques. Other potential topics include fishery biology, fishery management updates, exotic species impacts, and fish consumption advisories.
- (5) Action:** J. Jentes and extension agents will take the lead in organizing Sea Grant Extension displays at the Cleveland Boat Show, Cleveland Sport Show, etc.
- (6) Action:** Write and mail periodic news releases on Lake Erie issues and sport fisheries to key leaders, outdoor writers and local media contacts.

- f. Objective:** Strengthen coordination of Ohio Sea Grant Extension.
- (1) Action:** Quarterly meetings will be scheduled with the program leader, Sea Grant Extension agents, the communicator, and other appropriate personnel.
- g. Objective:** Increase communication between Sea Grant agents and their advisory committees and researchers.
- (1) Action:** All Sea Grant agents will continue to review research proposals and work with their advisory committees to identify research needs. Meetings with researchers will be fostered at the quarterly staff meetings. Agents will continue to assist with the collection of research data.
- h. Objective:** Maintain high quality and active advisory committees.
- (1) Action:** Much of the strength and vitality of our program is due to our outstanding advisory committees. Sea Grant agents will continue to encourage and cultivate these groups. Membership of key people within local communities will be solicited. The Sea Grant Extension Program Advisory Committee is composed of the chair and vice-chair of the agent advisory committees.
- (2) Action:** Agent advisory committees will meet at least three times per year; the Extension program advisory committee will meet at least once per year.
- (3) Action:** All agents will provide data to their respective committees in a timely manner. This will allow the committee members to be proactive on lake-wide issues.
- i. Objective:** To participate in the Great Lakes Sea Grant Network committees during 2002-2006 in all program areas and to promote Great Lakes Sea Grant Extension agent professional improvement.
- (1) Action:** Ohio Sea Grant—including Extension agents, co-program leaders, and the communicator—will be represented on as many of the Great Lakes theme team committees as practical.
- (2) Action:** Ohio Sea Grant agents will host the Great lakes Network Conference at Put-In-Bay, Ohio, September 11 to 15, 2004.

**Denotes efforts by the Friends of Stone Laboratory (FOSL).*