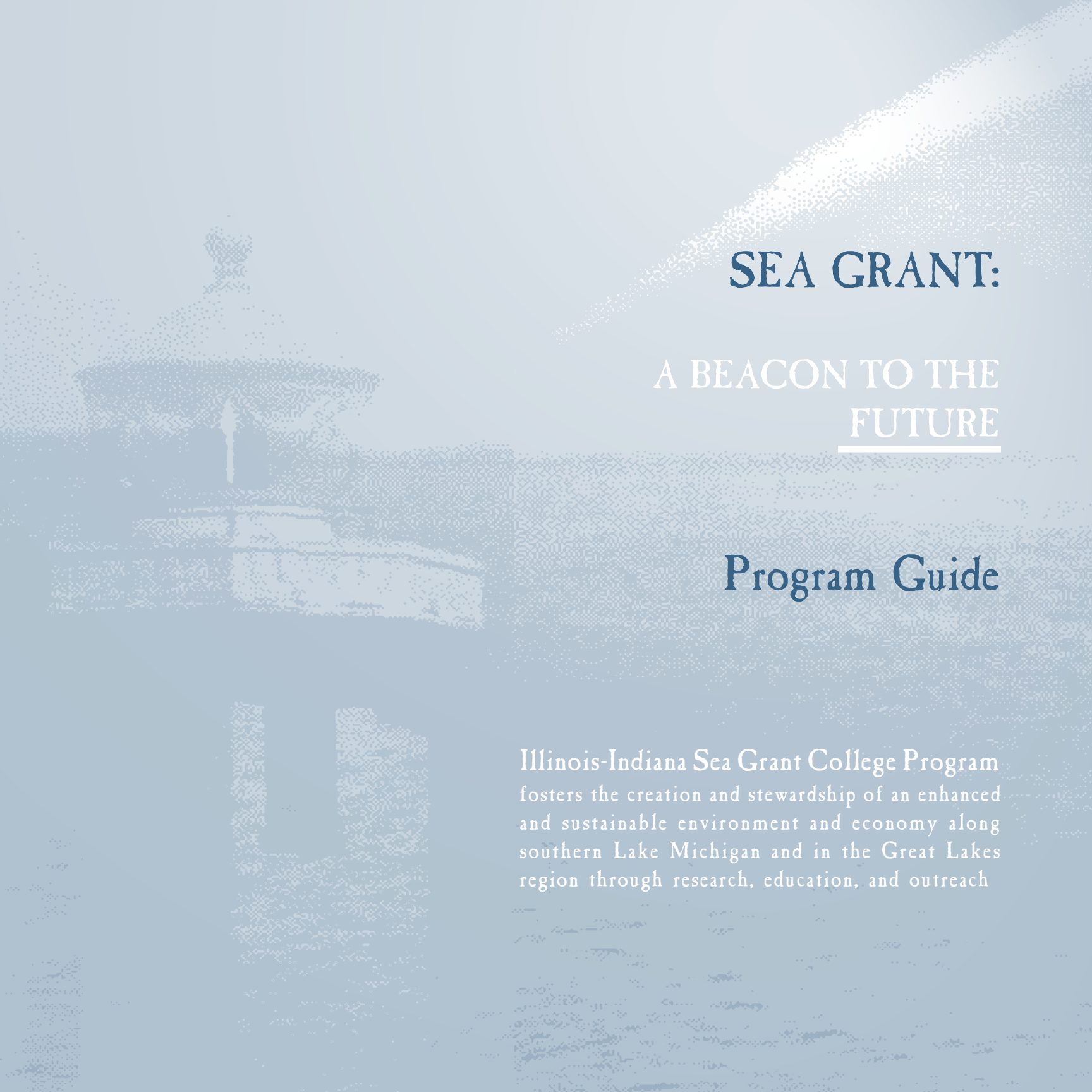

SEA GRANT:

A BEACON TO THE FUTURE

Program Guide

Illinois-Indiana Sea Grant College Program fosters the creation and stewardship of an enhanced and sustainable environment and economy along southern Lake Michigan and in the Great Lakes region through research, education, and outreach

Director's Message

This program guide serves to inform you about the Illinois-Indiana Sea Grant College Program, what we do, and how we are defining our role in the states of Illinois and Indiana, the Great Lakes region, and the nation. Specifically, listed in this guide you will find introductions to our functional and thematic areas, descriptions of selected ongoing research and outreach projects, and our accomplishments and milestones since 1994.

Throughout this document, you will find many references to our partners and clients. Our relationships with these two groups help define our activities and how we accomplish them. Illinois-Indiana Sea Grant is dedicated to serving its constituent base.

So, I would encourage you, the reader, to contact us if you believe we might be helpful. By hearing from you, we can respond readily and provide the services and information you need. We value input from all of our users, in addition to our institutional partners. Without the formation of partnerships with area universities, nonprofit groups, governmental agencies, and business/industry, Illinois-Indiana Sea Grant would not be nearly as effective.

The hard work of the Illinois-Indiana Sea Grant staff and area scientists is represented in this guide. The staff's dedication and commitment to our organizational mission and goals are the driving force behind this Program's success, and I wish to take this opportunity to thank them for their efforts.

Phillip E. Pope
Director

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Mission

Illinois-Indiana Sea Grant College Program fosters the creation and stewardship of an enhanced and sustainable environment and economy along southern Lake Michigan and in the Great Lakes region through research, education, and outreach.

To fulfill its mission, the Program:

- Applies scientific knowledge to solve resource problems
- Promotes environmentally sustainable economic development in the Great Lakes and inland waters
- Contributes to solving pressing problems of Great Lakes and inland water ecosystems
- Strives to create an informed citizenry and highly qualified professionals

Program History

The National Sea Grant Act adopted by Congress in 1966 provided for the development of the nation's marine resources through a partnership between the federal government and educational institutions, just as the century-old Land Grant Act did for land-based resources. Illinois-Indiana Sea Grant is one of 29 programs in the national Sea Grant Network, which includes coastal and Great Lakes states and Puerto Rico.

The Program began in 1982 as a Marine Extension Project at the University of Illinois under the direction of Robert Espeseth. In August 1994, Purdue University assumed the policy and operational responsibility for Illinois-Indiana Sea Grant. The Program has continued to expand in its scope and regional impact under the leadership of Dr. Phillip Pope.

Sea Grant uniquely blends research, outreach, and youth education. This Program has contributed to the region's economic and environmental well-being through the long-standing partnership between the University of Illinois and Purdue University. Its scope goes well beyond these campuses, encompassing Illinois and Indiana, from their Lake Michigan shores to their inland waterways.

Population Pressures Take Their Toll on the Coast

Illinois-Indiana Sea Grant serves clients along 104 miles of heavily urbanized and industrialized shoreline in Illinois and Indiana.

One-third of the population of the Great Lakes resides along the shore of Lake Michigan, between Milwaukee, Wisconsin and Michigan City, Indiana.

This area is the largest population center outside of New York City and Los Angeles.

