2002-04 IMPLEMENTATION PLAN
OHIO SEA GRANT COLLEGE PROGRAM

Including:
F.T. STONE LABORATORY,
THE CENTER FOR LAKE ERIE AREA RESEARCH (CLEAR), and the
GREAT LAKES AQUATIC ECOSYSTEM RESEARCH CONSORTIUM (GLAERC)

Jeffrey M. Reutter, Ph.D.
Director

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7 December 2001

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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 proposed actions and current 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 5-year printings.

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, e.g. a reiteration of each goal, objective, and action, followed by the results and accomplishments/benefits of that action.

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1 Research projects that will be funded from March 1, 2002 – February 29, 2004 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/f-research.html.
I. Economic Leadership

A. Advanced Technology for Commercial Products and Processes

1. Commercial Biotechnology

**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.

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

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

2. Environmental Technology

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

**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.

**Research Project:** Advanced Treatment Process for the Removal of Cyanobacterial Toxins from Drinking Water (project R/PS-31), Harold Walker, The Ohio State University.

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

**Action:** Develop environmentally friendly composting technology for sanitary disposal of nuisance mayfly accumulations and provide this information to municipalities and industries facing mayfly disposal problems, e.g. continue the demonstration project in collaboration with the City of Port Clinton and the Ohio EPA to address the mayfly problem in that and other coastal cities.

**Objective:** Extend the results of artificial reef research with implications for other reef structures to the artificial reef task force and to other communities.
Action: D. Kelch and J. Lucente will assist communities exploring artificial reef structures in assessing the feasibility of reefs in their locations.

Action: D. Kelch and F. Snyder will continue a monitoring and research program for the Cleveland Stadium reefs to explore adaptation as habitat by fish before, during and after placement of materials.

Action: D. Kelch, Joe Lucente and F. Snyder will investigate the feasibility of a multi-purpose deep-water artificial reef in Lake Erie to be used primarily for scuba diving and secondarily for fishing, including intentional vessel sinking.

Action: D. Kelch will develop and conduct a photo contest for scuba divers for the purpose of developing an artificial reef photo and VHS archive.

Action: D. Kelch will develop appropriate publications to encourage artificial reef use, safety, and conservation.

B. Seafood Production

1. Commercial Fisheries

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

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

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

Action: Develop collaborative programs with the Ohio Department of Natural Resources to assist in the development and evaluation of management strategies.

Research Project: Genetic Structure of Smallmouth Bass Populations from Nuclear and Mitochondrial and Nuclear DNA (project R/LR-5), Carol A. Stepien, Cleveland State University.

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

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

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

Action: Collaborate with the Ohio Division of Wildlife to identify and evaluate new management strategies.

Objective: Maintain a liaison with the commercial fishing industry in Ohio and assist in the development of business opportunities.
Action: D. Kelch, F. Snyder, and J. Hageman will investigate potential research efforts relevant to commercial fisheries issues and market development.

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

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

Action: Prepare a technical summary evaluating economic impact of a potential buy-out of the commercial fishery and inform decision-makers of the results.

2. Sustainable Aquaculture

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.

Objective: Cooperate with OSU 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.

Action: F. Snyder and F. Lichtkoppler will work with the Piketon Research and Extension Center to assist in the production and dissemination of educational material and programs for aquaculturists in Ohio.

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

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.

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

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.

3. Seafood Technology

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

Objective: Improve seafood safety and improve HACCP compliance within the Ohio Seafood industry.
Action: D. Kelch will conduct HACCP training for the Ohio commercial fishery and aquaculture industries as needed.

Action: D. Kelch will provide fact sheets and other educational materials as appropriate to seafood industry participants about seafood safety procedures.

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.

C. Coastal Economic Development

1. Coastal Business Development

   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.

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

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

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

     Action: Explore ways to interact with the National Outreach Strategy for Recreational Fishing and Boating to increase participation in angling and boating.

     Action: D. Kelch will continue to conduct Lake Erie angling, fisheries education and other outdoor education programs.

