

THE PENNSYLVANIA STATE UNIVERSITY

DATE: 12 December 2003

SUBMITTED TO: The National Sea Grant College Program
NOAA-U.S. Department of Commerce

PROGRAM TITLE: Pennsylvania Sea Grant Coherent Area Program

PROGRAM PERIOD: 1 March 2004-28 February 2005

AMOUNT REQUESTED: \$386,051

MATCHING SUPPORT: \$200,000

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We, the undersigned, certify that, in the event this proposal is accepted, in whole or in part, our signatures on this proposal constitute acceptance of and compliance with statutes and regulations of the U.S. Government and the U.S. Department of Commerce.

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LIST OF ABBREVIATIONS

Abbreviations are redefined within each section of the proposal

ABBREVIATION	FULL NAME
AIS	Aquatic Invasive Species
ANS	Aquatic Nuisance Species
AOC	Area of Concern
BCMS	Bayfront Center for Maritime Studies
B-WET	Bay Watershed Education & Training
CEO	Campus Executive Officer
CBP	Chesapeake Bay Program
CMP	Corridor Management Plan
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Area
DCNR	Pennsylvania Department of Conservation and Natural Resources
DEP	Pennsylvania Department of Environmental Protection
ECCD	Erie County Conservation District
EPA	U.S. Environmental Protection Agency
ESCAPE	Exotic Species Compendium of Activities to Protect the Ecosystem
FTE	Full-Time Equivalent
GIS	Geographic Information System
GLIN	Great Lakes Information Network
GLNPO	Great Lakes National Program Office
GPS	Global Positioning System
HACCP	Hazard Analysis of Critical Control Points
IJC	International Joint Commission
Jr. PLEWA	Junior Pennsylvania Lake Erie Watershed Association
LEAF	Lake Erie Arboretum at Frontier
LEEEP	Lake Erie Environmental Education Partnership
MSME	Master of Science in Mechanical Engineering
NEMO	Nonpoint Education for Municipal Officials
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NSGO	National Sea Grant Office
PAC	Presque Isle Bay Advisory Committee
PACE	Purchase of Agricultural Conservation Easements
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCR	Polymerase Chain Reaction
PDR	Purchase of Development Rights
PENNTAP	Pennsylvania Technical Assistance Program
P ³ ERIE	Pollution Prevention Partnership, Environmental Responsibility in Erie
PFBC	Pennsylvania Fish & Boat Commission
PLEWA	Pennsylvania Lake Erie Watershed Association
PSIE	Penn State Institutes of the Environment
RAP	Remedial Action Plan
SEWER	Saving Erie's Water and Environmental Resources
SONS	Save Our Native Species
STEAR	Shipwreck Training Education Archaeology and Research
SUNY	State University of New York
TOUCH Nature	Teaching Outdoors to Urban Communities Helps Nature
WET	Watershed Education Team

***PENNSYLVANIA SEA GRANT
COHERENT AREA PROGRAM***

**YEAR 7 PROPOSAL
and
68-Month Progress Report**

Submitted to

THE NATIONAL SEA GRANT PROGRAM

Prepared by

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12 December 2003

I. DOCUMENT OVERVIEW AND HIGHLIGHTS

A. OVERVIEW

This document includes the Pennsylvania Sea Grant request for funding for Year 7 (1 March 2004-28 February 2005), with status reports for Years 1-6 included where appropriate. The focus of the proposal is a report of the implementation of outreach activities through 31 October 2003, continuation of outreach activity for Year 7, the proposed addition of a coastal communities thrust area for Year 7, the initiation of a research thrust area related to aquaculture, and the redesignation of Pennsylvania Sea Grant from project to Coherent Area Program.

Please note that it is Pennsylvania Sea Grant's intention to continue progressing toward Sea Grant College status, the next step being Coherent Area Program. Toward that end, this document also includes a long-range plan for Pennsylvania Sea Grant, which outlines the strategy for the next 5-7 years.

For purposes of this proposal, "outreach" includes extension, education, communications, and applied research mini-grants; and "program" indicates Coherent Area Program.

Pennsylvania Sea Grant has completed 68 months as a Sea Grant "project."

During Year 1, beginning on 1 March 1998, the project received funding of \$159,303 from the National Sea Grant Program, with matching funds from The Pennsylvania State University (\$75,325), and the Pennsylvania Departments of Environmental Protection, and Conservation and Natural Resources (\$46,834).

In Year 2, the project received \$160,817 from Sea Grant, with matching funds from Penn State (\$42,806) and the Commonwealth of Pennsylvania (\$52,300).

In Year 3, the project received \$162,096 from Sea Grant, with matching funds from Penn State (\$73,354) and the Commonwealth of Pennsylvania (\$65,869).

In Year 4, the project received \$167,765 from Sea Grant, with matching funds from Penn State (\$49,676) and the Commonwealth of Pennsylvania (\$310,474).

In Year 5, the project received \$168,000 from Sea Grant, with matching funds from Penn State (\$44,951) and the Commonwealth of Pennsylvania (\$280,274).

In Year 6, the project received \$179,759 from Sea Grant, with matching funds from Penn State (\$57,751) and the Commonwealth of Pennsylvania (\$365,000).

For Year 7, as a program, the request is for \$386,051 from Sea Grant, with matching funds from Penn State (\$46,480) and the Commonwealth of Pennsylvania (\$380,000). The funds from Sea Grant include the base from Year 6 (\$179,759); a cost-of-living increase of 3.5 percent (\$6,292); research funds to support an initial thrust area related to aquaculture (\$150,000); and a proposed coastal communities outreach thrust area (\$50,000). Please note that state support is anticipated to be in excess of \$400,000; however, for purposes of match, only \$200,000 is included in the proposed budget.

B. MISSION AND GOALS

Pennsylvania Sea Grant’s mission is to increase public awareness and solution of coastal environmental and economic issues through extension, communication, and education outreach; and to improve the overall environmental and economic “health” of Pennsylvania’s coastal regions.

The major goals of Pennsylvania Sea Grant include:

- **Provide leadership for outreach activities leading to the enhancement of the economic and environmental “health” of Pennsylvania’s Lake Erie watershed and Delaware Estuary.**
- **Develop a coastal communities outreach thrust area related to sustainable land use, economics, coastal processes, and nonpoint-source pollution.**
- **Initiate a research thrust area related to aquaculture.**
- **Serve as a conduit for information and services available through the National Oceanic and Atmospheric Administration (NOAA) and other sponsoring agencies and organizations.**
- **Improve the understanding of Pennsylvania’s Lake Erie watershed and Delaware Estuary among teachers and students through the development and support of coastal-related educational programs.**

C. HIGHLIGHTS

Highlights of the first eight months of Year 6 follow:

- **Leveraged \$179,759 federal Sea Grant funds with \$861,056 of other funds; a 4.8 to 1 match**

Amount	Source
\$250,000	Commonwealth of Pennsylvania Department of Environmental Protection (DEP) line item

\$ 15,000	Commonwealth of Pennsylvania Department of Conservation and Natural Resources (DCNR)
\$100,000	Coastal Zone Management (CZM) grant for addition of two staff members
\$100,000	CZM grant for Presque Isle Center equipment in conjunction with DCNR
\$150,000	11 applied research grants from state and federal sources
\$246,056	DEP Growing Greener grant for Nonpoint Education for Municipal Officials (NEMO) program - three years
\$861,056	Total

- **Assumed leadership role for key coastal issues**
 - ✓ Director Bob Light elected president of the Regional Science Consortium at Tom Ridge Center at Presque Isle. Includes design and oversight of 6,000-square-foot laboratory complex at the center, direction of science consortium, and acquisition of laboratory equipment and supplies.
 - ✓ Promotion and design of field station in conjunction with DCNR staff on Presque Isle where researchers can prepare samples and conduct in situ research. Funding for the field station was awarded in fall 2003.
 - ✓ Pennsylvania Sea Grant staff worked with DEP to move Presque Isle Bay from forty-third Area of Concern (AOC) to designation as an Area in Recovery. This was the first such redesignation in the United States. This included oversight of the AOC document and facilitation of strategic planning for the public advisory committee that oversees the AOC.
 - ✓ Procurement of multiple grants and staging of two fish tumor conferences that brought together researchers and agency staff to develop standardized criteria for the analysis of fish tumors and other deformities in Great Lakes AOCs. Developing concept paper on standardized tumor sampling and monitoring criteria for the International Joint Commission for use in all AOCs.
 - ✓ Continued leadership, in conjunction with New York and Ohio Sea Grant, related to avian botulism in Lake Erie, including facilitation of a botulism taskforce, coast watch and reporting system, research, and outreach.
 - ✓ Development of a Flathead Catfish Research and Outreach Consortium to address issues caused by this invasive species in the Delaware Estuary.
 - ✓ Facilitated the development of the Lake Erie Environmental Education Partnership (LEEEP). LEEEP is a partnership among organizations that design, develop, and deliver environmental education in the northwest region of Pennsylvania.

- **Other initiatives**
 - ✓ Pennsylvania Sea Grant was awarded a Growing Greener grant of \$246,056 to establish a NEMO program in the Lake Erie watershed. NEMO is a

non-regulatory, research-based educational program that has achieved national recognition for its work in nonpoint source pollution education. The program uses cutting-edge satellite data and Geographical Information Systems (GIS) technology to show municipal officials how their current and future land-use decisions can affect water quality. It addresses nonpoint sources of pollution and their link to different land uses, particularly impervious surfaces and transport of pollutants. In Pennsylvania's Lake Erie watershed, the Walnut Creek, Mill Creek, and Four-Mile Creek watersheds are being heavily impacted by urban growth. The municipalities in these watersheds will be targeted for initial education efforts. Other Pennsylvania watersheds would be targeted at a later date. NEMO-Erie hopes to partner with Penn State's Cooperative Extension Program and other conservancy organizations to expand the program to other portions of the state.

- ✓ Facilitated the development of an economic survey of the Lake Erie steelhead fishery and its contribution to the Erie economy.
 - ✓ Hosted the regional meeting of the Lake Erie Great Lakes Fishery Leadership Institute.
 - ✓ Collaborating with state agencies on the development of a statewide Invasive Species Management Plan.
 - ✓ Assisted in procuring the designation of Pennsylvania's coastal Seaway Trail as a scenic byway, which makes it eligible for federal grants. Currently developing a request for proposal for a Seaway Trail Corridor management plan.
- **Staff update – increased staff from 4.33 to 6.33 FTE.**

II. BACKGROUND

A. INTRODUCTION - PROJECT HISTORY

The National Sea Grant Program, administered by the National Oceanic and Atmospheric Administration (NOAA) within the U.S. Department of Commerce, was established in 1966 to promote wise stewardship of coastal resources.

Until 1998, Sea Grant was represented in all states bordering the Great Lakes and/or oceans with the exception of Pennsylvania. However, in 1998 after a decade-long effort led by Penn State Behrend, a Sea Grant project was established in Pennsylvania.

In March 1998, Penn State Behrend, on Pennsylvania's behalf, received funding from Sea Grant to initiate a highly focused Sea Grant extension project related to the Lake Erie watershed and coastline of Pennsylvania. This plan was developed in cooperation with the Governor's Office, the Department of Environmental Protection (DEP) and its Office of the Great Lakes, the Department of Conservation and Natural Resources (DCNR), and the Erie County Department of Health.

Pennsylvania Sea Grant's mission is to increase public awareness and solution of coastal environmental and economic issues through extension, communication, and education outreach; and to improve the overall environmental and economic "health" of Pennsylvania's coastal regions.

During the initial two project years (1 March 1998-29 February 2000) staff focused on extension efforts in the Lake Erie watershed (including the lake, Presque Isle Bay, Presque Isle State Park, and the upland regions of the watershed).

During Year 3 (1 March 2000-28 February 2001), the project added an applied research mini-grants program. These small, focused grants directly supported ongoing extension efforts.

During Year 4 (1 March 2001-28 February 2002), the project expanded to the Delaware Estuary (including the Delaware and Schuylkill Rivers and associated watersheds), establishing an extension presence in Philadelphia in conjunction with Penn State's Cooperative Extension office; and added a NOAA Coastal Management Fellow in conjunction with DEP.

During Year 5 (1 March 2002-28 February 2003) the project remained status quo due to funding constraints, with the exception of the placement of an Executive Branch Knauss Fellow.

The Year 6 (1 March 2003-29 February 2004) project which is in progress continues to focus geographically on the Lake Erie watershed and the Delaware Estuary. With

support from Pennsylvania's Coastal Zone Management Program (CZM), two staff members were added, one in the Delaware Estuary office and one in the Lake Erie office.

The request included in this proposal for Year 7 (1 March 2004-28 February 2005) would allow Pennsylvania Sea Grant to make the transition from project to program status. Specifically, to Coherent Area Program ("program") status.

Programmatically, during Year 7 Pennsylvania Sea Grant would:

- continue its successful outreach program that focuses on the delivery of services related to environmental quality and coastal land use and development, coastal-related education, communications, and applied research;
- establish a coastal communities program that focuses on sustainable land use, economics, and nonpoint-source pollution;
- establish a focused research program that would build on the current mini-grant format to support larger, longer-term projects in several key thrust areas, beginning with aquaculture;
- continue the implementation of a Nonpoint Education for Municipal Officials (NEMO) program in the Lake Erie region;
- establish and direct a science consortium for the Tom Ridge Center at Presque Isle.