A Shining Achievement—College Program Status

On October 3, 1997, Secretary of Commerce, the Honorable William M. Daley designated Illinois-Indiana Sea Grant a "college" program, the highest achievement a state program may attain within the National Sea Grant College Program. Throughout its evolution, Illinois-Indiana Sea Grant underwent rigorous review to demonstrate its merit The Program was recognized for sustained excellence in research, education, and public service dedicated to the environmentally responsible development of the nation's Great Lakes resources.

Our Vision

To become a premier provider of new information and unbiased science-based outreach and education on coastal issues in southern Lake Michigan.

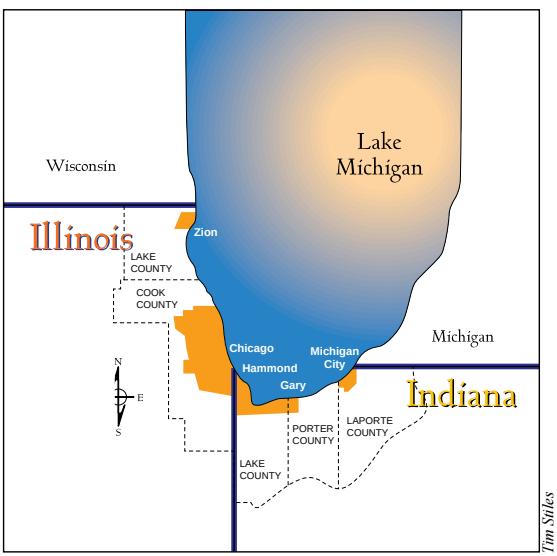
A Focused View of Great Lakes Issues

Illinois-Indiana Sea Grant (IISG) utilizes its resources to address both national and local topics of high priority. Overall Program direction is based on input from a wide range of stakeholders in the bi-state area. We work closely with government agencies as well as private and non-profit organizations that have priorities related to those of IISG and who support the sustained economic and environmental well-being of the southern Lake Michigan region.

To meet our goals and overall mission, the Program is organized into four thematic areas—Aquaculture, Biological Resources, Coastal Business and Environment, and Water Quality. These topics are developed through the careful integration of IISG's research, outreach, and administration functional components.

Program Setting

- Urban
- Industrial
- Southern Lake Michigan region



Shedding Light on....

Research

Projects are selected through a rigorous peer review process. We focus on the issues and resources of the Great Lakes, with an emphasis on Lake Michigan and the ways its resources can be used to enhance the quality of life for the citizens in Illinois and Indiana.

Outreach

Our Staff outreach professionals provide essential information on Great Lakes issues to clientele. We offer technical expertise to help solve problems and develop and deliver training programs and education resources. Staff members respond promptly to all inquiries, but are particularly attuned to the needs of three major client groups:

Resource Users

Coastal residents, coastal business and industry personnel, tourists, anglers, and consumers of fish

Decision Makers

Legislators and administrators in public and private sectors

Information Users

Natural resource professionals, environmental organizations, industry managers, media, citizen groups, educators, university researchers, and members of the client groups listed above

Administration

Program administrators ensure that IISG's research and outreach activities are both clearly defined and well linked thereby allowing for the efficient and effective delivery of research findings. The administration provides support and leadership in developing new projects and partnerships to expand the scope of the Program.

Committees Guide Program to Meet Needs of Water Users

Agencies and organizations in the two states and throughout the Great Lakes region provide input that is useful in guiding Program activities. In addition, the administrative staff has assembled committees to:

- Help identify program priorities
- Provide administrative and programmatic oversight for the bi-state program

Administrative Committees

Joint University of Illinois-Purdue University Policy Committee

- Provides oversight on all policy and budget decisions
- Composed of senior-level administrative and research officers at the University of Illinois and Purdue University—specifically, deans, chancellors, and vice-chancellors who provide principal support to the Program

Administrative Management Committee

- Advises the IISG Director in formulating overall management plans including development, program planning, project and thematic area evaluation, proposal development, research coordination, program reporting, and administrative functions
- Composed of the directors (or designees) of the Extension Service and Agricultural Research Programs at both Purdue University and the University of Illinois

Program Advisory Committees

Research Advisory Committee

- Makes recommendations on research priorities and funding levels
- Reviews requests for proposals
- Provides technical expertise in the review of preproposals and unsolicited proposals
- Composed of senior-level scientists and research administrators representing prominent research universities in Illinois and Indiana

External Users Advisory Committee

- Helps the Program identify the needs of its various users groups
- Participates in the selection of subject areas for solicited project proposals
- Assists in determining Program priorities and makes recommendations on the overall Program plan and budget
- Composed of members with wide-ranging viewpoints who represent universities, state and local government, business and industry, and the public throughout Illinois and Indiana

Partnerships Open New Windows of Opportunity

Illinois-Indiana Sea Grant actively seeks to form meaningful partnerships that advance its mission and goals. Partnerships are critical to all aspects of Sea Grant's administrative, outreach, and research activities. These dynamic relationships with agencies and organizations at the local, state, and federal level help to:

- Expand Sea Grant's philosophy and influence beyond the boundaries imposed by limited funds and personnel
- Facilitate close ties with various municipalities, lake resource user groups, aquaculture producers, and Great Lakes-related businesses and industries
- Ensure that IISG uses funds wisely
- Reduce duplication of effort, as exemplified through IISG's active involvement in the national network of Sea Grant institutions and the regional Great Lakes Sea Grant Network

The following examples illustrate partnerships that extend our reach to new audiences.

Chicago Academy of Sciences

IISG has joined with the Chicago Academy of Sciences to provide environmental and science education to K-8 teachers, students, parents, and the general public in the greater Chicago area and the Midwest. The Academy is developing new education programs that include aquatic learning activities, a Web site, teacher training, videos, and a learning center.

NIPSCO Industries Environmental Challenge Fund

The Environmental Challenge Fund is an employee-supported, nonprofit enterprise of NIPSCO Industries. By offering small grants to citizen action groups, schools, and environmental restoration organizations, the Challenge Fund will improve public and private lands in northwestern Indiana. On an annual basis, we cosponsor a number of these small grants and participate in the selection of applications for funding.

City of Chicago, Department of Environment

IISG has forged an ongoing partnership with the City of Chicago, Department of Environment to address the issue of environmental restoration. This long-term demonstration and applied research project is based on the premise that environmental restoration is not only compatible with economic growth, but is necessary to encourage it.

With support from Sea Grant, the City has acquired and plans to improve a degraded open space/wetland area adjacent to industrial property. The long-term goal is to build an interpretive center that embraces both the industrial and ecological heritage of the Lake Calumet area. The center will become a focal point for education and research projects addressing sustainable development in the region.

Illinois-Indiana Sea Grant College Program: 1994-1998

A Renewed Commitment to Citizens of the Southern Lake Michigan Region

Since 1994, the Illinois-Indiana Sea Grant Program has undergone a number of changes to better serve its clientele. These changes have had far-reaching impacts for our staff and researchers. We restructured our administration and management and created active policy and advisory committees. IISG initiated a strategic plan and developed successful competitive research and education components. The scope of our extension and communications components has been broadened, and productivity has increased dramatically.