     Objective: Collaborate with the Ohio Division of Wildlife on research and outreach efforts to evaluate management strategies and disseminate results.

     Action: Join the Division of Wildlife on a Management Team for Lake Erie.

     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.

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

     Objective: Improve the decision-making process regarding the development and retention of coastal recreation businesses.

     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.
Research Project: A comparison of Recreation and Amenity Values in the Lake Erie Basin (project R/ME-24), Brent Sohngen, The Ohio State University.

**Action:** Support research and outreach efforts to determine the economic and environmental impacts of various types of coastal recreation to assist resource managers.

**Action:** F. Snyder will lead tourism, recreation and wildlife development initiatives within the Portage River Basin Council.

**Action:** D. Kelch will continue to serve on the Lorain County Visitors Bureau Board of Directors and work on Lake Erie related tourism issues.

**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.

**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.

**Action:** Continue socio-economic research with coastal recreational users including surveys at boat and sport shows.

**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.

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

**Action:** Develop an “Underwater Field Guide for Lake Erie” to be used by divers, students, and teachers.

**Action:** Link the scientific community, bird watching groups, and visitors’ bureaus to enhance educational value, participant enjoyment, and economic impact of bird watching.

**Action:** F. Snyder will assist ODNR in transient marina development.

**Action:** F. Snyder and/or F. Lichtkoppler will serve on the board of the Lake Erie Area Heritage Tourism Steering Committee.

**Action:** F. Snyder will coordinate Efforts with Lake Erie Wingwatch to expand participation and economic benefits of bird watching.

**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.

**Action:** D. Kelch and J. Lucente will continue to work with Ohio Department of Natural Resources, Ohio Historical Society, the Marine Archeological Survey Team and residents of Kelleys Island towards the establishment and documentation of an underwater preserve around Kelleys Island for fishing, scuba diving and historical information on submerged vessels for the general public to promote eco-tourism.

**Action:** J. Lucente and D. Kelch will explore the feasibility of helping local dive shop operation(s) expand to provide services to tourists and the diving population of Kelleys Island.

**Action:** F. Lichtkoppler, J. Lucente, F. Snyder and D. Kelch will link the scientific community, bird watching groups, and visitors bureaus to enhance the educational value, participant enjoyment, and economic impact of nature based tourism.

**Objective:** Develop a “Wet (by boat) Circle Tour” to compliment the existing circle tour to increase boater satisfaction/pleasure and tourism impact.

**Action:** Collaborate with the Division of Watercraft and visitors’ bureaus to increase the availability of transient docks in communities.

**Objective:** Provide outreach education and assistance to county visitors bureaus in the marketing and development of tourism on Ohio’s North Coast.

**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.

**Objective:** Support the Lake Erie marine trades industry, and other tourism related businesses.

**Action:** F. Snyder will provide marina operators with current and appropriate in-water weed control procedures through personal contact, publications and workshops, as appropriate.

**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.

**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.

**Action:** J. Lucente will assist the Toledo Area CVB in the development and publication of the Western Lake Erie Waterfront Guide.
- **Marine Trades**, including: marinas, boat sales, shipping, etc.

  **Objective:** Increase the profitability of marine businesses through business and technology research, education, and outreach.

  **Action:** F. Lichtkoppler will continue to cooperate with the ODNR Division of Watercraft and the Lake Erie Marine Trades Association to inventory and report boat sales figures within Ohio.

  **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 Ohio Division of Watercraft and the Lake Erie Marine Trades Association and share/interpret the results for decision makers.


  **Action:** F. Snyder will assist charter fishing operators in incorporating electronic technology into their businesses.

  **Objective:** Increase recreational access to Lake Erie.

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

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

  **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.

  **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 skill for small business managers.

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

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

  **Action:** W. Williams and J. Lucente will continue efforts with the Greater Cleveland Growth Association and economic development groups in Toledo to redevelop brownfield sites.
Action: Assist existing businesses with expansion plans to reduce urban sprawl and prevent the development of new brownfield sites caused by business relocations.