Staff (6.33 FTE) would include a director (33%); extension director and associate director for Lake Erie (100%); associate director for Delaware Estuary (100%); coastal education and maritime specialist (100%); two coastal outreach specialists (100%); coastal land-use and economic specialist (100%); part-time student research interns; and DEP liaison.

B. HOST INSTITUTION - THE PENNSYLVANIA STATE UNIVERSITY

Penn State Behrend, an undergraduate and graduate university campus of Penn State, has led the implementation of the statewide outreach program with the support of the Penn State system and the Commonwealth. As the program expands geographically and programmatically, additional University resources would be incorporated, including:

- statewide strength - colleges, campuses, professional schools, county extension offices, and graduate centers;
- leadership from the University's Vice President for Research and Dean of the Graduate School, Vice President of Outreach, Dean of the College of Agricultural Sciences, and others;
- oversight by Penn State's Institutes of the Environment, an organization that coordinates the entirety of the University's environmental resources;
- selected faculty, staff, and graduate student research expertise, such as environmental resources and engineering, fisheries ecology and management, GIS and remote sensing, wetlands, toxicology, chemistry, soil science,

- nonpoint pollution, and brownfield issues;
- a strong track record in research, technology transfer, and outreach; including over \$545 million in research expenditures, and \$30 million of environmental research expenditures, annually.

1. PENN STATE UNIVERSITY

Founded in 1855, Penn State University, with a broad mission of teaching, research, and public service is Pennsylvania's land-grant university. More than 80,000 students attend Penn State at 24 locations. Penn State offers instruction in more than 160 baccalaureate and 150 graduate programs. Located in central Pennsylvania adjacent to the community of State College, the University Park campus, with an enrollment of some 40,000 students, is Penn State's administrative and research hub. Other Penn State campuses - including the College of Medicine at the Hershey Medical Center and the Dickinson School of Law in Carlisle - play a vital role in the University's overall mission.

2. PENN STATE BEHREND

Penn State Behrend is highly selective in the choice of programs at the associate, baccalaureate, and graduate levels. A CEO and dean who reports to the University's provost and executive vice president leads the college.

Over 30 degrees are offered in engineering and engineering technology, business, science, humanities, and social sciences. The programs offered in these areas are heavily focused on regional needs. In support of the region, the college has developed a number of outreach programs in the areas of technology transfer, corporate and continuing education, and applied research.

Current enrollment at the college is nearly 3,700; with over half of the students pursuing degrees in science, engineering, and engineering technology fields. Faculty members, especially in science, have been active in their support of local environmental and coastal development issues, including involvement in education and applied research. More specifically, faculty members have been involved in the following areas: small mammal, amphibian, bird, and reptile population changes on Presque Isle State Park; zebra mussel genetics and distribution in Presque Isle Bay; impact of *Phragmites* on Presque Isle State Park; mayfly resurgence in Lake Erie; brown bullhead reproduction and tumor occurrence in Presque Isle Bay; native mussel occurrence and genetics in refugia; and others.

The college is located in suburban Erie - Pennsylvania's fourth largest city, with a metropolitan population of more than 280,000. Located on the shores of Lake Erie, the community is highly dependent on an abundant supply of clean water to support the important manufacturing sector, the thriving tourism business, and the general well being of its citizenry.

3. PENNSYLVANIA'S SEA GRANT INSTITUTION

The strength of the University's faculty, coupled with its land-grant heritage and vast experience in outreach and extension; its impact in technology transfer; and its partnerships with other higher education institutions and environmental-related organizations, make the University an excellent organization to lead Pennsylvania's relationship with the National Sea Grant Program. The University is a recognized leader in community development and cooperative extension and has compiled a strong track record. The University community also recognizes the value of collaborating with other institutions of higher education, and has developed many cooperative programs that afford the Commonwealth a broader range of outreach and research services.

Based on Pennsylvania Sea Grant's performance over its initial six years as an extension project, in October 2003, NSGO leadership determined that Penn State should be the Sea Grant institution for Pennsylvania.

C. DESCRIPTION OF WATERSHEDS

Pennsylvania Sea Grant focuses its efforts on Pennsylvania's two important coastal regions: Lake Erie watershed and Delaware Estuary.

1. LAKE ERIE WATERSHED

In Pennsylvania, the Lake Erie watershed consists of the northern half of Erie County and the northwest corner of Crawford County. Overall, the watershed land area is 511 square miles. The dominant topographic feature of the watershed is the 63-mile shoreline of Lake Erie that includes the Presque Isle ecosystem.

The Presque Isle ecosystem contains an ecological resource that is unique within the state and rare within the Great Lakes basin. The primary components of this ecosystem are the numerous natural communities that occur on the flying sandspit peninsula (Presque Isle); the natural embayment formed by the approximately 3,200-acre peninsula (Presque Isle Bay); and the open waters of Lake Erie contiguous with the peninsula shoreline to a depth of about 30 feet. Over 3,000 species of flora and fauna inhabit these natural communities, with at least 130 occurrences of plant and animal species of special concern.

Presque Isle Bay is approximately 3,718 acres in size. The embayment is shallow with a substrate composed of organic sediments, although sand is a dominant substrate at the mouth of streams and near the navigational channel. Most of the bay drainage basin is densely developed. As a consequence, wastewaters (domestic and industrial) and storm waters are now generally discharged into the municipal wastewater treatment plant. In the past this was not the case.

The western end of Presque Isle Bay is considered to be a productive and valuable spawning area for a number of species including largemouth bass, northern pike, yellow perch, gar, and a number of sunfish and minnows. Overall, 63 fish species inhabit the bay. Seven of these species are classified as species of special concern.

Nearly the entire sandspit peninsula is a state park - Presque Isle State Park. The park averages nearly four million visitors annually. Its seven miles of sandy beaches and exceptional natural communities, wildlife, and diversity of aquatic life within the Presque Isle ecosystem, as well as other natural attributes, make the area a popular recreational area. Indeed, recreation is the primary use of Presque Isle and the rest of the county's coastal waters. Recreational activities include hiking, hunting, biking, swimming, bird watching, year-round sport fishing, picnicking, and boating.

High-gradient, short-run tributaries flow to the lake east of the City of Erie while more moderate gradient streams flow to the lake west of the city. Given the geologic history of the watershed's physiographic provinces, all streams have shallow flows over shale bedrock or gravel-rubble substrates, often developing deep gorges throughout their courses. Pool development is poor and, except for a few streams, sedimentation, siltation, and composite-mud bottom substrates are uncommon. These streams support cold water and warm water fisheries. Fishes associated with these streams include smallmouth bass, white suckers, smelt, emerald shiners, rainbow trout, steelhead, and coho and chinook salmon.

2. DELAWARE ESTUARY

The Delaware Estuary is home to approximately 5.25 million Pennsylvania residents, however, the Pennsylvania Coastal Zone Management Area (CZMA) is Pennsylvania Sea Grant's primary geographic focus. The CZMA includes a 57-mile stretch of tidal coastline within Bucks, Philadelphia, and Delaware counties. The head of tide for the Delaware Estuary in years of normal rainfall is Trenton, New Jersey. The CZMA varies from 1/8-mile wide in urban areas like Philadelphia to over 3½ miles in Bucks County and extends to the boundary with New Jersey in the middle of the Delaware River. Because of its importance to Philadelphia and the Delaware Estuary, the Schuylkill River watershed is also a target area for Pennsylvania Sea Grant.

The Delaware River is one of the last free-flowing rivers left in America; i.e., one of the last major rivers without a dam or other control structure on its main channel, and is one of the busiest ports in the United States, supporting one of the world's greatest concentrations of heavy industry and the second largest petrochemical refining center in the nation. The estuary, in its entirety, is the world's largest freshwater port with more than 70 percent of the East Coast's oil processed by numerous refineries lining the coast at the ports of Marcus Hook, Philadelphia, Camden, and Delaware City to name a few. The entire

Delaware River drainage is home to almost eight million people, ranking as the fifth highest population of all North American estuaries. Including water diverted from its Catskill headwaters to New York City, the Delaware supplies drinking water for 17 million people.

The watershed is composed of Appalachian Plateau, Ridge and Valley, New England, Piedmont, and Atlantic Coast provinces, which support some of the highest biodiversity in North America; and critical habitat for birds migrating along the Atlantic flyway, annual spawning of horseshoe crabs, spawning runs of American shad, and rare reptiles and amphibians.

The estuary is important to thousands of people as a recreational resource for water-related activities that provide the urban area with opportunities such as boating, fishing, rowing, birding, and hunting. These activities are highly dependent upon the preservation of open space, public access, and clean water.

III. ORGANIZATION

A. PENNSYLVANIA SEA GRANT OFFICE

In cooperation with Penn State Behrend, the Pennsylvania Sea Grant Office was established on 8 May 1998. It is anticipated that sometime in Year 7 that the Sea Grant office would be relocated to the newly constructed Tom Ridge Center at Presque Isle, built at the entrance to Presque Isle State Park. Sea Grant staff would assist in the oversight of the research and education aspects of the center, including laboratories and traditional classrooms.

In 2001, a Delaware Estuary office was opened in west Philadelphia. In January, the office will move to Chester City, a location close to waterfront development on the Delaware River.

B. PENNSYLVANIA SEA GRANT STAFF

Staff (6.33 FTE) would include a director (33%); extension director and associate director for Lake Erie (100%); associate director for Delaware Estuary (100%); coastal education and maritime specialist (100%); two coastal outreach specialists (100%); coastal land-use and economic specialist (100%); part-time student research interns; and Pennsylvania's Department of Environmental Protection (DEP) liaison. Figure 1 on page 19 includes a Pennsylvania Sea Grant organizational chart.

1. BOB LIGHT (33%) - DIRECTOR

Bob has 18 years of research administration experience that complements his doctorate in ecology. His technical areas of specialty are cold-water stream ecology and ichthyology. *Bob has been director of Pennsylvania Sea Grant since its inception in March 1998.*

Items to note:

- Member of Earth Force national board of directors.
- Selected as local Lake Erie-Allegheny Earth Force community advisory board chair.
- Selected as president of the newly created Regional Science Consortium at Tom Ridge Center at Presque Isle.
- Promoted to Penn State Behrend's Senior Associate Dean for Research, Graduate Programs, and Outreach in 2003.

2. ERIC OBERT (100%) - EXTENSION DIRECTOR AND ASSOCIATE DIRECTOR FOR LAKE ERIE

Eric has 25 years of combined experience with the Pennsylvania Fish & Boat Commission (PFBC) and DEP. His areas of technical specialty are limnology,

lake ecology, and ichthyology. *Eric has been with Pennsylvania Sea Grant since May 1998.*

Items to note:

- Appointed by Governor as Pennsylvania's sport fishing representative on the Lake Erie Advisory Committee for the Great Lakes Fishery Commission.
- Selected as chair of the research subcommittee of the Presque Isle Partnership.
- Selected member of the fish research subcommittee of the Presque Isle Advisory Committee.
- Selected member of Presque Isle State Park's Presque Isle Center task force.
- Selected chair of the research oversight team for the Presque Isle Center.
- Staged three avian botulism conferences with New York Sea Grant.
- Appointed by Pennsylvania's Department of Conservation and Natural Resources (DCNR) Secretary to Presque Isle State Park Advisory Board.
- Past chair of program leaders for the Great Lakes Network.
- Great Lakes Aquatic Nuisance Species (ANS) Panel - Pennsylvania alternate.

3. DAVE SKELLIE (100%) - COASTAL LAND-USE AND ECONOMIC SPECIALIST

Dave has 28 years of land-use planning experience with Erie County. His areas of technical specialty are sustainable development, including areas such as comprehensive planning, land-use regulations, the coastal zone management program, transportation planning, farmland preservation, Geographic Information Systems (GIS) mapping, and solid waste planning. Dave's activities include serving as a liaison with watershed and governmental organizations, implementation of the Seaway Trail initiative, nonpoint-source pollution, land preservation, brownfield restoration, wetlands protection, and land-use-related outreach. *Dave has been with Pennsylvania Sea Grant since September 2003.*

Items to note, Dave serves with the following organizations:

- Lake Erie Region Conservancy.
- Route 5 Scenic Byway Corridor Management Plan Committee.
- Pennsylvania Lake Erie Watershed Association.
- Millcreek Township Planning Commission.
- Pennsylvania Planning Association - Northwest Section.
- Weed and Seed Program Economic and Neighborhood Revitalization Committees.
- Neighborhoods First Collaborative.

4. ANNE DANIELSKI (100%) - EDUCATION AND MARITIME

SPECIALIST

Anne graduated from Penn State Behrend's biology program in 1999 and received her teaching credential through a cooperative program at Mercyhurst College in 2001. Anne served as a student assistant with Pennsylvania Sea Grant for 16 months and now serves as education and maritime specialist. Anne has three years of environmental education experience. Her primary responsibilities are to provide liaison to the Bayfront Center for Maritime Studies (BCMS), direct the award-winning *Environmental Rediscoveries* program, and coordinate coastal-curriculum development. *Anne has been full-time with Pennsylvania Sea Grant since July 2000.*

Items to note:

- Developed the award-winning *Environmental Rediscoveries* program and led the instruction of over 3,500 students and 140 teachers. Won the Governor's award for Environmental Excellence in 2002.
- Coordinated the Area of Concern Stage II and III Remedial Action Plan document update for DEP that led to the Presque Isle Area of Concern (AOC) becoming the first U.S. AOC to be redesignated as an AOC in Recovery.
- Facilitated development of the Lake Erie Environmental Education Partnership (LEEEP), an organization that coordinates environmental education in northwest Pennsylvania.
- Coordinated the development and staging of the first annual *Coastal Connections: Celebrating Land, Water, and You*. A multilocation watershed festival that brought together over 100 volunteers and 13 environmental organizations.
- Assisted in the development of the Pennsylvania Sea Grant Fleet Surgeon program, including the development of a Waterfront Safety Techniques course.
- Received \$66,000 in grant funds to support a variety of educational programs.
- Coordinated *The Great Lakes Invasion*, a 16-page educational supplement on exotic species that reached over 90,000 individuals, including 20,000 school students. This piece was adapted by several other Great Lakes cities for their citizens.
- Developed *Environmental Rediscoveries* board game utilized by participating teachers as an interactive assessment tool for their students.
- Directed first Get W.E.T. (Watershed Education Team) program; a unique watershed education mentoring program for high school and elementary school students.