With a staff that has tripled in size, the Program can better meet the needs of its audience and address a wider array of coastal issues. In addition to forming strategic partnerships, the Program has integrated its activities into the administrative and academic structures of the University of Illinois and Purdue University systems. These initiatives helped foster an environment in which our staff and researchers achieved and were recognized for sustained excellence, as evidenced by the attainment of "college" status.

GOALS

- To increase overall Program efficacy, scope, funding, and visibility through collaborative research, extension, education, and communications efforts.
- To recruit and retain productive staff who are empowered to use their creativity, imagination, and energy.

ADMINISTRATION MILESTONES

- Reinstatement of a state-directed research program and the appointment of a research coordinator. By having the autonomy to make funding decisions, our administration is now able to respond better to local needs.
- Expanded program scope to include the "water quality" and "coastal business and environment" thematic areas. Through the addition of staff specialists and the adoption of program plans, IISG began to address the pressing research and outreach needs of the region's residents.
- Establishment of long-term institutional agreements with the University of Illinois and Purdue University enhanced program resources, increased staff, and provided institutional vision and perspective for our Program plan.
- Elevation of IISG to an administrative department within Purdue University raised the profile of the Program, increased administrative autonomy, and facilitated more efficient operations.

AQUACULTURE

Aquaculture's rapid growth has attracted the attention of potential producers and investors. Current trends show that the growth of the aquaculture industry in the heartland of the country will continue to increase. New producers need access to timely and reliable information to ensure a successful enterprise that meets consumer demand for farm-raised fish and seafood. Sea Grant shares the latest research developments with farmers, landowners, bankers, and investors to educate them about raising fish as a profitable activity. Staff members offer the latest information concerning economic, marketing, and technical topics.

As a result of Sea Grant's research and outreach efforts since 1992, aquaculture has emerged as an industry in both Illinois and Indiana. Program staff has conducted applied research and taught Extension educators in both states the fundamentals of raising and marketing farm-raised fish. IISG is currently helping new producers gain financial support, while providing information to lending institutions through a new aquaculture business planning bulletin. As positive impacts to the states' economies become more apparent, the Program expects to see legislative and financial support for aquaculture to grow.

GOAL

To increase the size and profitability of aquaculture industries in Illinois and Indiana in an environmentally sound manner.

Why the Aquaculture Industry Has Great Potential

- Per capita consumption of farm-raised fish is increasing.
- The Midwest provides a ready supply of raw materials for low cost fish feed (corn and soybeans).
- Many seafood consumers live in the Midwest.
- Chicago is one of the five largest U.S. seafood markets.
- The Midwest has large numbers of potential producers who are receptive to incorporating aquaculture into their existing farming operations.

AQUACULTURE MILESTONES

- Indiana and Illinois aquaculture associations were formed, developed, and expanded into organizations that now serve as positive instruments of change for the industry

- Indiana Aquaculture Plan enacted and Illinois Aquaculture Development Plan written. These plans describe the current status of the industry, outline steps for expansion, and include marketing and supply cooperatives. To develop these plans, Sea Grant joined with the respective state aquaculture associations, Aquatic Control, Inc. in Indiana, the State Policy Analysis Committee, Southern Illinois University-Carbondale, and the Illinois Department of Agriculture.

- Regulatory requirements for aquaculture in Illinois and Indiana were changed to promote industry development.

- All Extension and agri-science educators in Illinois and Indiana were trained to deliver aquaculture assistance: 19 extension educators in Illinois and Indiana have developed a specialty in aquaculture.

- Aquaculture Network Information Center (AquaNIC), an Internet/World Wide Web site, provides comprehensive computer-based educational materials for starting and refining production systems, economic information for business planning, as well as marketing and pricing information to maximize profit to aquaculture producers.

- Production strategies for perch and hybrid striped bass in ponds have been optimized, and essential amino acid and chlorine requirements for perch were identified and developed.

- Essential economic information for business planning (enterprise budgets for pond-raised yellow perch and caged hybrid striped bass) is provided to prospective producers.

- 500 new producers now grow fish in cages in ponds, a substantial increase in the number of practicing aquaculturists.

- Double-cropping systems have been developed and refined for high-demand species—tilapia, hybrid striped bass, or yellow perch, followed by rainbow trout or coho salmon.

- Producers have increased access to marketing outlets through:

  - Construction of a processing facility in Illinois that provides market stability
  - Creation of an Illinois fish farmers cooperative to help stabilize market prices and aid with bulk supply purchases
  - Education and assistance in complying with Hazard Analysis at Critical Control Points (HACCP)

IMPACTS

Size of Industry

- Gross sales of aquaculture products grew from $2million in 1989 to $6million in 1998.

- 200 producers have been assisted in starting and developing successful aquaculture businesses.

- 3,000,000 pounds of fish were grown and sold in Illinois and Indiana in 1998.

Profitability of Industry

- Food fish producers have increased their income 75 percent by switching from catfish to tilapia, yellow perch, hybrid striped bass, and rainbow trout.

Lending Institutions

- Leading lending institutions regard aquaculture as a viable agriculture endeavor.

- At least 10 producers during the past two years have received loans totaling $3million as a result of improved business plans, prepared with the assistance of IISG's aquaculture outreach program.

Aquaculture Research Activities

Listed below are summaries of selected research projects. For a complete listing of all IISG-funded projects, visit our Web site at <http://ag.ansc.purdue.edu/il-in-sg>.

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Pesticide Detection In Farm-raised Fish

The Measurement of Chlorpyrifos in Catfish
Charles R. Santerre, Foods and Nutrition, Purdue University, West Lafayette

Department of Foods and Nutrition Purdue University

Detection of contaminants in fish generally requires costly and time-consuming methods that rarely provide results prior to consumption. The eventual development of a kit to measure multiple chemical compounds including chlorpyrifos will allow a rapid, low-cost, and reliable means of determining contaminant residues. Efforts to measure chlorpyrifos and determine its fate during preparation are necessary to assess the human health impact from exposure to this pesticide in fish. This study intends to adapt a commercially available kit to measure chlorpyrifos levels in fish. Chlorpyrifos is a pesticide used on soybeans and alfalfa, both of which are widely planted in the Great Lakes region. This research will use the Enzyme Linked Immuno-Sorbent Assays (ELISA) kit to verify residue concentrations in catfish samples containing the pesticide before and after preparation.

Biotechnology For Improved Aquaculture Production

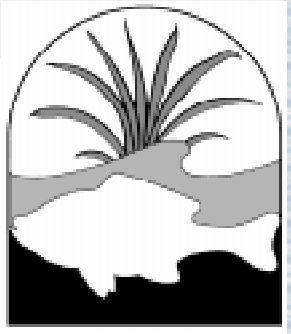
Primordial Germ Cell (PGC) Cultures for Transgenic Fish Production
Paul Collodi, Department of Animal Sciences, Purdue University, West Lafayette

This project's long-term goal is to develop the use of primordial germ cell (PGC) and embryonic stem (ES) cells for the production of transgenic fish. This technology may prove to be a powerful approach for optimizing aquaculture production through the use of genetic methods to alter characteristics such as growth rate, disease resistance, and temperature. Through a series of experiments, methods for the establishment of long-term fish PGC cultures will be developed. Having available a PGC line able to efficiently contribute to germ cell lineage will greatly facilitate gene transfer studies with aquatic species and enable researchers to produce "knockout" mutant lines of fish that are deficient for a particular gene.