2. Coastal Community Development

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

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

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.

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

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

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.

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.

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.

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

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

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.
Action: W. Williams will publish the quarterly newsletter Development Notes with a focus on economic development and environmental issues of concern to Cleveland area businesses.

3. Marine Infrastructure

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

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

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

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

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

Action: F. Lichtkoppler will work with the City of Mentor to implement a strategic plan for the long-term development of the Mentor Lagoons property.

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.

II. Coastal Ecosystem Health and Public Safety

A. Coastal Ecosystem Health

1. Coastal Ecosystems

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

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


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 nuisance species, sediment loading, and economic impacts.

**Research Projects:** Role of Detritivores in PCB Trophodynamics in the Western Basin of Lake Erie (project R/PS-28), Robert H. Findlay, Miami University.

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.

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.

Modeling Smallmouth Bass Consumption of Round Goby in Lake Erie: Implications for Predator Growth and Contaminant Transfer (project R/ER-55), Roy A. Stein, The Ohio State University.

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

**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.

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

**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.

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

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

**Action:** F. Lichtkoppler will partner with economic researchers to develop and provide economic data to local municipalities and tourism bureaus detailing the loss of revenues stemming from beach closures.

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

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

Objective: Evaluate alternative rejuvenation strategies (including wetland mitigation) to improve damaged ecosystems.

Research Project: Photodegradation of Agricultural Herbicides in Lake Erie Coastal Wetlands (Project R/PS-29), Yu-Ping Chin, The Ohio State University.

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.

Action: Define the desired characteristics of functional coastal wetlands.

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

Objective: Develop educational programs and materials on zebra mussels and other aquatic nuisance species and serve as the "Aquatic Nuisance Species Information Center" for Ohio.

Action: Our "Aquatic Nuisance 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.

Action: F. Snyder will be responsible for determining which fact sheets and other publications relating to zebra mussels and other aquatic nuisance species are to be developed or revised.

Objective: Reduce the possibility of future introductions of aquatic nuisance species.

Action: F. Snyder will work with the Great Lakes Network project to develop HACCP-like procedures for bait and fish transfer, which minimize the danger of transferring aquatic nuisance species to new waters. He will work with the Ohio portion of a survey of live bait and other fish transporters, collect baitsfish samples from Ohio dealers and analyze for NIS and non-bait organisms, and assist in writing the HACCP-style manual and hazards guide.

Action: F. Snyder will assist in the development of new knowledge about aquatic nuisance species 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.
Action: All Sea Grant agents will assist the research efforts of zebra mussel and other aquatic nuisance species researchers in data collection activities where appropriate and transfer research findings to recreational and industrial clientele on the Great Lakes and on inland waters.

2. Coastal and Great Lakes Habitats

Goal: Support research and outreach efforts to determine the impacts of habitat alteration and loss on the fishery and the entire aquatic ecosystem.

Objective: Support research and outreach efforts to determine the biological and economic impacts of artificial reefs and assist with their continued development where and when appropriate.

Action: Continue evaluations of fish use of artificial reefs constructed with rubble from old Cleveland Stadium.

Action: Collaborate with the Ohio Division of Wildlife to establish a tagging program to characterize smallmouth bass use of artificial reefs.

Action: Support research to map Lake Erie's artificial reefs and transfer the information to users.

Action: Investigate the development of a deep-water artificial reef demonstration project.

Action: Evaluate intentionally sinking vessels as artificial habitats and diver destinations as done in many of our coastal states.

Action: Collaborate with the Submerged Lands Advisory Committee to mark shipwrecks for divers.

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. Implement these results to improve Lake Erie habitats and assist Remedial Action Plans.

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

Research Projects: Sonochemical Desorption of Mercury Laden Sediments, (project R/PS-26), Linda K. Weavers, The Ohio State University.

Sonochemical Desorption and Destruction of Contaminant Mixtures from Sediments (project R/SP-30), Linda K. Weavers, The Ohio State University.
Action: Develop at least one successful interaction with the Coastal Management Program to improve a damaged ecosystem in year one.