5. ANN FAULDS (100%) - ASSOCIATE DIRECTOR FOR DELAWARE ESTUARY

Ann has 15 years of experience in science instruction and aquatic resource education, including two years of biology instruction at West Chester University. She received her master's degree from West Chester in 1998. Her

specialties include wetland, stream, and lake ecology; and aquatic entomology, with a focus on wetland beetle communities. *Ann has been with Pennsylvania Sea Grant since August 2001.*

Items to note:

- Provided leadership to develop funding to support the Delaware Estuary Flathead Catfish Research and Outreach Consortium to raise awareness of potential problems and identify research and outreach priorities.
- Conducted an angler intercept fish consumption survey for the Delaware Estuary to direct future fish consumption advisory outreach and education programs.
- With funding from the Chesapeake Bay Program, designed, organized, and co-instructed the 2003 Chesapeake Bay Faculty Development Scholarship program.
- Assisted in the instruction of a watershed education teacher training program sponsored by Delaware Sea Grant.
- Collaborated with the Office of River Basin Cooperation to survey Pennsylvania aquatic resource managers and educators regarding their aquatic invasive species (AIS) activities and concerns.
- Used the AIS survey to develop an educational outreach program, *Aquatic Invaders of the Delaware Estuary* attended by 77 key aquatic resource managers and educators from area colleges, watershed associations, and state and federal agencies.
- Collaborated with the Partnership for the Delaware Estuary to design and present *Aquatic Supertramps of the Delaware Valley* display, fact sheets, and roulette wheel game for the Southeast Pennsylvania Coast Day.
- Collaborated with Delaware Sea Grant and Philadelphia Cooperative Extension to sponsor *Seafood Sense* workshop for seafood educators.
- Collaborated with the Delaware Riverkeeper Network to organize the Schuylkill River Congress.
- Serves on four Delaware Estuary advisory committees.

6. SEAN RAFFERTY (100%) - LAKE ERIE COASTAL OUTREACH SPECIALIST

Sean graduated from Penn State Behrend's biology program in December 2002. Sean served as a student assistant with Pennsylvania Sea Grant for 11 months, for six months as a part-time staff member after graduation, and now serves as coastal outreach specialist for Lake Erie. As a student assistant, Sean developed an *Identification Guide to the Invertebrates of Presque Isle Bay*. Sean's responsibilities include overseeing the development and maintenance of fact sheets; facilitating ecological studies related to coastal issues; maintaining the Sea Grant Web site; providing outreach leadership related to marinas, nonpoint-source pollution, charter boats, boater safety, AIS, and waste reduction. *Sean has been full-time with Pennsylvania Sea Grant since July 2003.*

Items to note:

- Compiled *Fish Tumors Related to Great Lakes Areas of Concern Conference* proceedings.
- Began an AIS outreach program, distributing Sea Grant Watch ID Cards to various marinas, bait shops, and conservation agencies in the Lake Erie watershed of Pennsylvania.
- Working with the Erie Safe Boating Task Force to install display cases at various marinas and boat launches in the Lake Erie watershed of Pennsylvania. These display cases house information related to safe boating, clean boating, AIS spread and prevention, and general Pennsylvania Sea Grant information.

7. SHARI CURREY (100%) - DELAWARE ESTUARY COASTAL OUTREACH SPECIALIST

Shari has over eight years of experience in coastal zone management, marine research, and oceanographic instruction. Shari earned her master's degree in marine resource management from Oregon State University, where she served as a graduate research and policy assistant for Oregon Sea Grant. Her areas of expertise include coastal recreation and tourism management, sustainable community development, and public access. She has diverse experience working throughout the government, academic, and non-profit sectors. *Shari began working for the Pennsylvania Sea Grant Delaware Estuary office in November 2003*, where her primary responsibilities focus on AIS outreach.

Items to note:

- 2000-2002 National Oceanic and Atmospheric Administration (NOAA) Coastal Management Fellow.
- Co-facilitated a workshop entitled, *The Human Dimensions of Coastal Zone Management*, at the Coastal Zone '03 Conference in Baltimore, Maryland.
- Selected to the Massachusetts Personal Watercraft Task Force.
- Selected to the Advisory Board for the Cape Cod Water Trail Association.
- Selected to the Gulf of Maine Council's Working Group on Coastal Recreation and Tourism.
- Served on the Planning Committee for the 1999 World Congress on Marine Recreation and Tourism, Vancouver, British Columbia.
- Active member of The Coastal Society.

8. OTHER

- **John Booser** - a DEP and Coastal Zone Management liaison housed in and funded by DEP assists in the rollout of Pennsylvania Sea Grant in the Delaware Estuary.
- Several part-time student interns.

C. PENNSYLVANIA SEA GRANT GOVERNING BOARD

Three Penn State administrators currently serve on the Governing Board; Jack Burke, Campus Executive Officer (CEO) and dean, Penn State Behrend; Eva Pell, vice president for research and dean of the Graduate School, Penn State University; and Bill Easterling, director Penn State's Institutes of the Environment (PSIE). Additional members, if appropriate, would be identified and appointed in Year 7. Robert Light, director of Pennsylvania Sea Grant, keeps the board apprised of programmatic and financial issues.

D. PENN STATE'S INSTITUTES OF THE ENVIRONMENT

Concurrent with the Year 7 incorporation of additional Sea Grant and Penn State resources is the alignment of Pennsylvania Sea Grant under PSIE. Pennsylvania Sea Grant would report to PSIE director, Bill Easterling.

"The University believes that environmental research, education, and outreach are essential elements of the scientific, social, and economic future of the 21st century."

To this end, the University established PSIE in 2003 to increase the visibility and coordination of its many environmental resources and activities. The intent of PSIE is to address current needs and provide new interdisciplinary research opportunities for faculty and staff members and students. To focus its research efforts PSIE has identified thematic working groups: air quality, biodiversity and ecosystems, global change, health and the environment, industrial ecology and green engineering, and water resources.

As Pennsylvania Sea Grant establishes its research direction for Year 7, PSIE's research thrust areas would be taken into account. In addition, the theme team approach developed by the Sea Grant Association would also be incorporated.

E. PENNSYLVANIA SEA GRANT ADVISORY COUNCILS

1. LAKE ERIE

The council was established in consultation with community and Penn State leaders. Members were identified from several organizational categories: higher education, Chambers of Commerce, DEP, DCNR, Cooperative Extension, PFBC, business and industry, County Planning, secondary schools, Port Authorities, County Health, consultants, and coastal-related non-profit organizations. The council meets biannually and provides programmatic direction for the staff. A list of council members is included in Table 1.

2. DELAWARE ESTUARY

A preliminary council was formed in 2002, with representation from DEP, University of Delaware, Heritage Conservancy, Philadelphia Water Department, and Fairmount Park Commission. The council meets biannually and provides programmatic direction for staff in the Delaware Estuary.

Additional members would be added in Year 7. A list of council members is included in Table 1.

Figure 1. Pennsylvania Sea Grant Organizational Chart.

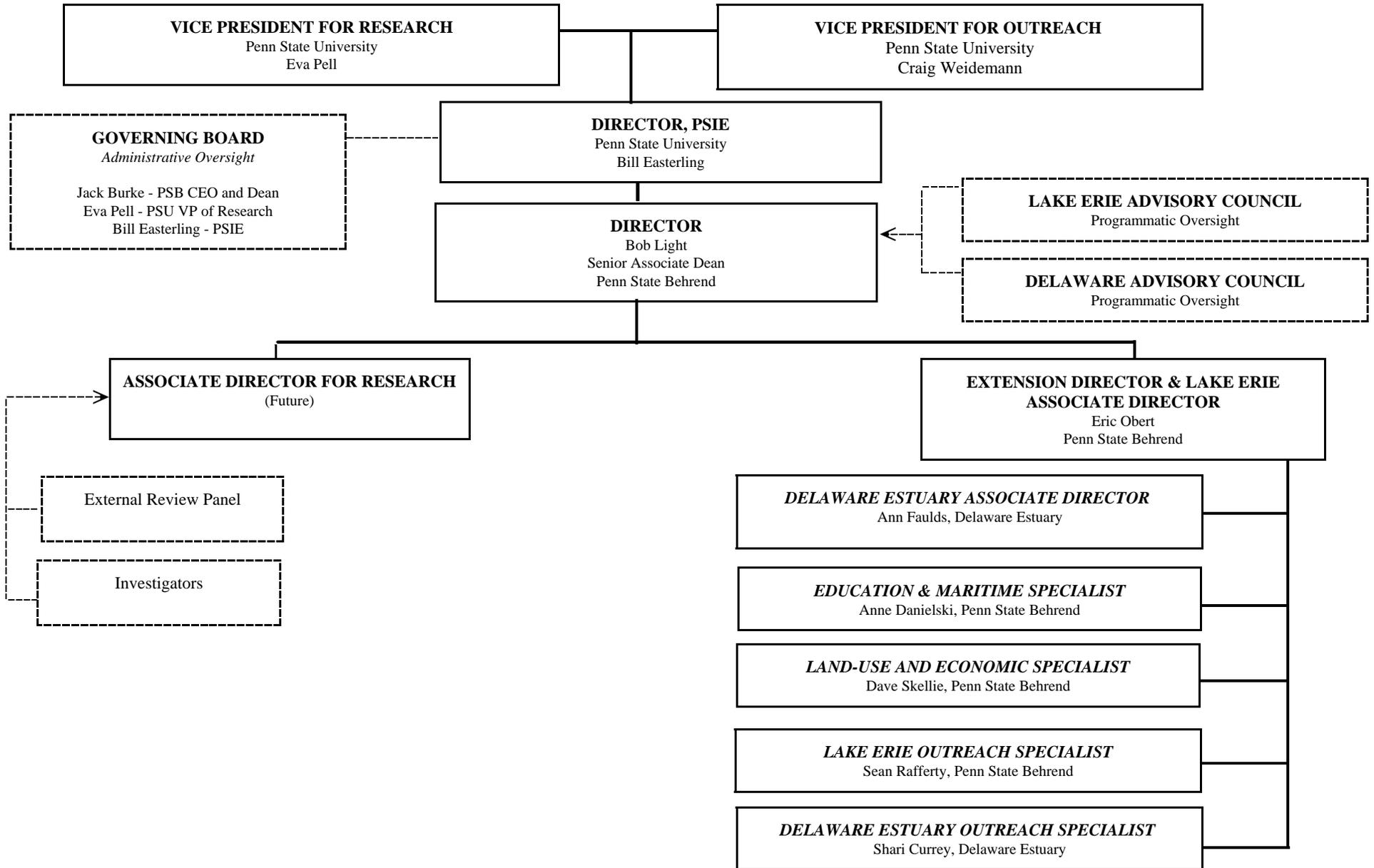


Table 1. Pennsylvania Sea Grant Advisory Council Members

Lake Erie Council

- **Emily Beck** Assistant Director
Erie Convention & Visitors Bureau
- **Lori Boughton**
Chief, Office of the Great Lakes
DEP
- **Kelly Burch**
Regional Director
DEP
- **Michael Campbell**
Professor of Biology
Mercyhurst College
- **Jerry B. Covert, Ph.D.**
President
Center for Advanced Manufacturing and
Technology
- **Holly Hedstrom**
County Extension Director
Erie County Cooperative Extension
- **Ed Kissel**
Save Our Native Species (S.O.N.S.) of
Lake Erie
- **Mark Kulich**
Regional Recreation & Park Advisor
DCNR
- **Harry Z. Leslie**
Manager, Presque Isle State Park
- **Sr. Pat Lupo, O.S.B.**
Lake Erie-Allegheny Earth Force
- **Chuck Murray**
Fisheries Biologist
PFBC
- **Robert E. Nipper**
Sr. Environmental Eng. Specialist
Lord Corporation
- **David Parker**
Owner/Operator
Presque Isle Canoe & Boat Livery
- **Jim Rutkowski**
Biology Teacher
Strong Vincent High School
- **Jay Schenck**
Sr. Technical Specialist, Pennsylvania
Technical Assistance Program
(PENNTAP)

- **Raymond Schreckengost**
Executive Director
Erie-Western PA Port Authority
- **Jim Stewart**
Executive Director
BCMS
- **Hamid Torab, Ph.D.**
Dean College of Sciences,
Engineering and Health Sciences
Gannon University
- **Robert Wellington**
Aquatic Biologist
Erie County Dept. Of Health

Delaware Estuary Council

- **Debbie Carr**
Director
Environmental Education Division
Fairmount Park Commission
- **Kathy Klein**
Director
Partnership for the Delaware Estuary
- **Howard Neukrug**
Director
Office of the Wetlands
Philadelphia Water Department
- **Laurel Stanley**
Aquatic Chemist & Graduate Student
University of Delaware
- **Kirstin Wakefield**
Past NOAA Coastal Management Fellow
PA DEP - CZM, Current Doctoral
Candidate, University of Delaware College
of Marine Studies
- **Sharon Yates**
Vice President of Planning
Heritage Conservancy

F. COOPERATING ORGANIZATIONS

In an effort to successfully develop and implement a Coherent Area Program, the staff has developed relationships with a number of key individuals and organizations (Table 2).