SPOTLIGHT ON OUTREACH

AquaNIC
http://ag.ansc.purdue.edu/aquanic

More than 25,000 people from 49 countries use the Aquaculture Network Information Center (AquaNIC) as a gateway to access and distribute the ever-increasing number of aquaculture resources. Information seekers appreciate online meeting capability and video and audio broadcasts which can be downloaded quickly. AquaNIC information is used by outreach educators, government agencies, aquaculturists, teachers, and students.



BIOLOGICAL RESOURCES

The biological resources of Lake Michigan are under constant stress from the changes that take place around them. For instance, the deliberate and accidental introductions of nonindigenous aquatic nuisance species (ANS) to the Great Lakes over the past 200 years have had wide-ranging effects on the Lakes' biological resources—some devastating, some relatively benign. The most recent invaders include the spiny water flea, Eurasian ruffe, round goby, and zebra mussel.

Many of these exotic species are of significant concern to lake managers and to industrial, municipal, and recreational water users of Lake Michigan and the inland waters of Indiana and Illinois. The concern stems from the species' potential ecological and economic impacts. In response to these concerns, Illinois-Indiana Sea Grant is conducting research on impacts and control measures. Using research findings, IISG staff provides resource managers and water users with information on potential ecological and economic impacts of ANS, ways to reduce their impact and spread, and methods to prevent future introductions. To reinforce its message, Sea Grant has created and placed exotic species advisory signs at boat landings and displays of preserved specimens of the non-native goby and native sculpin at bait shops.

Fisheries is another aspect of Sea Grant's focus on biological resources. Native populations are directly affected by invasive species and changes in water quality. ANS introductions are a factor causing changes in the food chain. In turn, this causes fluctuations in fish populations. Lake managers need information on factors that cause changes in fish populations. Anglers want to know how these fluctuating fish populations might affect their recreational pastime.

Sea Grant's efforts in both aquatic nuisance species and fisheries allow managers and water users to make informed management, policy, business, and personal decisions. IISG staff is currently engaged in meeting the needs of both lake managers and anglers.

GOALS

- To reduce the introduction, spread, and economic harm of nonindigenous aquatic nuisance species.
- To provide resource users and managers with research-based information on the ecological impacts of changes, to facilitate appropriate management decisions in response to them.
- To maintain and enhance the biodiversity and beneficial uses of biological resources.

BIOLOGICAL RESOURCES IMPACTS

- Actions by boaters now delay zebra mussel infestation of inland lakes by several decades, according to a model. This buys time to develop control methods and may save native mussels in hundreds of miles of streams and rivers.

- Economic impacts of exotic species on industry and recreational water users have been reduced because:
  - Industries have changed their zebra mussel control practices to be more effective and cost efficient
  - 25,000 boaters have obtained information on how to protect their boats and boat engines from zebra mussels

- 64 percent of anglers in the Chicago metropolitan area can identify the round goby; more than 70 percent of recreational boaters and anglers reportedly take steps to prevent the spread of aquatic nuisance species.

BIOLOGICAL RESOURCES MILESTONES

- Inland lake associations are equipped with a comprehensive education and monitoring program that empowers them to:
  - Prevent the spread of exotics into inland lakes
  - Reduce the impact and cost of infestations

- Multi-agency cooperation resulted in the investigation of a barrier to stop exchange of nonindigenous aquatic nuisance species between the Great Lakes and Mississippi River drainage basins.

- Critical control points through which nonindigenous species enter the baitfish industry have been identified, and control methods have been developed and are being implemented.

- Comprehensive information resources on zebra mussels that were developed by Great Lakes Sea Grant Programs are being used by scientists, extension educators, teachers, and resource managers throughout North America. Instant access to science-based, peer-reviewed information on ANS is available through a national Web site SGNIS (Sea Grant Nonindigenous Species), developed by Great Lakes Sea Grant programs.

- Illinois has drafted a comprehensive state plan to manage aquatic nuisance species.

- Vectors by which zebra mussels colonize and spread to other bodies of water have been identified and have been used by outreach staff to inform the public so they can take action to reduce the spread.

Biological Resources Research Activities

Listed below are summaries of selected research projects. For a complete listing of all IISG-funded projects, visit our Web site at <http://ag.ansc.purdue.edu/il-in-sg>.

Yellow Perch Decline

Recruitment Failure of Yellow Perch in Lake Michigan: Evaluation of the Starvation and Predation Hypotheses
John Janssen, Loyola University Chicago

Since 1989, yellow perch in Lake Michigan have failed to produce a strong year class. In most years, larval yellow perch have been abundant but fail to survive their first summer. Two hypotheses for this failure are that: 1) the larvae are being consumed by alewife and other pelagic fishes, and 2) there is not enough food for the larvae due to competition with zebra mussels and other planktivorous organisms. Understanding the factors that affect yellow perch recruitment, and developing methods to predict yellow perch year class strength, will allow managers to make more informed decisions regarding yellow perch fishing regulations.

Prevention And Mitigation Of Invasions

Degradation and Restoration of Lake Michigan: Past and Future of Nonindigenous Species
David M. Lodge, University of Notre Dame
Daniel Schneider, Illinois Natural History Survey and University of Illinois at Urbana-Champaign
J. Ellen Marsden, University of Vermont
Richard Sparks, University of Illinois at Urbana-Champaign

Exotic fishes have invaded both Lake Michigan and the Illinois River. No current comprehensive inventory of these invaders exists, however. An inventory of the species that have successfully invaded, and analyses of those characteristics that have made each species successful, will permit data-based assessments of future invading species. This will allow resource managers and policy makers to take a proactive approach to managing future invasions.

Dispersal Of Nuisance Species And Potential For Control

Model of Lake Michigan-Illinois River Zebra Mussel Metapopulation: Evaluating Possible Control Strategies
Daniel Schneider, Illinois Natural History Survey and University of Illinois at Urbana-Champaign

Zebra mussel veligers (larvae) produced in Lake Michigan move downstream into the Illinois River via Chicago-area waterways. A model that incorporates the transport and viability of these veligers will permit analysis of the effects of Lake Michigan veliger supply on zebra mussel populations in the Illinois River. This model will also permit simulations of reductions in the Lake Michigan veliger supply and the resulting downstream zebra mussel populations, and thus will be a valuable management tool for preserving ecosystems of the Illinois River.

A Promising Control Method

Low Frequency Electromagnetism as an Effective Method of the Control of Zebra Mussel Infestation

Matthew F. Ryan, Purdue University Calumet

Zebra mussels threaten the shutdown of any facility that draws water from infested sources. Chemical treatments are extensively used by such facilities to prevent zebra mussels from colonizing their systems, but there are numerous regulatory and environmental concerns regarding the prolonged use of chemicals to control infestations. Extremely low frequency electromagnetism (ELF EM) prevents adult and larval zebra mussels from assimilating calcium, preventing normal growth and development. Thus, ELF EM represents a nonchemical, economically sound, environmentally responsible method to control zebra mussel infestation.