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.

Objective: Develop and evaluate new technologies to remove and/or detoxify contaminants in Areas of Concern.

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

Objective: Minimize the spread of aquatic nuisance species from Great Lakes’ waters into Ohio’s inland waters.

Action: Continue outreach/education programs for the live bait industry and angling public to prevent ANS spread.

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

Action: Collaborate with the Ohio 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.


Action: All Sea Grant Extension agents will participate as appropriate with Remedial Action Plan Council and provide RAP Council numbers with information that will advance the remedial work of each council.

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

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

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.

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.
3. Sustainable Development

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

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

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

**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.

**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.

**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.

**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.

**Action:** Develop fact sheets, news releases, and/or seminars to increase awareness among landowners of programs compensating them for implementing stream bank protection practices, such as buffers and filter strips.

**Action:** Participate on citizen advisory councils working to protect and improve Lake Erie tributaries and their drainage basins.

**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.

**Action:** F. Snyder will work with the Sandusky River Coalition and the Ottawa River Coalition to develop watershed management plans.

**Action:** Agents will participate on citizen advisory councils working to protect and improve Lake Erie tributaries and their drainage basins.

**Action:** F. Lichtkopfler will work with the Ohio NEMO (Non-point Education for Municipal Officials) extension team to train interested OSU Extension agents and to Lake Erie coastal government agencies on land use and water quality.
**Action:** F. Snyder will disseminate educational materials on agricultural buffers to landowners and sister agencies.

**Action:** W. Williams will explore potential partnerships with other organizations in conducting waste water minimization studies of several types of industries and disseminate the research results to these industries in order to interest them in water quality improvement and potential cost savings for businesses.

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

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

### B. Public Safety

#### 1. Coastal Hazards

**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.

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

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<td>Examining the Effects of Lake Water Level Variations on Sediment Resuspension (project R/ES-7), Diane L. Foster, The Ohio State University.</td>
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**Objective:** Support research and outreach programs to improve capabilities and utilization of the Great Lakes Forecasting System (GLFS).

**Action:** Demonstrate the function and value of the GLFS to user groups and decision makers at seminars and workshops.

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

**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.

**Action:** Provide news releases, alerts, web pages, and personal assistance to agencies and local officials on critical storm and water level information, including the GLFS.

**Action:** All agents, as appropriate, will conduct workshops to inform local emergency response agencies and interested
citizens about increased potential for flooding and erosion under high water conditions.  
**Action:** All agents will collaborate with ODNR to inform those concerned about Ohio's new CZM plan.  

**Objective:** Improve the ability of coastal facility operators to minimize damages and business losses caused by fluctuating lake levels.  
**Action:** Provide current and forecast information on lake levels to marina managers, marine contractors, plant operators, and other coastal business personnel and inform them of possible actions to minimize property damage.  

**Objective:** Improve the ability of coastal property owners to minimize damage from fluctuating water levels.  
**Action:** Provide outreach education to property owners on lake level changes, low-water hazards, flood insurance and emergency actions (e.g., sandbagging, evacuation, etc.).  

**Objective:** Improve the ability of state and local governments to identify and remove coastal navigation hazards.  
**Action:** F. Snyder and F. Lichtkoppler 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.  

**Objective:** To increase awareness among boaters of navigation hazards associated with low lake levels and navigation hazards and skills.  
**Action:** All agents will provide to the public information on lake levels, navigation hazards, and safe boating skills.  

2. **Safety at Sea**  
**Goal:** Focus research, education and outreach efforts to make boating and recreational, scientific, and commercial diving safer.  
**Objective:** Increase safety for underwater welders.  
**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.  
**Action:** Implement a Diving Safety Program for Stone Laboratory and all Ohio Sea Grant research.  
**Action:** D. Kelch and J. Lucente will develop and disseminate diving safety information.  

**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.  
**Action:** Collaborate with the Ohio Division of Watercraft on surveys and evaluations to identify boating safety issues and problem areas.  
**Action:** All Agents will disseminate boating safety information.
III. Education and Human Resources

A. Technically Trained Workforce

1. Scientists, Engineers, and Educators

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

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

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

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

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

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 or the use of curricula developed at Stone Laboratory.