Table 2. Pennsylvania Sea Grant Cooperating Organizations

1. Other Sea Grant Programs

Alaska
Connecticut
Delaware
Illinois-Indiana
Maryland
Michigan
Minnesota
New Jersey
New York
North Carolina
Ohio
Sea Grant Association
Vermont
Virginia
Wisconsin

2. Lake Erie Programs

Presque Isle State Park Staff
Presque Isle Partnership
Presque Isle Bay Public Advisory Committee for the RAP
Presque Isle State Park Advisory Board
Save Our Native Species (SONS) of Lake Erie
3CU (cooperative fish hatchery network)
Bayfront Center for Maritime Studies
Erie Area Chamber of Commerce's Convention and Visitor's Bureau
Erie County Environmental Coalition
Erie-Western PA Port Authority
Erie Maritime Museum
Professional Charters of Lake Erie
Lake Erie-Allegheny Earth Force
Lake Erie Region Conservancy
Safe Boating Task Force
P³Erie (local pollution prevention organization)
PA Lake Erie Watershed Association
Erie Power Squadron

3. Other Federal Programs

Army Corps of Engineers
GLINPO
Great Lakes Environmental Research Lab
International Joint Commission
U.S. Coast Guard
USEPA Regions III & V
USFWS Lower Great Lakes Fishery Resource Office
USGS Great Lakes Science Center
USGS National Wildlife Health Center
USFWS Cooperative Research Unit - Penn State University
National Marine Fisheries Service

4. Government Related

State and Federal Legislators
Erie County Department of Health
Erie County Soil Conservation District

Erie County Cooperative Extension
PA Dept. of Agriculture
PA Dept. of Conservation and Natural Resources
PA Game Commission
PA Dept. of Environmental Protection
PA Fish & Boat Commission
PA Coastal Zone Management
PA Dept. of Transportation
DEP Office for River Basin Cooperation

5. Other Programs

Canadian Wildlife Service
Great Lakes Commission
Great Lakes Information Network
Great Lakes Fishery Commission
Western PA Conservancy
Erie International Institute
Environment Canada

6. Colleges and Universities

Allegheny
Dickinson College
Edinboro University of Pennsylvania
Gannon University
Lehigh University
Mercyhurst College
North Carolina State University
Penn State Berks
Penn State Behrend
Penn State University Park
Philadelphia University
SUNY Buffalo
SUNY - College at Buffalo
Texas A&M University
University of Pennsylvania
University of Pittsburgh-Pymatuning Lab
University of Maryland - Eastern Shore
University of Windsor, Canada
West Chester University of Pennsylvania
Westminster College

7. Delaware Estuary Programs

The Nature Conservancy
Delaware Riverkeeper Network
Delaware Valley Regional Planning Commission
Fairmount Park Commission
Partnership for the Delaware Estuary, Inc.
PA Fish & Boat Commission
Penn State Coop. Extension - SE Region
Philadelphia Water Department
The Academy of Natural Sciences
The Delaware Estuary Program
Delaware River Basin Commission
Heritage Conservancy
U.S. Fish & Wildlife Service

IV. SHORT-TERM OUTREACH APPROACH

The Year 7 or short-term outreach approach to Pennsylvania Sea Grant would include the continuation of the geographic expansion of the outreach program to include both coasts of the state: Lake Erie and Delaware Estuary. Program focus would include outreach activities related to extension, education, applied research, and communications.

The overall goal of Pennsylvania Sea Grant's outreach activities is to further the National Oceanic and Atmospheric Association (NOAA) and Sea Grant objectives in Pennsylvania. This section includes an update on Delaware Estuary and Lake Erie outreach and future plans for the five major outreach categories.

EXTENSION

- *Continue to refine list of priority environmental and other coastal issues within identified project thrust areas.*
- *Select high profile issues, identify current situation, and address the issues in consultation with advisory councils and the community.*
- *Pennsylvania Sea Grant outreach specialists would continue to act as conveners/facilitators of relevant individuals and organizations to address priority issues.*
- *Establish a "coastal communities" focus based on the model developed by the Sea Grant Association and National Sea Grant Office.*

EDUCATION

- *Develop Lake Erie and Delaware Estuary related curricula, out-of-class programming, and other environmental awareness-raising activities, especially within regional middle and high schools.*

COMMUNICATIONS

- *Create an increased awareness of Pennsylvania Sea Grant and coastal-related issues.*

APPLIED RESEARCH (This outreach category is on hold until sufficient funding is in place.)

- *Support extension activities through the implementation of an applied research mini-grants program for projects that directly support outreach staff and high priority issues.*

SEA GRANT NETWORK INITIATIVES

- *Continue to become an active participant in the National Sea Grant Network, with an emphasis on the Great Lakes and mid-Atlantic regions.*

A. DELAWARE ESTUARY EXTENSION THRUST AREAS

Pennsylvania Sea Grant's expansion into the Delaware Estuary continues to make substantial progress. Perhaps the most significant development of the past year is the creation of a new coastal outreach specialist position. Our new colleague, Shari Currey, was hired to coordinate Pennsylvania and mid-Atlantic aquatic invasive species prevention and control initiatives. The position was designed to provide support for the development of an aquatic nuisance species (AIS) statewide management policy. Substantial funding for the position was provided through the Pennsylvania Coastal Zone Management (CZM) Program.

Another significant development is the opening of a new Pennsylvania Sea Grant office in Chester City at the University Technology Park, a joint venture between Widener University and Crosier Chester Medical Center. Pennsylvania Sea Grant would also maintain an educational presence in the west Philadelphia Cooperative Extension Office that has served as headquarters since August 2001; however, the move to the Chester City location places Sea Grant closer to the Delaware River in a community on the cusp of waterfront renewal and redevelopment. The park was constructed on a brownfield reclamation site and was developed as a collaboration among many nonprofit redevelopment groups. We feel the new headquarters will provide improved infrastructure and increased program visibility.

Initial formation of Pennsylvania Sea Grant's Delaware Estuary Advisory Council (Table 1) has been completed, with additional members to be added during Year 7. The advisory council would assist in the development and implementation of strategic planning for Pennsylvania Sea Grant's Delaware Estuary program.

Pennsylvania Sea Grant staff, in cooperation with the advisory council and an expanding number of Schuylkill and Delaware rivers stakeholders (Table 2) has identified the following issues that are consistent with the mission of Pennsylvania Sea Grant (*not in priority order*):

- Promote "smart growth" and sustainable coastal land-use planning including redevelopment of abandoned commercial piers for public access.
- Coordinate endangered species protection and AIS prevention and control activities.
- Develop a wetland monitoring and education program aimed at identifying and conserving wetlands at risk of being disturbed or destroyed.
- Provide technical support for municipal officials, citizen monitors, and watershed groups.
- Develop Delaware Estuary seafood safety and fish consumption advisories.
- Disseminate applied research findings to targeted watershed groups.
- Identify environmental indicators of value in aquatic resource education and outreach efforts.
- Support existing efforts to increase public access to the river.
- Promote aquatic habitat enhancement and restoration efforts aimed at

improving the habitat functions of wetlands, ponds, and streams; and evaluate the feasibility of establishing a Delaware Estuary wetland bank.

- Enhance existing efforts to improve fish passage.
- Collaborate with Delaware and New Jersey efforts to model the source and movement of polychlorinated biphenyls (PCBs) and other Delaware Estuary nutrient and toxic contaminants.

1. DELAWARE ESTUARY ENVIRONMENTAL THRUST AREAS

- Aquatic Invasive Species
- Seafood Safety and Consumption Advisories
- Fisheries Extension and Outreach
- Water Quality
- Native and Keystone Species Stewardship

a. Aquatic Invasive Species (AIS)

Background

Through an e-mail survey conducted in collaboration with CZM, and informal discussion with environmental groups in the estuary, Pennsylvania Sea Grant has identified a need for increased awareness of AIS. Recent introductions of flathead catfish in the Schuylkill River and zebra mussels to a diving quarry near Bethlehem, Pennsylvania illustrate a need for increased vigilance and awareness of AIS in the region.

Pennsylvania Sea Grant has further identified a need for a basin-wide collaboration to increase the understanding of the negative ecological and economic impacts associated with AIS. There is no existing mechanism for coordination among Delaware Estuary environmental groups to optimize AIS early warning and prevention efforts, and on a regional level a mid-Atlantic AIS panel has yet to be formed. Last spring Pennsylvania Sea Grant conducted an e-mail survey to formally identify species of concern for the Pennsylvania portion of the Delaware Estuary. AIS species identified include:

Plants

- *Phragmites*
- Purple loosestrife
- *Hydrilla*
- Eurasian watermilfoil
- Japanese knotweed
- Resident Canada goose
- Nutria
- Asian carp
- Flathead catfish

Animals

- Zebra mussels

Objectives

- Raise awareness of AIS and minimize economic and ecological impacts to the Delaware Estuary.
- Facilitate Delaware Estuary representation in the formation of the mid-Atlantic AIS panel.

Progress to Date

- Helped obtain \$10,000 from CZM to develop a collaborative AIS symposium on March 20, 2003. *Aquatic Invasives of the Delaware River* was the first symposium to comprehensively review the status and identify gaps in AIS management in the Delaware River watershed. Sponsored by Pennsylvania Sea Grant, CZM, the Partnership for the Delaware Estuary, National Oceanic and Atmospheric Administration (NOAA), and the U.S. Environmental Protection Agency's (EPA) Delaware Estuary Program, the symposium addressed economic and ecological impacts, identified key pathways for introduction, and highlighted regional and local management successes. The program was attended by 77 key fisheries managers, academics, and conservationists in the Delaware Estuary. Symposium proceedings are now posted on the Delaware Estuary Partnership's and Pennsylvania Sea Grant's Web sites.
- Hosted a multistate flathead catfish round-table discussion in March 2002 to increase awareness of the flathead introduction, and help develop research and outreach agendas. Flathead catfish population biologist Tom Kwak, from North Carolina State University, discussed his flathead research experiences in the southeast coastal plain states.
- Successfully organized a Flathead Catfish Research and Outreach Consortium in conjunction with the Philadelphia Water Department, Academy of Natural Sciences, and the Monell Chemical Senses Center. The consortium sought and received a \$13,000 grant from CZM to conduct a pilot study on the distribution and sensory biology of the flathead catfish in order to develop strategies to prevent its spread. An additional \$21,108 CZM Flathead Catfish grant has been secured from the next funding cycle.
- Provided an applied research mini-grant to the Monell Chemical Senses Center, which funded a college intern, Maria Russo, to assist Senior Scientist John Teeter with flathead sensory and behavior research to determine promising catfish control methods. Maria is a marine science major at Southhampton College. In 2003, with knowledge gained from consortium-sponsored research results to date, John Teeter submitted a catfish behavioral research proposal to the National Institutes of Health and to the National Science Foundation
- Ann Faulds authored an article entitled *Meet the Flathead Catfish: Recently Introduced to the Delaware Valley*, which appeared in the *Delaware Estuary News* (spring 2002), Pennsylvania Sea Grant's newsletter *Keystone Shorelines* (spring 2002), and *Pennsylvania Angler and Boater Magazine* (summer 2002). A news article about the Flathead

Catfish symposium was also published in *Keystone Shorelines* (summer 2002).

- Ann Faulds and Kirstin Wakefield (NOAA Coastal Management Fellow) authored an article entitled *Phragmites: A Tale of Two Strains*, which appeared in the *Delaware Estuary News* and has been converted into a *Phragmites* fact sheet.
- An e-mail survey, conducted in collaboration with Pennsylvania's Department of Environmental Protection (DEP), polled Pennsylvania fisheries managers, academics, and conservationists in the Delaware Estuary of their knowledge of AIS and species of concern. A full survey report is posted on the Pennsylvania Sea Grant Web site.
- AIS survey results were used to develop a ten least wanted list displayed on 10 banners as part of the *Aquatic Supertramps of the Delaware Valley* exhibit. The banners were developed for Pennsylvania Coast Day, which was attended by a total of 8,000 people in 2002-2003. A second copy of *Aquatic Supertramps* was printed for New Jersey Sea Grant to display at the New Jersey Coast Days in 2002-2003, and electronic versions of full color posters and associated fact sheets will soon be available on the Pennsylvania Sea Grant Web site. An *Aquatic Supertramps* roulette game was developed to help make youth aware of the AIS problem.
- Participated in a 2002 multistate boater survey to help assess Delaware Estuary boater risk of interbasin transfer of AIS.
- A flathead tackle box/ boat sticker was developed and disseminated in collaboration with the Pennsylvania Fish & Boat Commission (PFBC) to discourage anglers from returning flatheads to Pennsylvania waterways.