Biological Resources Specialist
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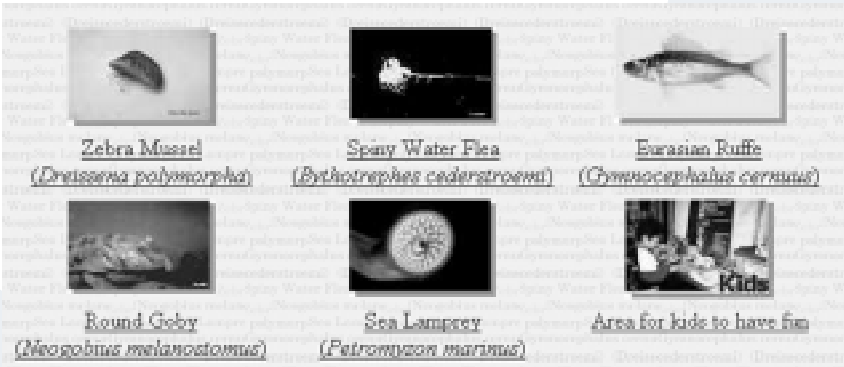
SPOTLIGHT ON OUTREACH

SGNIS Web Site
http://www.ansc.purdue.edu/sgnis/

Sea Grant
Nonindigenous Species Site
Zebra Mussel and Other Aquatic Nuisance Species
sgnis

Now, everyone with on-line access can easily learn about aquatic nonindigenous species through Sea Grant's comprehensive, peer-reviewed Web site, SGNIS. They can obtain the latest research findings and learn about new training materials and educational resources. The Web site, developed by the Great Lakes Sea Grant Network, has a large collection of color photos, video clips, and distribution maps of nonindigenous species that can be downloaded for future use. Resource managers, scientists, educators, students, water industry operators, boaters, and anyone wanting more information on exotic species will want to surf this site.



COASTAL BUSINESS AND ENVIRONMENT

Economic indicators show that the regional economy will continue to grow, but, at the same time, this growth will impose costs to society. Expansion of the metropolitan area for commercial, industrial, and residential uses onto agricultural land and current open space will affect the use of watersheds. Increased public expenditures will be required to supply the water necessary for human consumption, landscape irrigation, food processing, and manufacturing.

The economic value of coastal resources (wetlands, water, wildlife) and recreational resources (fishing, boating, and beach and park use) is not readily available to local and regional planners. The lack of information makes it very difficult to make choices that effectively and sustainably balance competing goals of conservation and development of coastal areas. Sea Grant scientists and outreach staff are obtaining information and developing tools that assist coastal communities in making future development decisions. IISG's efforts will ensure that these decisions balance short-term economic gains with the long-term loss of coastal environmental values.

Sea Grant initiated an outreach effort in 1997 to address sustainability issues. The Program works closely with regional land-use decision makers to help them understand and incorporate into their plans accurate measures of the economic value of their region's natural resources that can be enhanced or lost through future development.

GOAL

To enhance the economic climate and quality of life in Illinois and Indiana by supporting ecologically sound and sustainable coastal economic development.

Information Technology and Communications Services

COASTAL BUSINESS AND ENVIRONMENT MILESTONES

- The City of Chicago has located a unique natural urban area within Lake Calumet in which to begin contaminant remediation, ecological restoration, and public education. Federal and municipal agencies and citizen groups are now focusing future scientific research and contamination remediation efforts on Chicago's demonstration project area.

- Planners and decision makers in Chicago and neighboring communities receive hands-on training and critical resources needed to incorporate environmental considerations into comprehensive plans, site designs, and the management of regional growth patterns.

Listed below are summaries of selected research and outreach projects. For a complete listing of all IISG-funded projects, visit our Web site at <http://ag.ansc.purdue.edu/il-in-sg>.

Improved Urban Environment Through Planning

Ecosystem Issues Training in Northeastern Illinois

James W. Ford and Dennis Dreher, Northeastern Illinois Planning Commission

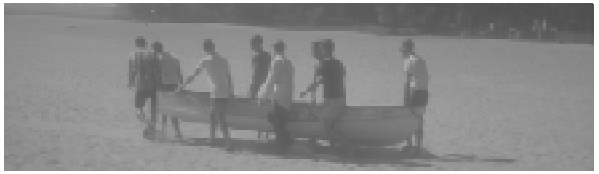
This project seeks to provide local planning officials in Northeastern Illinois with information and training on planning techniques to reduce the negative impacts of urban development on Lake Michigan. Local training workshops will be held to discuss environmental considerations in local comprehensive and site planning for air- and water quality benefits. Implementation of planning efforts based on information gained through these workshops will contribute to reduced contamination of Lake Michigan through lower surface runoff volume and lower contaminant levels.

Understanding Recreational Habits Of Coastal Resource Users

Outdoor Recreation and the Nationwide Survey on Recreation and the Environment: An Examination of Nature-Based Learning Activities with a Focus on Water

Joseph T. O'Leary, Purdue University, West Lafayette

The Nationwide Survey on Recreation and the Environment (NSRE) is a nationwide cooperative research effort designed to better understand recreational use and public attitudes toward the nation's natural resources. This survey presents a unique opportunity for Sea Grant to gather information on how coastal resources are used for recreation. Utilizing the NSRE data, this project seeks to 1) enhance the description of recreation participants in nature-based, water-related learning activities; 2) determine how water-related activities differ in terms of geographic, sociodemographic, and other characteristics; and 3) provide recommendations for public and private recreation organizations interested in better understanding the water-related recreation market.



An Improved Public Understanding Of Sustainability

Coastal Business and
Environment Specialist
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The Lake Calumet Economic-Ecosystem Initiative

Suzanne Malec, City of Chicago Department of Environment

This ongoing project explores how an urban area might practically preserve and enhance its existing fragments of functioning ecosystems, and how this stock of natural capital relates to the regional economy. The initial phase of this initiative analyzed the ecology of three sites within the Lake Calumet area on Chicago's south side. Using this information, planners will select an optimal location to develop the site as a Sustainability Center. This will be an asset to the public, who will learn about the area's industrial and economic heritage as well as its ecological history. This project channels the interests, expertise, and collaboration of many agencies and stakeholders toward an on-the-ground project.

Coastal Business and Environment Expected Impact

Precise economic measures and models of coastal resources will be used as a tool for policy makers to make ecologically and economically sound sustainable development decisions.

WATER QUALITY

Information Technology and Communications Services

Clean water is essential to life. People expect it to be instantly available for home and industrial uses, and to be aesthetically pleasing for recreational use. Wildlife, both aquatic and terrestrial, depend on clean water for habitat. Clean water and diverse and healthy coastal habitats, in turn, contribute to a high quality of life for people who flock to swimming beaches, fishing spots, and natural areas.

Water quality and usage have been greatly affected by industry, agriculture, and population growth. In addition, Lake Michigan and adjacent waters are favorite areas for recreational anglers. Many waters, however, are contaminated by heavy metals and organic chemicals (PCBs and PAHs). Sea Grant-funded researchers are studying the effects of contaminants on fish and other aquatic organisms, and the ultimate risks to human health.