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

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

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

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

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

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

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

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

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

Action: F. Lichtkoppler and F. Snyder will mentor and assist extension coworkers in the OSU promotion and tenure process.
**Action:** All agents will continue to upgrade their technical skills.

**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.

2. **Resource Managers**

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

**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.

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

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

**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.

**Action:** Develop and/or host educational seminars or field trips, which focus on environmental problems facing Lake Erie and the State of Ohio.

**Action:** Contribute to NSF’s Digital Library system with products related to teaching and learning about freshwater environments.

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

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

3. **Technical Training**

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

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

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

**Objective:** Educate and inform citizens of the most up-to-date research based technical information on Lake Erie.
Action: All agents will help inform citizens on current Lake Erie technical issues, problems and opportunities

B. Environmentally and Scientifically Informed Citizenry

1. Pre-College Education

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.

Objective: Expand opportunities for teacher education and development.


Action: Develop and institutionalize a Master's program for inservice teacher education using primarily Stone Laboratory summer courses.

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

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

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

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

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.

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

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

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

Objective: Create opportunities for exceptional students to participate in real-world aquatic research and educational experiences.
Action: Continue and expand the use of single day and week long shadowing experiences for selected students.

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

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

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

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

2. Informal Education

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.

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

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.

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

Action: Establish an Ohio/Lake Erie Learning Consortium (Stone Laboratory, Lake Erie Nature and Science Center, University of Toledo, Old Woman Creek NERR, Great Lakes Science Center, etc).

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

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

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.

Action: Organize and host Ohio Sea Grant’s State Legislature/Congressional Day educational programs.

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

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

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.

**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.

**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.

**Action:** Maintain high quality, active Sea Grant advisory Committees to assist with information dissemination efforts.

**Action:** Develop high quality articles, ideas, and information for the Sea Grant newsletter, *Twine Line*.

**Action:** Collaborate with the IAGLR 2001 Organizing Committee to maximize the media outreach effort for the IAGLR 2001 Conference in May 2001.

**Action:** Collaborate with the ODNR Coastal Management Program to maximize the media outreach effort for the Coastal Zone 2001 Conference in July 2001.

**Action:** Investigate the development of a Lake Erie 4-H project for Ohio youth.

**Action:** Host at least six Elder Hostel groups at Stone Laboratory.

**Action:** Expand and improve our web site as a major outreach element of the program.

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

**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.

**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.

**Action:** F. Snyder, D. Kelch and F. Lichtkoppler will continue to write Twine Line articles and fact sheets of interest to sport anglers.

**Action:** D. Kelch and F. Snyder will 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.

**Action:** D. Kelch and F. Lichtkoppler will take the lead in organizing Sea Grant Extension displays at the Cleveland Boat Show, Cleveland Sport Show, and other shows as appropriate.
**Action:** F. Snyder will write and mail periodic news releases on Lake Erie issues and sport fisheries to key leaders, outdoor writers and local media contacts.

**Action:** D. Kelch will work with the Lake Erie Nature and Science Center (LENSC) to periodically revise and update the permanent Sea Grant exhibit within their new building. In addition, he will continue to conduct educational programs at the LENS C facility, and assist with teacher education programs at the center.

**Objective:** Strengthen coordination of Ohio Sea Grant Extension.

**Action:** Quarterly meetings will be scheduled with the program leader, Sea Grant Extension agents, the communicator and other appropriate personnel.

**Objective:** Increase communication between Sea Grant agents, their advisory committees and researchers.

**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.

**Objective:** Maintain high quality and active advisory committees.

**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.

**Action:** Agent advisory committees will meet at least three times per year; the Extension program advisory committee will meet at least once per year.

**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.

**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.

**Action:** Ohio Sea Grant, including Extension agents, co-program leaders and Communicator, will be represented on as many of the Great Lakes theme team committees as practical.