Year 7 Approach

- Continue to develop AIS outreach projects and partnerships to help organizations better address AIS associated problems. Cultivate additional interest in AIS prevention by increasing the availability of the knowledge and expertise of the National Sea Grant Network.
- Provide leadership to continue the interest initiated by the 2003 AIS symposium.
- Continue to provide leadership in coordinating activities and grants to support the Flathead Catfish Research and Outreach Consortium. Expand upon existing outreach activities by developing flathead catfish Web resources and printed materials. Assist in developing additional funding proposals for research and outreach activities.
- Display *Aquatic Supertramps* exhibit and roulette game at the 2004 Fishermen's Expo and Pennsylvania East Coast Day. Continue to distribute *Supertramp* fact sheets.
- Assist DEP, CZM, and other state agencies in the development of a state management plan for invasive species.
- Assist in the multiagency effort to organize a mid-Atlantic AIS Panel.

b. Seafood Safety and Consumption Advisories

Background

Currently, DEP, the Pennsylvania Health Department, and PFBC issue fish consumption advisories for the Pennsylvania portion of the Delaware Estuary. The advisory recommends guidelines for safe consumption of fish species that are contaminated with high levels of mercury and PCBs. However, these advisories are often confusing and hard for most anglers to understand. Our preliminary findings from the 2003 fish consumption survey indicates that more than 90 percent of the anglers interviewed were concerned about eating their catch. Results from the survey also indicated that less than 80 percent of those interviewed were aware of the Commonwealth's consumption advisories. In addition to fish consumption advisories, there are health concerns regarding the safe storage and preparation of seafood served in restaurants and homes in the greater Philadelphia area. Pennsylvania Sea Grant staff has collaborated with Delaware Sea Grant on two seafood safety training and education workshops for extension personnel.

Objective

Inform the public about the risks and benefits of consuming locally available fish and seafood.

Progress to Date

- In collaboration with Delaware Sea Grant and Philadelphia County Cooperative Extension, Pennsylvania Sea Grant was instrumental in creating and delivering an annual three-day residential program, *Seafood Sense 2002 and 2003*. Thirty-three seafood educators from seven states attended these programs, which covered seafood safety and preparation issues. Indirect contacts from this workshop are expected to exceed 15,000 participants annually.
- Presented a summary of the Delaware Estuary Fish Consumption Survey at the Interstate Seafood Seminar in October 2003 in which 50 seafood inspectors and food safety professionals attended.
- In collaboration with the Delaware Riverkeeper Network and Partnership for the Delaware Estuary, Pennsylvania Sea Grant helped secure \$23,000 from CZM to conduct a subsistence angler intercept survey. The survey, coordinated by Pennsylvania Sea Grant, was conducted in spring and summer 2003 to determine the eating habits of subsistence anglers in the greater Philadelphia area. These data will be further analyzed to identify at-risk populations and communities as well as educational approaches. Jill Benowitz, a recent graduate in education from Acadia University, served as project coordinator.
- Served on the multistate Delaware Estuary Fish Consumption Advisory Team. The purpose of the group is to pool data and resources and promote consistent, estuary-wide advisement.

Year 7 Approach

- Serve as the primary coordinator of the CZM-funded Delaware Estuary Fish Consumption Outreach and Education Program. This program would serve as an outreach and education follow-up to the 2003 Fish Consumption Survey that identified target ethnic groups and educational opportunities. Collaborators would include the Delaware Estuary Program, Partnership for the Delaware Estuary, Philadelphia Cooperative Extension, and Delaware Riverkeeper Network.
- Continue to participate with the multistate Delaware Estuary Fish Consumption Advisory Team and assist the members in promoting a better understanding of fish consumption risks among Delaware Estuary anglers and fish consumers.
- Continue to collaborate with Philadelphia Cooperative Extension and Delaware Sea Grant to repeat and expand *Seafood Sense* workshops during 2004.

c. Delaware Estuary Fisheries

Background

Recent improvements in Delaware River water quality and dam removal efforts should enhance efforts to restore migratory fish populations such as shad, herring, striped bass, and sturgeon. However, the impact of nonpoint source pollution and the threat of oil spills and new invasive species remain a concern for the recreational and commercial fisheries of the Delaware. As the fifth largest city in America, Philadelphia is a major seafood market, ideally suited to support a growing and diverse Pennsylvania aquaculture industry.

Objectives

- Assist in the coordination of fisheries research and aquaculture production related to the Delaware River and Estuary.
- Conduct fisheries extension outreach (pending funding of the National Sea Grant Office (NSGO) fisheries extension proposal).
- Support research on the restoration of anadromous and catadromous fisheries to the Delaware River.
- Support fisheries restoration efforts in the Delaware River and Estuary.

Progress to Date

- Through representation on the Delaware Estuary Fisheries Cooperative Committee, Pennsylvania Sea Grant is involved with issues concerning fishery management. Pennsylvania Sea Grant activities have helped raise awareness of the impacts that invasive species such as the flathead catfish can have on migratory fisheries restoration efforts in the Delaware.
- Served as an advisor for the Delaware Sea Grant horseshoe crab Web site.
- Provided funding to support American shad migration research in the Delaware River, which utilized radio telemetry to improve hydroacoustic population estimates. A total of 22 shad were fitted with radio transmitters

and released in the Delaware River in April 2001. The purpose of the experiment was to investigate the feasibility of using radio transmitters to determine the timing of fish movement through the hydroacoustic sampling array at the Route 202 Bridge at Lambertville. Detailed movement was obtained from eight fish as they moved upriver through the sampling array. Of the eight fish that were monitored only one fish moved downstream after release. Results indicated that radio transmitters can be used to effectively monitor these fish as they move upstream.

Year 7 Approach

- Facilitate statewide aquaculture initiatives in the Delaware Estuary to cultivate successful approaches for seafood markets.
- Collaborate with the University of Pennsylvania's Aquaculture Research Program to evaluate the regional feasibility of cultivating and marketing native minnows for a growing live bait industry.
- Collaborate with Pennsylvania universities and colleges supporting and developing aquaculture research programs.
- Assist with mid-Atlantic fisheries initiatives geared primarily toward charter boat outreach.
- Continue to support Delaware Sea Grant's horseshoe crab outreach efforts.

- Continue to support research efforts related to anadromous and catadromous species of the Delaware River.
- Continue to support flathead catfish research and outreach in the Delaware Estuary.
- Develop proposed fisheries extension outreach program (pending funding support from NSGO).

d. Delaware Estuary Water Quality

Background

The water quality in the Delaware Estuary is intimately related to land use. Historically, pollution severely depleted dissolved oxygen levels in the main stem of the Delaware River, creating a dead zone that prevented anadromous fish passage and reproduction in freshwater tributaries. Through improvements in municipal sewage treatment, particularly in Trenton, Camden, and Philadelphia, nutrient and dissolved oxygen levels have improved dramatically during the period 1977-91. Restoration of sustainable populations of shad, striped bass, and other important fish species now appear achievable.

While many point source water quality problems in the Delaware Estuary have been addressed, nonpoint source pollution remains a major source of water quality impairment for fish communities, aquatic life, fish consumption, recreation, and public water supply. This remains a major reason why some areas of the estuary still do not comply with the goals of the Clean Water Act.

Objective

Assist in Delaware Estuary water quality improvement efforts in conjunction with EPA, DEP, CZM, and the Delaware Estuary Program.

Progress to Date

- Collaborated with the Delaware Riverkeeper Network and other sponsors to organize the March 2001-03 Annual Schuylkill River Congresses attended by over 500 participants to date. Through financial and program support, Pennsylvania Sea Grant helped to provide scientists, teachers, municipal officials, land managers, and conservation groups with a forum for discussion of nonpoint-source pollution problems, remediation methods, and priorities.
- Served on the Heritage Conservancy's Nonpoint Education for Municipal Officials (NEMO) advisory committee. Pennsylvania Sea Grant is also involved in the statewide coordination and expansion of NEMO.
- Participation and sponsorship of Southeast Pennsylvania Coast Days 2002-03, an annual forum for more than 30 non-profit groups to celebrate the bounty of the natural resources of the Delaware Estuary. Much of Coast Day's purpose was to motivate people to take a stewardship role in the prevention of nonpoint-source pollution.

Year 7 Approach

- Continue in-kind and financial support of the Schuylkill River Congress by providing conference meeting space at the Penn State Great Valley Campus, and financial and organizational assistance.
- Continue in-kind and financial support of Southeast Pennsylvania Coast Day 2004.
- Continue to support the Heritage Conservancy's NEMO project.
- Work with Pennsylvania Sea Grant's Lake Erie office to plan Delaware Estuary NEMO program.

e. Native and Keystone Species Stewardship

Background

Pennsylvania Sea Grant has been involved with several native and keystone species issues in the Delaware River. A major concern is the threat that exotic species can pose to the Delaware Estuary flora and fauna. For example, the introduction of zebra mussels to the flowing waters of the estuary could endanger native mussel populations. The recently introduced flathead catfish, now present in the Schuylkill River, is expected to extirpate sympatric catfish species, including *margined madtoms*, while depleting shad, sunfish, crabs, crayfish, and other native prey species.

Pennsylvania Sea Grant is also concerned about protecting those Delaware Estuary species, which are particularly important in driving native species assemblages, often termed keystone species. One Delaware Estuary keystone

species is the horseshoe crab. While not currently threatened with extinction, horseshoe crab eggs, which are laid on sandy beaches in the spring, serve as a major food source to the second largest shorebird concentration in the world. Loss of critical habitat and over fishing are believed to have reduced the number of horseshoe crab eggs available to shorebirds by 50 percent during the past decade, which in turn is believed to have had a cascading effect on endangered shorebird populations such as the red knot. A coordinated management policy and public education are critical to the success of horseshoe crab and shorebird management and conservation efforts.

Objective

Protect and restore populations of keystone and endangered species of the Delaware Estuary.

Progress to Date

- Prevent the introduction and spread of AIS competitors (see Aquatic Invasive Species section).
- Assisted Delaware Sea Grant with the development of a comprehensive Web site on Delaware Estuary horseshoe crabs.

Year 7 Approach

- Continue to raise awareness and prevent the spread of invasive species and advance public understanding of the ecological risk that invasive species can play in advancing the extinction or extirpation of native species.
- Pennsylvania Sea Grant is poised to assist Delaware Sea Grant with ongoing Delaware Estuary horseshoe crab outreach efforts.
- Develop outreach programs to Pennsylvania-based oil refineries to increase awareness of shorebird conservation issues and promote strategies to reduce the risk of oil spill damage to keystone and native species, particularly during the vulnerable spring migration season. Wherever possible, a Hazard Analysis of Critical Control Points (HACCP) style oil spill risk management approach would be advocated.
- Support the Ocean Resources Policy approved by NOAA in July 2003.
- Continue to support NOAA's Marine Managed Areas Inventory initiative to survey natural resource managers in both Pennsylvania coastal zones.

B. LAKE ERIE EXTENSION THRUST AREAS

- **ENVIRONMENTAL**
- **COASTAL COMMUNITIES**
- **OTHER COASTAL ISSUES**

1. ENVIRONMENTAL THRUST AREAS

Current environmental thrust areas:

- Fish and Wildlife Advisories
- Aquatic Invasive Species
- Presque Isle Bay Area of Concern
- Fisheries and Native Species

Detail on each thrust area follows.

Please note that each thrust area description includes four sections: Background, Objectives, Progress to Date, and Year 7 Approach.

a. Fish and Wildlife Advisories

Background

Fish consumption advisories are in effect on Lake Erie for numerous species of fish. These advisories are issued by Pennsylvania's Department of Environmental Protection (DEP) in conjunction with the Pennsylvania Fish & Boat Commission (PFBC) and Pennsylvania Department of Health, and are based on fish tissue samples from Lake Erie. The advisories are based on polychlorinated biphenyl (PCB) levels found in these fish. More recently, mercury levels have been added to the advisory. Because the advisories include several species of fish, each with different consumption advisories based on the species and length of fish, it was apparent that the advisory was confusing to anglers. Pennsylvania Sea Grant's approach was to put these advisories into easy-to-read formats for English-speaking and non-English-speaking anglers.

A second area for concern in the Lake Erie watershed is avian botulism. Since 1999, avian botulism, a disease caused by the bacterium *Clostridium botulinum*, has caused the die-off of thousands of gulls, loons, and other fish-eating birds on Lake Erie. Botulism type E has been identified as the strain that is affecting these birds and has also been linked to numerous fish kills occurring on Lake Erie. Pennsylvania Sea Grant, in partnership with New York and Ohio Sea Grant, has taken the lead in developing an Avian Botulism Task Force to address this problem, including driving research efforts and helping to procure funding for related research.

Objectives

- Develop new, user-friendly fish consumption advisories.

- Work with the Erie International Institute and Earth Force groups in the development and distribution of easy-to-read English and foreign language versions of the current fish advisory.
- Work with the Pennsylvania Game Commission, Erie County Health Department, and DEP on potential human health and wildlife advisories.
- Partner with New York and Ohio Sea Grant on workshops that address problems associated with avian botulism on Lake Erie.