In the summer, it is common for swimming beaches to be closed or posted with warnings about potential health risks because of contamination by bacteria and viruses. Sea Grant scientists are investigating the sources of bacteria and viruses in river and near-shore environments. Our research addresses the pressing need for effective methods to prevent contamination or detect it if already occurring. In response to these needs, IISG initiated this thematic area in 1996 to develop water quality programs and information resources for water users.

Rapid and sometimes poorly planned development further influences water quality because runoff and storm drainage may increase contamination from septic systems, factories, or sewage treatment facilities. Acres of hard or impermeable surfaces, such as roofs, roads, and parking lots, increase water runoff (and downstream flooding) and decrease groundwater recharge. Program staff members work closely with state and federal agencies, local municipalities, environmental groups, and private citizens to increase access to information and help them develop sound plans. As a result, the public can make informed choices about their quality of life—whether it be through involvement in the policy-making process or through changes in their water usage activities.

GOAL

To enhance the water quality of Lake Michigan by facilitating appropriate use of Great Lakes region resources through proper stewardship, management, and conservation of natural resources.

WATER QUALITY MILESTONES

- 18 Indiana agencies have been working together since 1997 to focus science and policy on the *E. coli* issue.
- Reporters and citizens now have access to public-friendly, unbiased, science-based information about local water quality issues.

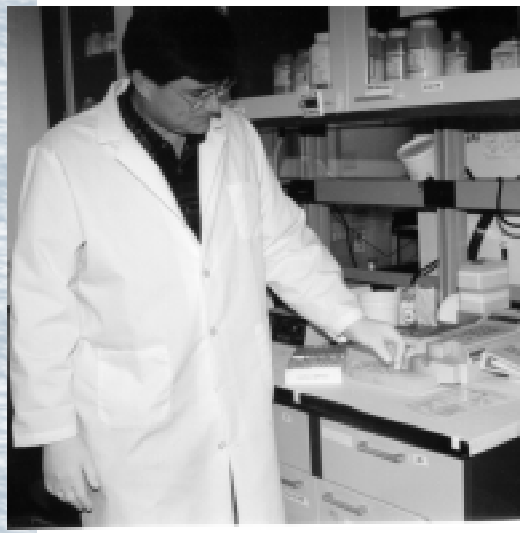
Listed below are summaries of selected research projects. For a complete listing of all IISG-funded projects, visit our Web site at <http://ag.ansc.purdue.edu/il-in-sg>.

Contaminant Detection

Molecular Recognition Based Sensing of Critical and Emerging LaMP Pollutants: A Versatile New Nano-engineered Materials Approach

Joseph T. Hupp, Northwestern University

Chemicals from airborne and waterborne sources degrade the water quality of Lake Michigan. Volatile organic chemicals and herbicidal pollutants are just a few of the major contaminants entering the Lake. This project proposes to develop cost-effective, real-time water pollutant sensing equipment using materials for chemical binding and pollutant sensing. The new, ultrasensitive, quartz crystal-based sensors should prove to be valuable tools for any of the remediation proposed by the Lakewide Management Plan (LaMP) and should be applicable in any type of remediation, compliance, or assessment effort undertaken in the Great Lakes.



Biological Effects Of Contaminants

A Genotoxicological Approach to Biomonitoring: Biomarkers for Carcinogens in Bullhead Catfish

Olin E. Rhodes, Purdue University, West Lafayette

This project proposes to assess the usefulness of brown bullhead catfish, a fish found around the Great Lakes, as a biomonitor for the effects of environmental carcinogens in the Great Lakes region. The biomarkers used to assess the genetic damage, DNA strand-breaks, DNA adducts, and hepatic tumors are at the molecular and cellular level. This will be a useful monitoring tool for the future remediation efforts in the river, as well as a biological tool to assess the effects of environmental carcinogens on the fish. This project should also provide information on contaminant-related genetic damage and damage-related disease, which will provide information on potential human health risks associated with direct (environmental) or indirect (fish consumption) contaminant exposures. In addition to being used in the Great Lakes region, the research may be applied to other contaminated aquatic systems under consideration for remediation.

Cleanup Efforts

Natural Photochemically-Mediated Destruction of Contaminants in Rivers and Lakes of the Calumet Area

Gary R. Peyton, University of Illinois
Mary LeFaivre, Illinois State Water Survey

A new way to clean up contaminants is the use of natural light to produce chemical reactions. If the watershed is dredged, there is a potential for resuspension of the sediments. Sediments may carry with them contaminants, which may be carried to the surface. Here, contaminants may transform or be assimilated to a less toxic state due to photochemistry. It is also possible for the opposite to occur—the resulting product may be more toxic. The less toxic form is desirable for many reasons, such as reducing the contaminant load to another section of the watershed. This project examines the fate of contaminants exposed to natural solar photochemical processes in the Calumet watershed. Results should help researchers understand the photochemical reactions taking place in the water and examine a possible adaptation to bankside treatment. When scaled up, the results of this study are likely to have broad applications in Lake Michigan.

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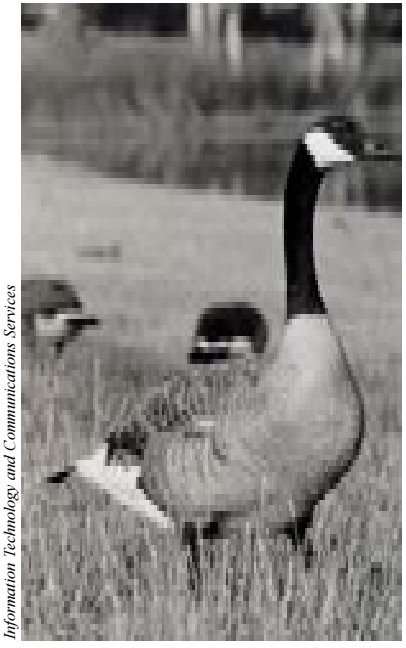

Information Technology and Communications Services

SPOTLIGHT ON OUTREACH

Water Quality: Issues and Concerns

This fact sheet series provides information on a variety of water quality topics ranging from taste and odor to contaminant issues related to fish consumption advisories. Available on the Web and in print, this series helps policy makers, regulators, journalists, educators, and concerned citizens understand the issues pertaining to daily water consumption and water-based activities. Visit <http://ag.ansc.purdue.edu/il-in-sg/staff/sleslie/>.

EDUCATION ENLIGHTENS YOUTH

Sea Grant's youth education projects create and enhance understanding of water resource issues and improve scientific literacy. Our education component is successful due to collaborative projects and partnerships with education leaders in the bi-state area, as well as coastal regions throughout the United States. Program staff provides classroom materials for K-12 teachers on topics in aquaculture, biological resources, and water quality. Interactive learning tools developed by IISG include CD-ROMs, Web sites, curriculum guides, subject matter workbooks, in-depth fact sheets, and distance education opportunities.

Youth are the future stewards of our coastal resources. They will remain a key audience for Illinois-Indiana Sea Grant education projects. We will assess future needs and increase our current network of educational partners to develop new approaches for delivering interactive curricula and other classroom activities.