Progress to Date

- Edited and helped fund the printing of *Freddy the Fish*, a brochure created by Villa Maria Academy Earth Force students that lists the Lake Erie and Presque Isle Bay fish consumption advisory and explains how to properly prepare fish in order to minimize intake of PCBs. With the help of Erie's International Institute and Printing Technologies, produced *Freddy the Fish* in Bosnian, Vietnamese, Spanish, Arabic, and Russian to target subsistence anglers.
- Supported research on flesh analyses of snapping turtles in northwest Pennsylvania and the Lake Erie watershed. Penn State Behrend researchers are compiling data on the concentrations of organic chemicals and heavy metals in snapping turtles for development of potential consumption advisories. Research efforts reported by Jeanette Schnars showed heavy body burdens of PCBs (18-207 ppm) and lead (0.344 pm), greatly exceeding current fish advisory levels in Presque Isle snapping turtles as compared to lower levels in inland lakes PCB (0.6-7.8 ppm). Population structure and sex ratios appear to be normal at Presque Isle and the inland lakes. In addition, no abnormalities commonly observed in contaminated areas were observed in hatchlings at Presque Isle or inland lake sites.
- Developed fact sheets and posters to identify the problems associated with avian botulism. Posters were developed to inform the public of dangers associated with the handling of dead birds and fish exposed to botulism. In addition, posters were developed on food safety procedures pertaining to handling, cooking, and smoking of fish and wildfowl.
- Funded an applied research study on avian botulism mortality rates in waterfowl and disease transmission pathways and arranged for botulism testing in live fish in conjunction with the University of Pennsylvania's Botulism Laboratory at New Bolton Center.
- Partnered with New York and Ohio Sea Grant to facilitate three botulism workshops, January 2001 in Erie, Pennsylvania; December 2001 and April 2002 in Buffalo, New York. Over 70 researchers attended from the United States and Canada, including representatives from state, federal, and provincial agencies; and pathologists and veterinarians from several universities. New York Assemblyman Richard Smith helped promote attendance at the Buffalo workshops

with over 100 researchers and agency personnel in attendance for each workshop. Collaborated with Fredonia College, New York and New York Sea Grant on facilitating a collaborator workshop in Fredonia in May 2002.

- In cooperation with New York Sea Grant, Pennsylvania co-authored the publication of the workshop proceedings for the three workshops on avian botulism.
- Continued to update avian botulism task force members on the lakewide status of avian botulism through a listserv developed at the workshop. E-mail updates of the most recent bird and fish kills are sent to the taskforce to keep members aware of the ongoing epidemic. In addition, research and Lake Erie reports are sent to task force members as new information is received in order to keep members apprised of current botulism research and meetings.
- Staff continues to present botulism information to regional and national governmental agencies with an interest in Great Lakes issues. Outreach staff presented information to the International Joint Commission, U.S. Fish and Wildlife Service, and the Great Lakes Fishery Commission meeting in Thunder Bay, Ontario. Staff has also been asked to speak at numerous local and state meetings. The botulism conference proceedings are available on the Pennsylvania and New York Sea Grant Web sites.
- Hosted and facilitated a meeting with Pennsylvania agencies having an interest in the botulism outbreak on Lake Erie. The purpose of the meeting was to leverage state agency support and resources for research and outreach pertaining to the outbreak.
- Collaborating with the University of Pennsylvania's Botulism Laboratory and U.S. Geological Survey Wildlife Health Center in Wisconsin to have fish tested for botulism in an effort to discover the pathways of transmission for this epidemic.
- Developed a curriculum on fish advisories, contaminants, and tumors affecting Great Lakes fish. The curriculum, funded by the National Sea Grant Office, was part of the training curriculum developed for participants in the Great Lakes Fisheries Leadership Institute.

Year 7 Approach

In Year 7, Pennsylvania Sea Grant would continue to update the public on the latest fish consumption advisories and the avian botulism outbreak.

- In conjunction with New York and Ohio Sea Grant would continue to provide leadership for the Avian Botulism Task Force. The three programs would facilitate workshops, fund research, and act as the hub for information and outreach needs related to the outbreak. A fourth botulism workshop would be held in early spring 2004.
- Continue to maintain the avian botulism listserv.

- Continue to support research on the development of consumption advisories for snapping turtles in northwest Pennsylvania and the Lake Erie watershed.
- Continue working with the International Institute, DEP, and Erie County Health Department on the delivery of fish consumption advisories to anglers and at-risk members of the public.

c. Aquatic Invasive Species (AIS)

Background

Pennsylvania Sea Grant is addressing ecological and economic impacts of AIS in Lake Erie. The National Sea Grant Network has long been recognized as the leader in providing information to the public on invasive species and has gained special prominence related to zebra mussel invasion of the Great Lakes. Pennsylvania Sea Grant has been involved in distributing public information on several invasive species that are affecting Lake Erie and inland waters. The species of particular concern are the zebra and quagga mussels, round goby, and spiny and fishhook water fleas (*Bythotrephes cederstroemi* and *Cercopagis penjoi*).

The round goby, a benthic fish, is of specific concern. It feeds primarily on zebra mussels and the recent population explosion of the round goby in Pennsylvania waters has fisheries biologists worried about several effects they may have on the ecosystem:

- May increase the biomagnification of contaminants to higher levels of the food chain. This could result in an increase in fish consumption advisories on Lake Erie.
- Affect the reproductive success of native fish populations through their role as egg predators.
- May be transferred to inland streams and lakes through sales of baitfish from Lake Erie wholesalers.
- Affect fishing success of anglers of other fish species by stealing bait intended for target species.
- Out-competing native species and driving them from preferred habitat.
- Suspected of playing a role in the transmission of botulism through the food chain.

As a deterrent to the spread of invasive species, Pennsylvania Sea Grant is collaborating with the Great Lakes Sea Grant Network to provide outreach related to ANS HACCP (Aquatic Nuisance Species Hazard Analysis of Critical Control Points). HACCP is a program that was modified by the Great Lakes Sea Grant Network from a quality assurance process developed by the Pillsbury Corporation to ensure that they could make food safe for space travel. The specific purpose of ANS HACCP is to stop the spread of invasive species through the sale and distribution of bait fish. The

Great Lakes Sea Grant Network is teaching the mechanics of this process to bait dealers in order to exclude the transfer of unwanted species through wild harvest and bait fish production. This process is also being used by conservation agencies to avoid AIS transfer through fish management trap and transfer programs.

Objectives

- Prevent the spread of exotic species out of the Lake Erie watershed.
- Work with the PFBC and Pennsylvania Department of Agriculture to develop more restrictive rules and regulations on the transfer of aquatic invasive species to other watersheds.
- Develop an educational outreach program related to the recent zebra mussel invasion of inland lakes.
- Assist the Presque Isle Partnership in the development of an invasive species conference.
- Mentor a National Oceanic and Atmospheric Administration (NOAA) Coastal Management Fellow in conjunction with Pennsylvania's Coastal Zone Management (CZM) staff in Harrisburg.
- Work with other state and federal agencies in the Chesapeake Bay and Delaware River drainage on the development of invasive species outreach programs and invasive species panels.
- Work with Pennsylvania agencies on the development of a statewide invasive species management plan.
- Continue to facilitate ANS HACCP workshops at regional and state venues.

Progress to Date

- Convened a task force to focus on issues related to the recent invasion of zebra mussels in Edinboro Lake. This is the first inland lake to be invaded in northwest Pennsylvania.
- Funded an applied research project on the zebra mussel invasion of Edinboro Lake. The study monitored the rate of infestation in the lake and the extent and probability of downstream spread of the mussels into the French Creek drainage. A second part of the study measured the effectiveness of a fall lake-level draw down to freeze out adult zebra mussels. Jim Grazio, Water Pollution Biologist for DEP, conducted this study. The draw down of Edinboro Lake has had mixed results. Zebra mussels exposed to the winter draw down experienced a kill and depletion of zebra mussels in the exposed area; however zebra mussel colonization of samplers placed in the lake have shown increasing densities for successive years. At this point stream densities of zebra mussels are very low. Zebra mussels have been found in decreasing densities in a downstream progression from the Dam to French Creek. Zebra mussels have been found as far downstream as the community of Venango on French Creek. Veliger densities collected from Edinboro Lake and Conneauttee Creek are in the process of being analyzed.

- In cooperation with CZM, Pennsylvania Sea Grant was successful in receiving funding for a Coastal Management Fellow position for the Delaware Estuary. This position was responsible for activities related to AIS and fish consumption advisories, including the initiation of a statewide AIS policy. (See also final report by NOAA Coastal Management Fellow Kirstin Wakefield, in the Other Coastal Issues section.)
- Sea Grant staff and the NOAA Coastal Fellow, in conjunction with statewide invasive species panel, helped with the development and implementation of new regulations banning possession of injurious invasive species. See also final report by NOAA Coastal Management Fellow Kirstin Wakefield, in the Other Coastal Issues section.
- Pennsylvania Sea Grant and Penn State researchers met with PFBC staff to increase awareness of exotic species transfer laws. The intent of the meeting was to stop the transfer of the round goby into watersheds outside the Lake Erie basin. As a result of this meeting PFBC designated space in their rules and regulation booklet pertaining to the legalities of baitfish and exotic species transfer laws.
- Funded other applied research projects related to AIS problems:
 - ✓ Ecosystem impact of the round goby on Lake Erie tributary streams.
Round gobies migrated up tributary streams to varying extent, as much as 2.2 km in one stream; fed most heavily on Chironomid larvae (midges) and almost exclusively on non-mollusk benthic macroinvertebrates; female round gobies matured at 1 year in tributary streams; stream comparison data indicates that round goby displace native mottled sculpin from preferred habitat.
 - ✓ Sampling Presque Isle Bay and Lake Erie for the exotic cladoceran *Bythotrephes cederstroemi*.
Bythotrephes was found at various Pennsylvania sites on Lake Erie, but was not found in Presque Isle Bay waters.
 - ✓ Round goby diet study in Lake Erie concerning the biomagnification of polycyclic aromatic hydrocarbons (PAHs) in round goby via zebra mussel consumption.
No accumulation of PAHs were found in gobies.
 - ✓ A survey of Presque Isle Bay for native unionid mussels not affected by zebra mussel colonization.
Eight living species of native unionid mussels were found in Thompson Bay (refuge area) while four live species were found in Misery Bay. No live species were found in areas with zebra mussels.
 - ✓ A survey of microplankton communities in Thompson Bay in relation to surviving native unionid mussel populations.
There were no consistent trends in zebra mussel versus non-zebra mussel sites in Misery Bay and Marina Bay with respect to alkaline Phostase activities suggesting that zebra mussels were not influencing phosphorus availability in appreciable ways. It was

determined that zebra mussels were not altering the taxonomic composition of the microbial communities of the sediments but may be affecting the densities of protists and affecting the overall biomass of the microbial community.

- Participated in presenting ANS HACCP baitfish curriculum and training to federal, state, and private fish production personnel at the U.S. Fish and Wildlife Service Northeast Regional Office in Hadley, Massachusetts.
- Sea Grant staff presented ANS HACCP program to aquaculture producers at the Penn Aquaculture Conference at Penn State University.
- Participated with the Chesapeake Bay Program in the development of ANS management plans. Attended two strategic planning meetings on the development of ANS plans for the Chesapeake Bay drainage. Provided signage and contact information on zebra mussels for two New York Lake associations in the Susquehanna River Basin. Current member of the zebra mussel task force committee for the Chesapeake Bay program.
- Developed an AIS outreach initiative geared toward anglers and boaters. Great Lakes Sea Grant Network Watch ID cards, which provide information on AIS affecting the Great Lakes, were distributed to various bait shops, marinas, and conservation agencies in the Pennsylvania Lake Erie drainage basin. Currently, asian carp, round goby, zebra mussel, Eurasian ruffe, rusty crayfish, spiny and fishhook water fleas, Eurasian watermilfoil, and purple loosestrife watch cards are on display. The purpose of this program is to educate anglers and boaters about the species that threaten our ecosystem, and inform them of the measures they can take to prevent the spread of these species into other water bodies.
- Coastal Fellow, Kirstin Wakefield, produced a field guide to the invasive wetland, riparian, and aquatic plants of the Lake Erie and neighboring watersheds. The field guide was given to participants of a citizens monitoring workshop for AIS detection. This was a pilot project initiated in the Lake Erie watershed with the support of DEP and Sea Grant staff (See Other Coastal Issues section).

Year 7 Approach

- Facilitate two ANS HACCP training workshops for federal and state agency staff; private bait fish dealers; fish production managers; and fish management personnel, consultants, and researchers.
- Continue to work with DEP, PA Department of Agriculture, and CZM staff to coordinate a Pennsylvania Agency effort in the development of an Invasive Species Management Plan for Pennsylvania.
- Work with PFBC on the development of outreach materials related to the transfer of AIS. Pennsylvania Sea Grant would work with the PFBC's Aquatic Resources Education Program on this issue.

- Work with DEP, Edinboro University, and Allegheny College in support of research and an outreach program related to AIS invasions of inland lakes. Pennsylvania Sea Grant would support research surveys and AIS alerts for inland lakes.
- Continue to fund applied research projects pertaining to AIS.
- Continue to serve on the Great Lakes ANS panel, assist the Chesapeake Bay Program in the development of ANS management plans for the Chesapeake Bay watershed, and participate in the development of a Mid-Atlantic ANS panel (see Delaware Extension section).
- Assist in the development and distribution of outreach and education materials to the pet industry relating to aquarium release of AIS. The national initiative is being funded by National Sea Grant Office (NSGO).

d. Presque Isle Bay Area of Concern

Background

In January 1991, the International Joint Commission (IJC) declared Presque Isle Bay the forty-third Area of Concern (AOC). The IJC uses a list of 14 beneficial-use impairments to determine if a water body or area should be listed as an AOC. The use impairments listed for Presque Isle Bay in determining its status were fish tumors and deformities, and contaminated sediments. Pennsylvania Sea Grant has played an active role as a member of the Presque Isle Bay Advisory Committee (PAC) in development of Remedial Action Plans (RAP) and has participated in studies to address Presque Isle Bay's status as an AOC.

Objectives

- Assist the PAC in the monitoring of fish tumors and possible development of additional genetic biomarkers.
- Monitor sediment contamination and look for sources of contaminant input.
- Assist DEP, U.S. Environmental Protection Agency (EPA), and the Erie County Health Department in the collection and analysis of fish tissue samples for dioxin and other contaminants.
- Assist PAC in monitoring the bay during its Recovery Stage.
- Assist the IJC and EPA in refining its beneficial-use listing criteria in relation to fish tumors and deformities.
- Work with the PAC in the development of a strategic plan to enhance restoration efforts.
- Continue to support monitoring and histological studies pertaining to the Presque Isle Bay fish tumor studies.
- Continue to support brown bullhead hybridization research studies.
- Continue to support PAC efforts in sediment contamination studies.
- Assist the PAC in obtaining funding support for the Presque Isle Bay through EPA Great Lakes Legacy Act.

Progress to Date

- Supported the PAC as working board members. Pennsylvania Sea Grant hosted a strategic planning day for PAC to develop long-range plans for remediation of the bay's impairments. Several subcommittees were created as a result of this meeting. Pennsylvania Sea Grant staff members sit on several of these subcommittees.
- Coordinated and assisted the U.S. Geological Survey and U.S. Fish and Wildlife Service in conducting a histological study of brown bullheads in Presque Isle Bay in 1998.
- Worked with Dr. Mark Pyron of Penn State Behrend in a study of reproductive success of brown bullheads in Presque Isle Bay and were instrumental in helping Penn State Behrend get a grant from EPA for the study. During spring and summer 1999, Dr. Pyron completed a population estimate and reproduction study on brown bullheads in Presque Isle. Dr. Pyron's study showed a decline in skin and liver tumors in Presque Isle brown bullheads. Skin lesion rates declined from a high of 61 percent in 1991 to less than 25 percent in 1999. Liver lesions declined from a high of 22 percent in 1991 to 0 percent in 1999. Evidence of successful reproduction occurring in Presque Isle Bay was established with the collection of young-of-year fish at three sites. The Presque Isle Bay bullhead population was estimated to be 30,950, which is similar to the 1992 estimate of 31,715 individuals.
- Assisted Dr. Jack Vanden Heuvel, a veterinarian at Penn State's University Park campus, in the completion of a genetic research project on the development of a biomarker for brown bullheads in Presque Isle Bay. The biomarker was used to determine what chemicals were causing tumor formation in brown bullhead. Dr. Vanden Heuvel's study showed genetic exposure levels of brown bullhead to be four times higher in Presque Isle Bay than a local population from a nearby inland lake. The higher level of genetic activity appears to be a response to PAHs. PAHs are closely related to dioxins in their chemical structure and have been cited by other researchers as a tumor promoter. Dr. Vanden Heuvel's study also focused on genetic testing of bay water and sediment samples collected by Pennsylvania Sea Grant staff. His findings showed elevated results for dioxin-like contaminants in tributary streams and several bay sites. EPA conducted additional sampling of the sediments in Presque Isle Bay in 2000 and dioxin was added to the list of compounds to be analyzed because of the results of Dr. Vanden Heuvel's study. No dioxin at levels of concern were found in Presque Isle Bay.
- Funded an applied research project to develop genetic biomarkers in aquatic vegetation that would be used to measure levels of sediment contamination. Dr. Michael Campbell, associate professor of biology at Penn State Behrend was principal investigator of this project. Preliminary experiments demonstrated that *Arabidopsis* plants growing

in soils supplemented with 33 mg/kg of arsenic were not viable. Further experiments did not increase viability. In year two, the experimental procedures were expanded to include gene expression profiles for zinc, copper, and nickel. An RNA isolation procedure was established. Final results showed that *Arabidopsis thaliana* plants grown in soil with similar metal levels as those found in Presque Isle Bay which exceed probable effects concentrations can induce gene changes. A single gene *mrp1* changes with all levels of metal levels in soil. The *mrp1* shows promise to be used as a tool to assess metal contamination level in contaminated sites.

- Assisted Erie County Health Department and Gannon University in the collection and analysis of sediment from Presque Isle Bay. This study was conducted in conjunction with a grant received by Dr. Harry Diz, Gannon University, from EPA for a characterization of Presque Isle Bay sediments. The Mudpuppy, an EPA vessel, was used to retrieve sediment cores from the bay sediments.
- In 2001, assisted the Erie County Health Department and DEP in the collection of fish from Presque Isle Bay for dioxin analyses. Staff conducted electrofishing operations in Presque Isle Bay for the collection of fish for fish tissue analyses of dioxin.
- Funded applied research grant to determine the spatial and temporal distribution of arsenic in Presque Isle Bay and lagoon sediments. Historic studies completed by DEP have shown elevated levels of arsenic in lagoon sediments. The probable effects level for arsenic (33.0 mg/kg) was exceeded in the surface sediments at all 13 test sites. Arsenic sediment concentrations ranged from 36.9 mg/kg to 325.4 mg/kg. The sediments of Presque Isle ponds have high arsenic levels and represent a threat to the aquatic ecosystem. These high levels could be due to a culmination of natural processes over time; however, anthropogenic sources cannot be discounted.
- Helped develop requests for proposal and seek funding for studies relating to Presque Isle Bay's AOC designation change to AOC in Recovery. Funding came from EPA and the Great Lakes Protection Fund.
- Helped coordinate and compile the stage three RAP from goals and objectives established by the PAC subcommittees for Presque Isle Bay. This document was submitted to the IJC for approval of Presque Isle Bay as the first Area of Concern in Recovery in the United States waters of the Great Lakes. ***In early December 2002, EPA officially changed the AOC designation to AOC in Recovery. Pennsylvania Sea Grant Education and Maritime Specialist Anne Danielski played the lead role in compiling the document.***
- Helped develop a monitoring plan for fish tumor studies in Presque Isle Bay and assisted in obtaining funding to support these efforts.

- Assisted DEP, Erie County Health Department, and PFBC in brown bullhead histology and monitoring study of the Presque Isle Bay bullhead population in 2002 and 2003.
- Sediments and water quality indicator species of Presque Isle Bay were monitored by Sea Grant funded research projects related to mayfly nymph distribution and water quality data collected from Sea Grant's *Environmental Rediscoveries* program.
- Participated in Gannon University's Governor's School for Excellence Environmental Health program. Top students from area high schools attend a two-week summer camp at Gannon University to obtain classroom and field experience in environmental health issues. Sea Grant staff teaches boat electrofishing techniques as students participate in the capture of tumored fish from Presque Isle Bay. In the classroom, students are taught how toxic contaminants produce cancer in fish and learn fish necropsy techniques in order to conduct a histological examination.
- Hosted a fish tumor conference in January 2003 pertaining to fish tumors and deformities in AOCs on the Great Lakes. Funding was received from EPA Region 3. The two-day conference. The purpose was to facilitate the coordination of standardized fish tumor rates and severity ratings for all AOCs.
- Authored the proceedings for the January 2003 *Fish Tumors Related to Great Lakes Areas of Concern Conference*. The proceedings were compiled with the intention of capturing the thoughts of the participants and presenters at the conference, and to provide information on fish tumors as they relate to the beneficial-use impairment in AOCs.
- In August 2003, hosted a second conference on developing standardized listing and monitoring criteria for fish tumors and deformities in Great Lakes AOCs. The conference was funded by a grant from EPA's Great Lakes National Program Office. This conference was used to refine objectives developed at the January 2003 conference
- In September 2003 the results of the standardized fish tumor criteria for AOCs were presented to the IJC Remedial Action Committee by Dr. Paul Baumann, U.S. Geological Survey.

Year 7 Approach

- Assist DEP in fish tumor monitoring efforts for the Presque Isle Bay AOC in Recovery.
- Assist in the monitoring of Presque Isle Bay sediments and assist in acquiring Legacy Act funding from EPA's Great Lakes National Program Office (GLNPO) for monitoring studies.
- Assist with restoration efforts of the Presque Isle Bay watershed.
- Support studies of air quality and their effect on Presque Isle Bay sediment and water quality.

- Develop concept paper on standardized criteria for assessing fish tumors in Great Lakes AOCs and present it to the IJC.
- Support fisheries studies related to Presque Isle Bay Area of Recovery including support for Penn State research on hybridization of brown bullheads and other species susceptible to tumor promotion.

e. Fisheries and Native Species

Background

Pennsylvania Sea Grant is working on several issues of concern related to fisheries and native species populations in Presque Isle Bay and Lake Erie; enhancing aquaculture opportunities in Pennsylvania; studying the genetics and life cycle of native unionid mussels related to fish hosts that are surviving in Presque Isle Bay; promoting efforts to enhance fish habitat within Presque Isle Bay; and supporting applied research projects related to assessing and restoring populations of endangered fish species, such as *Etheostoma exile* (Iowa darter) and *Noturus gyrinus* (tadpole madtom).

Objectives

- Determine what is unique about the life cycle and genetics of native unionid mussels in the Thompson Bay ecosystem that allows them to survive the presence of zebra mussels. (See also AIS section.)
- Protect the Thompson Bay refuge area through its inclusion in Presque Isle State Park management plans.
- Culture and ultimately restore the Iowa darter (state endangered species) and other species in Lake Erie.
- Support aquaculture in Pennsylvania by providing technical assistance to aquaculture producers, supporting research, and developing marketing and production fact sheets and brochures.
- Support Great Lakes Fishery Leadership Institute workshops.
- Support Presque Isle Bay fish habitat improvement.

Progress to Date

- Undergraduate biology students from Penn State Behrend conducted a genetics study on native mussel and fish relationships. They compared the DNA found in glochidia attached to fish gills found in Thompson Bay to the DNA of five native mussel species observed in Thompson Bay. This technique was used to distinguish what fish species play an important part in the reproductive cycle of native Thompson Bay mussels. The analysis revealed that DNA sequences within the ITS1 and ITS2 regions are species specific and the development of species specific polymerase chain reaction (PCR) primers can be developed for the analysis of glochidia on host fish.
- Staff worked with local fisheries group, Save Our Native Species (SONS) of Lake Erie to enhance native fish habitat structures in Presque

Isle Bay. A fact sheet was compiled that described the type and location of underwater structures.

- Penn State researchers from the School of Forest Resources have collected Iowa darters from Presque Isle Bay. They are attempting to raise several generations of Iowa darters in order to develop brood stock for the restoration and restocking of this species to its historic range. The results of this study have been delayed due to problems encountered in rearing captive fish.
- Undergraduate researchers at Penn State Behrend assessed the habitat needs and range of the tadpole madtom in Presque Isle Bay. The results of this study are pending.
- Assisted aquaculture producers through the development of marketing plans and brochures for “What works best in Pennsylvania.” Pennsylvania Sea Grant, Pennsylvania Department of Agriculture, and Penn State University’s School of Forest Resources are cooperating on this project to promote Pennsylvania aquaculture. The report is expected to be available in January 2004.
- Pennsylvania Sea Grant facilitated two state workshops for participants from Pennsylvania invited to attend the Great Lakes Fishery Institute. Pennsylvania agency staff involved in the management of Lake Erie’s fishery and environment presented information to participants on how the Lake Erie and Great Lakes fisheries are managed and what agencies play a role in maintaining this ever-changing ecosystem. The purpose of the institute was to develop a greater understanding by and support from these organizations for management of the fisheries.
- Pennsylvania Sea Grant helped sponsor the 2002 Penn Aquaculture Conference. The conference was facilitated by the Pennsylvania Department of Agriculture and Penn State University.
- Pennsylvania Sea Grant, as part of Great Lakes Sea Grant Network, received funding from NSGO to develop a training curriculum for the Great Lakes Fishery Leadership Institute. Staff developed a portion of the curriculum related to fish consumption advisories, contaminants, and fish tumors and disease issues.
- Co-hosted a regional Lake Erie Fishery Leadership Institute in Erie, Pennsylvania, in conjunction with Michigan, Ohio, and New York Sea Grant. Invited participants from angling, boating, environmental, and economic development organizations attended the Fishery Institute to learn more about the management of the Great Lakes Fishery. Participants learned about how the fisheries are managed in the Great Lakes and also the environmental challenges facing fishery and environmental managers.

Year 7 Approach

- Support Pennsylvania aquaculture production, research, and outreach.
- Collaborate with the Pennsylvania Department of Agriculture, Penn State Cooperative Extension, and the Pennsylvania Aquaculture

Association in developing programs to support aquaculture in Pennsylvania, including support for conferences and development of extension programs.

- Penn State researchers would continue Iowa darter and other species restoration projects.
- Continue to work with SONS to enhance native fish habitat in Presque Isle Bay.
- Continue development of curricula and workshops for the Great Lakes Fishery Leadership Institute as funding becomes available.

2. COASTAL COMMUNITIES PROGRAM

Pennsylvania Sea Grant is requesting \$50,000 to support its coastal communities program. Staff understands that funds for this initiative from the National Sea Grant Office are not guaranteed, but are contingent on the FY 04 appropriation level.

Pennsylvania Sea Grant is proposing to initiate specific outreach activities relating to sustainable land-use development, otherwise known as *smart growth*. This is largely a new focus for the Commonwealth's Sea Grant program, which has in the past primarily addressed riparian-related research and education. The National Sea Grant Office (NSGO) has initiated efforts to promote this new emphasis area. In fact, National Oceanic and Atmospheric Administration (NOAA) and U.S. Environmental Protection Agency (EPA) have provided training and materials for all Sea Grant Network programs in a coordinated attempt to encourage land-use development which is compatible with improved water quality.

Sea Grant's smart growth emphasis reinforces the model suggested by the Coastal Communities and Economies Theme Team which was developed by the Sea Grant Association in conjunction with NSGO. As stated in the Theme Team literature, coastal communities ... "is about assisting coastal communities in protecting their environmental amenities, strengthening their economies, and improving their quality of life."