GOALS

- To create a science-based foundation of ecological knowledge for those who pursue college study or enter the workforce.
- To provide scientific and technical understanding that helps children become citizens who can make informed decisions as consumers and water resource users.

EDUCATION MILESTONES

- Teachers throughout the Great Lakes region can now find, select, and access, via the World Wide Web, teaching resources on water quality that enhance current classroom activities.
  http://seagrant.calumet.purdue.edu/gradek2.html
- Students throughout Chiago participate regularly in interactive classroom and field activities on water quality as a result of Sea Grant's partnership with the Chicago Academy of Sciences.
- A network of 36 prominent educational institutions across the United States and Canada train teachers on the biology, spread, and impact of exotic aquatic species. In addition, a network of Zebra Mussel Mania Traveling Trunk education sites offers ideas for student involvement in community awareness projects.
- Students around the world can participate in interactive learning activities on exotic aquatic species, available through the Sea Grant Nonindigenous Species Web site (SGNIS).
- Agri-science students are prepared to enter careers in aquaculture through instructional programs utilizing interactive learning experiences and in-service teacher training.
- 4-H youth receive training in life skills through aquaculture activities developed by Sea Grant in partnership with the Extension Service.
- More than 200 high school educators nationwide utilize curriculum on coastal concerns to help journalism students write science-based articles that also integrate other disciplines.

IMPACTS

- Through national use of our Traveling Trunks, over 1,000 teachers and 25,000 students have learned about the biology, spread, and impact of zebra mussels and other nonindigenous species.
- An estimated 18,000 students have information necessary to make responsible decisions about their actions with respect to the spread and transport of nonindigenous species. This is a direct result of the Great Lake Sea Grant Network's Exotic Species Day Camp workshops for 125 classroom teachers and environmental educators in 7 states who, in turn, instructed teachers in 1998 at workshops and conferences.
- Aquaculture is recognized by 10,000 high school students as an economically viable livestock enterprise. These students acquired their instruction from 75 teachers across the United States, who were trained by Sea Grant staff and other technical experts at the National Council on Agri-science Midwest site in Green Castle, Indiana, and at a national teacher workshop held at Auburn University.

SPOTLIGHT ON EDUCATION

Getting Started in Freshwater Aquaculture: CD-ROM and Workbook

Ag Communication

Provides a captivating way to learn about water analysis, species selection, production methods, and business planning. Video clips, colorful animation, photos, and illustrations add to the appeal of this educational tool for vocational agriculture students.

Exploring Science Writing: An Environmental Focus

Encourages the incorporation of science writing into existing high school curricula through teacher training and a reader including Sea Grant science-based articles from around the country. The project supports the Sea Grant goal of a more marine-literate public by contributing to better-informed

Exotic Species Day Camp for Educators

Gives teachers and environmental educators access to technical experts, Web-based information, and hands-on learning tools. From this workshop, a collection of 30 teacher-developed activities on aquatic exotics using science, math, art, and music is being published to give students a focused look at the biology, transport, and impact of exotics.

Outreach Staff Involved in Youth Education

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Science Writing
Nancy Riggs

Water Quality
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COMMUNICATIONS:
Information That Meets Your Needs

Through the use of existing, new, and emerging technologies, Sea Grant serves clientele with up-to-date information and offers immediate access to Sea Grant research and outreach.The Communications unit manages product development, oversees distribution, and creates and implements marketing plans. Communications specialists and a marketing assistant help researchers and outreach field staff match the medium with each message being conveyed to identified audiences.

IISG reaches new audiences with research findings and other information to improve their quality of life. An estimated 2.5 million people receive IISG information each year. Keeping the audience in mind, information is packaged in media releases, news tips for broadcast media, postings on Web sites, promotional flyers, direct mailings, and listings in resource catalogs.

Production is streamlined by working with a team of editors, designers, photographers, and videographers. Program partnerships with the Office of Information Technology and Communication Services at the University of Illinois and the Agricultural Communication Service at Purdue University create a strong foundation for production and management activities.

Marketing and distribution strategies provide for high-level responsiveness to information seekers. Together, these communications activities extend Sea Grant's reach well beyond the borders of Illinois and Indiana to a worldwide community.

GOALS

- To increase client accessibility to Sea Grant information and products.
- To position Illinois-Indiana Sea Grant as a premier provider of coastal information through traditional marketing and delivery approaches and emerging technologies.

Information Technology and Communications Services

COMMUNICATIONS MILESTONES

- The Program has established numerous contacts with the print and broadcast media which regularly distribute information.
- The Communications unit is routinely invited to exhibit science-based information at prominent institutions such as the Field Museum of Natural History in Chicago.
- Marketing strategies have increased consumer demand for products by 15 percent and raised the profile of the Program among its constituents.
- The general public and targeted user groups can order Sea Grant publications online, by credit card, and via a toll-free number.
- HELM Online, an electronic magazine, presents more timely information to large audiences and easily provides updates on issues of interest.
- The "splash" series now serves as a mechanism to regularly place timely information on coastal and aquaculture issues in 56 daily and weekly newspapers.

IMPACTS

- Sea Grant products and events are reaching a wider array of audiences and larger numbers of people as a result of focused and expanded media relations efforts, improved marketing, and Internet access to products.
  - Over 10,000 people engaged in interactive educational activities and/or spoke with Sea Grant experts at local, state, regional, and national events.
  - 1,000 Extension educators, resource managers, and scientists from 27 states and Canada are now prepared to confront zebra mussel invasions in their local waters through their participation in the Nationwide Zebra Mussel Videoconference in partnership with the Great Lakes Sea Grant Network.
- Media coverage greatly expands the reach of our unbiased, science-based information. Reporters from three major metropolitan papers with over a million readers repeatedly use Sea Grant science-based information.

Program Web Site
http://ag.ansc.purdue.edu/il-in-sg

Visit our newly designed site for a complete listing of our Program's research and outreach projects, late-breaking news, funding and fellowship opportunities, education and information resources, our online newsmagazine, upcoming workshops and public events, and links to other helpful Web sites.

Splash Media Series

Interesting coastal resource and aquaculture facts have been written by Sea Grant specialists to inform the public about relevant issues in their communities. The "splash!" media series draws attention to Sea Grant as an information source. An easy-reading format and clever design is appealing to those who may not be familiar with southern Lake Michigan water issues.

splash!

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INSTITUTIONAL SUPPORT

Partnerships and Matching Funds

While the functional areas of IISG (research, outreach including education, and administration) are largely defined by the mission of the National Sea Grant College Program, our organization and the location of our staff are strongly influenced by our host institutions—the University of Illinois and Purdue University. IISG administration interacts with the many supporting units of both universities, as well as the university administrators who provide continuing financial and logistical support.

Financial support for IISG comes from direct contributions and contributions of faculty and staff salaries. These long-term institutional commitments support our core program staff and provide matching funds for outreach, research, and administration. Funds provided to Sea Grant by partnering institutions, agencies, and organizations are used to support activities of common interest. By combining our goals and resources with those of our partners, we are able to achieve more for our investment and reach a broader and larger audience.

The Program requires all grantees to provide nonfederal matching funds for proposed and funded projects. Consequently, all projects are jointly funded with other institutions and agencies, and all are awarded on a competitive basis. Each research proposal and all outreach projects awarded outside the Program's core activities are required to provide match funding of one nonfederal dollar for every two dollars of federal money requested.

Staffing and Logistical Arrangements

The Illinois-Indiana Sea Grant College Program functions as a unit with a clearly defined mission and specific goals and objectives. Its personnel are employed by various institutions and are housed in a wide variety of departments. Quarterly meetings of IISG staff provide a forum to discuss client needs, program development, information delivery, and future Program directions.

Program personnel receive financial support, direction, and supervision from the Director for that portion of the individual's appointment allocated to Sea Grant. All staff activities, however, are related to IISG goals. In this way, Sea Grant activities become integral components of our institutional partners' activities, and vice versa. **See Program Reporting Structure on page 29.**

Charting The Horizon

The future of Illinois-Indiana Sea Grant is bright, complete with opportunities and the promise of success. The Program staff takes seriously the mission of fostering the creation and stewardship of an enhanced and sustainable environment and economy along southern Lake Michigan and in the Great Lakes region.

In executing our mission, we will continue to seek and address the needs of our local constituents as well as the priorities of the National Sea Grant College Program. Illinois-Indiana Sea Grant will strive to be a premier provider of new knowledge and unbiased, science-based outreach and education on coastal issues.

Distance education and communication via the Internet is fast becoming a matter of routine. To provide information in a timely and cost-effective manner, we will place an emphasis on enhancing the Program's computer capabilities and Web-based offerings to both adult and youth audiences. By capitalizing on the strengths of our major university partners, we hope to develop more effective methods of extension, communications, and education. And through this technology, IISG staff members can serve a larger number of clients and users more effectively and efficiently.

Coastal Business and Environment has emerged as IISG's newest thematic area. Critical to the sustainable economic growth of large metropolitan areas is a sustained and enhanced environment, including decisions on the use of its water resources. Our Program will support work to create and evaluate economic models to measure development and conservation decisions. In the future, we hope these

models will have broad application for coastal urban areas across the country. Activities in the southern Lake Michigan region are a critical first step in strengthening our existing efforts and establishing the path to the future.

In response to the local and regional needs of our constituents, Illinois-Indiana Sea Grant intends to add a new thematic area, *Coastal Processes*, to the current priorities—aquaculture and seafood safety, biological resources, coastal business and environment, and water quality. Just as Sea Grant has developed its other thematic areas, we intend to find our niche in the area of coastal processes while supporting the highest quality research to advance knowledge and provide state-of-the-art outreach for adult and youth audiences to inform our constituents.

The southern Lake Michigan shoreline and the accompanying natural and manmade wonders attract tourists and create an ever-increasing demand for recreational opportunities. A future priority of the Program is to assess tourism use and impact, and address the resource needs of this important client group.

The future directions and activities of the Illinois-Indiana Sea Grant College Program will be based on our clients' developing needs and priorities. We will continue to listen and be responsive to our constituents.

Our Program looks forward to the next millenium and the role we will play in advancing science and positively influencing the economic and environmental sustainability of southern Lake Michigan.

Illinois-Indiana Sea Grant College Program

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To be announced
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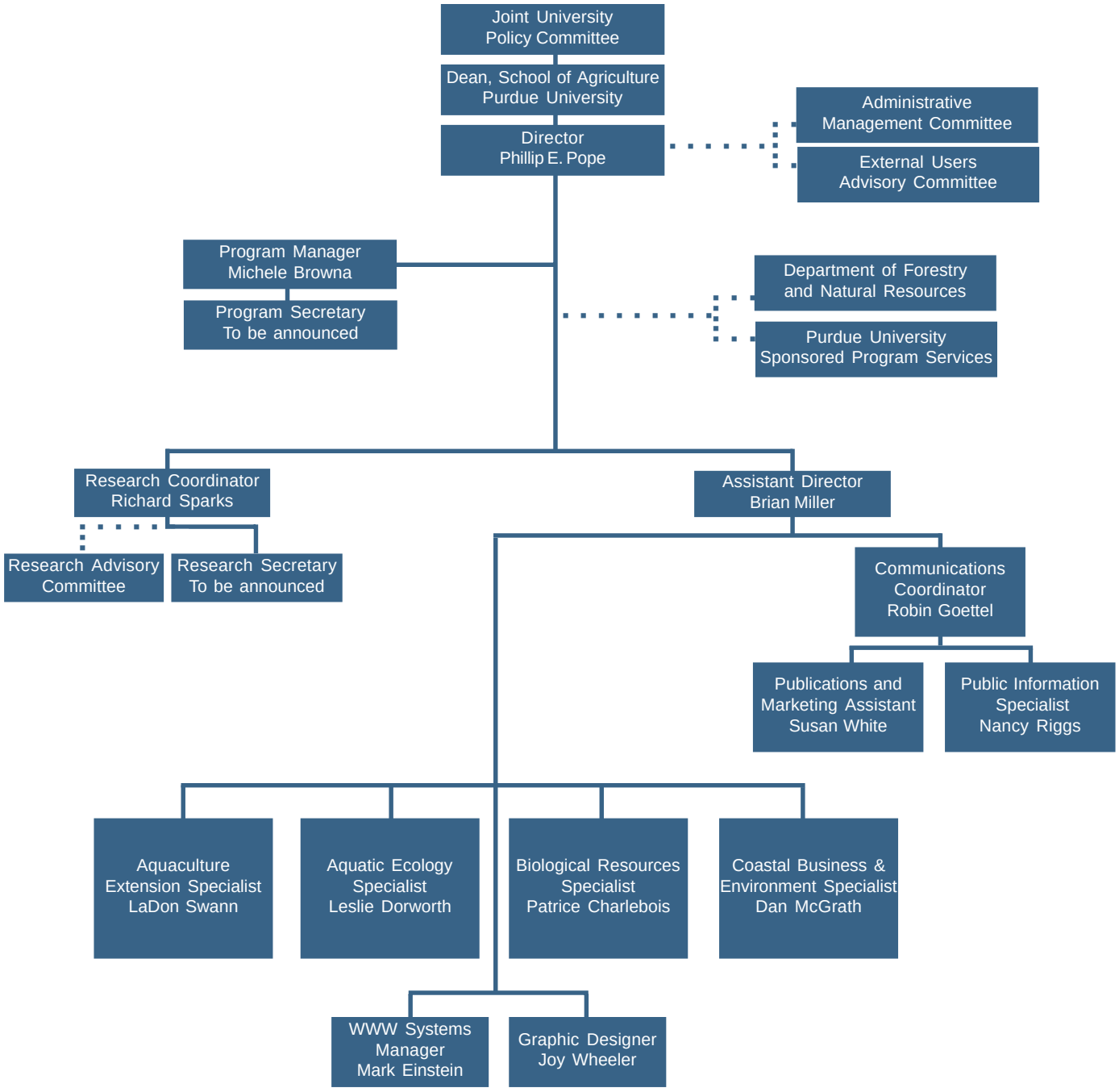
Program Reporting Structure



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