Sea Grant would also emphasize its close working relationship with the Pennsylvania Coastal Zone Management (CZM) Program. CZM, over its 24 years, has focused its efforts on sustainable coastal land-use practices relating to environmental education, planning, and land-use regulation preparation advocating smart growth, and acquisition and development of coastal lands which support public access to the waterfront.

The activities to be included in Pennsylvania's coastal communities program fall into several thrust areas:

Sustainable Land Use

- Rehabilitation/Restoration of older urban areas
- Land preservation
- Pennsylvania's Seaway Trail Scenic Byway Corridor Management Plan
- Technical assistance with comprehensive planning and land-use regulations

Coastal Economics

- Steelhead Survey
- Charter Boat Survey
- Underwater Preserve

- Concord Grape Belt

Nonpoint Source Pollution

- Implement Phase I of the Nonpoint Education for Municipal Officials (NEMO) program in Pennsylvania's Lake Erie watershed

Coastal Processes

- Collaborate with CZM to enhance the public's understanding of coastal erosion processes

Liaison to Watershed Organizations

- Coordinate Sea Grant activities with other coastal-related organizations

a. Sustainable Land Use and Economics

Rehabilitation/Restoration of older urban areas

Sea Grant staff seek to work cooperatively with older urban areas to encourage programs and projects which promote redevelopment/infill of such areas. The City of Erie and the older inner suburbs, as well as the area's boroughs have generally seen a loss of population and a deterioration of the tax base in recent decades. The housing stock is overwhelmingly pre-1940s, and water and sewer infrastructure requires increasing amounts of financial resources to repair/replace. The region's development continues to expand spatially. According to the U.S. Bureau of the Census, between 1982 and 1997 the county's urbanized area grew by 49.9 percent, with virtually no new population growth.

Pennsylvania Sea Grant proposes to be involved with on-going activities which would assist older urban areas with their redevelopment efforts. Staff would participate with programs such as Weed and Seed, and Neighborhoods First. These programs have been initiated recently. The Weed and Seed program seeks to "weed out" the criminal elements that are often found in older urban areas with a special focus on law enforcement in targeted neighborhoods. Sea Grant staff would work with the "seed" side of this program which encourages economic development and neighborhood revitalization. The Neighborhoods First program has been created by the City of Erie, working with the United Way, with a vision of creating safe, vibrant neighborhoods. Sea Grant would participate in this effort, as well, which currently is in the process of determining how to implement this vision.

Sea Grant staff would also facilitate discussions regarding the implementation of more substantial strategies which call for a strong, multifaceted, regional response to the challenges facing the Erie area as it grows. With the year 2000 changes to Pennsylvania's Municipal Planning Code, there is added emphasis on the benefits of multi-municipal

comprehensive plans. Such a plan for the City of Erie and its adjacent older inner ring suburbs would promote more integration of services, thereby reducing the costs associated with duplication. A joint planning effort can lead to changes in the way future development is planned and local services are financed. Assuming that there would be an interest among local officials to proceed in this direction, efforts could begin with the creation of a joint planning committee (or commission) which would prepare a scope of work and apply for funding to initiate work.

Land Preservation

Smart growth advocates question the environmental impacts of abandoning brownfields and other infill sites in older communities while open space and prime agricultural lands are developed at the suburban fringe. They also question the economic costs of abandoning infrastructure in older urban areas only to rebuild it farther out.

Pennsylvania Sea Grant staff seek to advance smart growth concepts by working cooperatively with rural areas to encourage programs and projects which promote the conservation of rural resources and development in those areas that is compatible with and supportive of a rural way of life such as agriculture, timbering, mining/quarrying, forest and game lands, recreation, and tourism.

Pennsylvania Sea Grant would be involved with on-going efforts which would assist rural areas of Erie County with their land preservation efforts. Staff would encourage the farming community to get involved with the Commonwealth's Purchase of Agricultural Conservation Easement (PACE) program. The voluntary sale of development rights by farmers is among the most powerful tools available for the preservation of prime agricultural land. Although the County of Erie participates in the PACE program, Sea Grant staff actively promote this program with farmers by informing them of the opportunities which are available to them if they choose to submit an application to the County Agricultural Land Preservation Board.

Sea Grant staff also propose to work with the local land trust, the Lake Erie Region Conservancy (LERC), to develop language which can be incorporated into a Pennsylvania Department of Conservation and Natural Resources (DCNR) funded report entitled the Pennsylvania Lake Erie Conservation Plan. Sea Grant staff are to receive EPA funds toward this effort which is expected to be completed by September 2004.

Through this project, Sea Grant staff would be working on the creation of a purchase of development rights (PDR) program for sensitive environmental/biodiverse lands in Erie County, especially targeting the Lake Erie drainage basin. It is anticipated that, following the conclusion of the EPA-funded effort, work would begin toward implementation of the

PDR program with efforts targeted on grant prospecting and writing and public outreach. Grant prospecting would be required in order to locate the funds necessary to enable LERC to implement a PDR program. Public outreach would be important as a tool to inform interested property owners of the opportunities which are available to them if they choose to submit an application to LERC.

Sea Grant staff would also work with DCNR, Pennsylvania Fish & Boat Commission (PFBC), local municipalities, the Western PA Conservancy, LERC, private property owners, and others to provide the technical assistance necessary to conserve properties in Pennsylvania's Lake Erie watershed. Such efforts work to promote coastal tourism and development which enhances the economic and environmental health of the region.

Completion of Pennsylvania's Seaway Trail Scenic Byway Corridor Management Plan

The Seaway Trail is a 454-mile scenic byway paralleling the St. Lawrence River, Lake Ontario, Niagara River, and Lake Erie. Pennsylvania's portion of the Seaway Trail does not at this time have designation as a "National Scenic Byway." In order to qualify for such designation, a Corridor Management Plan (CMP) must be developed for the scenic byway. Achievement of this designation would result in the ability to not only further promote the area as a tourist attraction but would allow local groups to apply for additional grant monies to enhance the intrinsic qualities of the byway. Pennsylvania Sea Grant has agreed to coordinate the development of this CMP working with a recently formed steering committee of about 20 interested parties. Sea Grant staff would assist with the facilitation of several public meetings to present Seaway Trail developments to the general public. Funds to undertake this project have been obtained. A request for proposals for consultants is under development at this time. Advertising for a consultant would begin in January 2004, with the work to be finished in June 2005.

Technical Assistance with Comprehensive Planning and Land-Use Regulations

Pennsylvania Sea Grant staff would provide technical assistance to local municipal officials, as staff capacity permits, with planning and land-use controls which promote the sustainable or "Growing Greener" method of development as advocated by Natural Lands Trust, Inc. of Media, PA and DCNR. This has been identified as a "preferred approach" to new land-use development in the recently adopted December 2003 Erie County Land-Use Plan. Under the Growing Greener (conservation subdivision) concept, a development is first analyzed to determine its net density (the number of lots the tract would yield exclusive of non-buildable land.) The amount of total land to be set aside as open space is then determined. Designated

non-buildable land and open space can total as much as 50 percent of the development tract.

By opting for a conservation subdivision, the developer not only builds the same number of units as is permitted in the traditional approach, but is given density bonuses which allow for the construction of additional units. The payback to the community is the conservation of views, open space, and environmentally important land, and ultimately higher tax valuations. Growing Greener subdivisions should be located only in designated growth areas, future growth areas, or in villages.

b. Coastal Economics

Many communities, including Erie, have endured a decline in their economic base and are evaluating options for revitalizing depressed economies. One way to reverse negative economic trends is to build on the assets of a community and identify potential industry clusters and niches for cultivation. Erie has had a long history of water-based industrial and commercial employers, not the least of which involves tourism. A renewed focus on water-resource-related projects/programs would assist in Erie's efforts to capitalize on one of its key strengths.

In an effort to promote Erie's economy, Pennsylvania Sea Grant continues to provide technical assistance for the following coastal economic projects:

Steelhead Survey

Pennsylvania Sea Grant is helping support and facilitate an economic study on the value of the Lake Erie steelhead fishery to the Erie County economy. Partners on the study include PFBC, Erie County Convention and Visitors Bureau, Penn State University Department of Economics, Erie Port Authority, and Pennsylvania Sea Grant.

PFBC staff is in the process of conducting this survey through April 30, 2004. Anglers at 23 high-use sites are being interviewed. Each site will be visited 90 times over the survey period. The results of this survey will be disseminated with the assistance of Sea Grant staff. Sea grant has developed a relationship with a faculty member in economics at Penn State who would conduct the data analysis. These survey efforts could be a first step toward a data collection effort for the entire Lake Erie fishery.

Charter Boat Survey

An on-going area of interest is the charter boat industry. A charter boat company usually is made up of just one person - a captain. The captain has a responsibility to the client(s) for giving them a safe, exciting, and successful fishing trip that requires not only a thorough knowledge of safe boat handling but also the expertise to find fish and instruct the client(s) on successful angling techniques. The captain also has a responsibility of

running a successful small business that requires bookkeeping, preparing taxes, advertising, and developing a business strategy.

In fall 2002 and winter 2003 the Great Lakes Sea Grant Network conducted a comprehensive survey of the charter fishing industry in the Great Lakes. The survey was an effort to provide an update on the status, characteristics, and economics of the charter fishing business in the Great Lakes and is modeled after a similar survey conducted in 1994.

Results of the survey include the number of licensed Pennsylvania captains, the number of years licensed and the type and value of his/her vessel and related equipment costs, the number of full-day and half-day paid charter trips per year, and the clients' cost per trip. The survey results also identified industry trends and strategies to advance future business.

As a follow up to the survey, Pennsylvania Sea Grant has developed the following work objectives:

- Establish a relationship with charter boat operations conducting business on the Lake Erie shoreline of Pennsylvania, while providing data that would be of benefit to all.
- Enhance the continued development and use of the Erie Bayfront as a charter boat tourism resource and destination for local and out-of-town anglers.
- Share survey information with other Great Lakes Sea Grant programs.
- Continue to support and participate in a variety of projects related to charter boats as opportunities arise.

Underwater Preserve

The central basin of Lake Erie is home to the Lake Erie Quadrangle; a section of waters containing more shipwrecks than the Bermuda Triangle. At one time there was more shipping on Lake Erie waters than any other place in the world. The Pennsylvania Lake Erie Underwater Preserve project seeks to identify, research, interpret, and protect all underwater cultural resources in the Pennsylvania waters of Lake Erie. Through the cooperative efforts of the Bayfront Center for Maritime Studies (BCMS), Pennsylvania's Department of Environmental Protection's (DEP) Office of the Great Lakes, the Lake Erie Shipwreck Preservation Society, Mercyhurst College, and Pennsylvania Sea Grant, the mission would be approached through:

- systematic research and documentation of wrecks;
- the perpetuation of the current U.S. Coast Guard approved mooring system;
- the creation of educational programs;
- identification and marking of five popular shipwrecks to promote Lake Erie as a safe diving destination and increase ecotourism.

Project S.T.E.A.R. (Shipwreck Training Education Archeology and Research) would enable at-risk youth to study the histories of Lake Erie shipwrecks while learning the intricacies of scuba diving. Once trained, these student divers would interact with archaeological research divers that are exploring the wrecks found on the floor of Lake Erie.

Concord Grape Belt

Another new outreach area which involves Pennsylvania Sea Grant is a regional effort, sponsored by Cornell University's Community Food and Agriculture Program, to promote the unique viticulture industry of Erie County, Pennsylvania and Chautauqua County, New York. This is a specialized agricultural industry, which is geographically restricted to not more than four miles inland from Lake Erie, and which extends from Harborcreek Township in Pennsylvania to Angola, New York. This area is restricted to the narrow Lake Erie coastal plain due to soil type and topography, as well as the beneficial climatic influence of the lake. This two-state region includes approximately 18,000 acres of vineyards in New York and 10,000 acres in Pennsylvania, and is one of only a few areas in the country that grow concord grapes (although numerous other types of grapes are grown for processing at local wineries as well). This group has been formed to promote a number of objectives, including heritage tourism, a buy local campaign, the creation of an inter-industry council, farmland protection, development of a grape industry museum and local education regarding the tremendous value of this local crop. Pennsylvania Sea Grant would work with this group on projects pertaining to GIS mapping, creation of a heritage tourism program, and efforts to preserve prime farmland.

c. Nonpoint-Source Pollution

Nonpoint-source pollution has been recognized as a major contributor of nutrients and contaminants to Lake Erie and Presque Isle Bay. It occurs when contaminants enter waterways in run-off from areas such as parking lots, driveways, yards, farmland, and construction sites. Nonpoint pollutants from these areas can include pesticides, fertilizers, oil, chemicals from washing cars, sediments from farmland, and cleaning chemicals and detergents.

In an effort to educate the public to the problems associated with nonpoint source pollution, Pennsylvania Sea Grant would implement a NEMO program in Pennsylvania. The NEMO program was introduced to conference attendees at the Great Lakes Sea Grant Network Conference held in Erie in fall 2001. Pennsylvania Sea Grant staff subsequently worked with DEP, CZM, the Tioga County Cooperative Extension, and the Erie County Conservation District to bring this program to the Lake Erie watershed. A grant application to DEP's Growing Greener grant program

was awarded (\$246,000) to Pennsylvania Sea Grant in September 2003 to undertake a NEMO program over the next three years.

NEMO is a non-regulatory, research-based education program that encourages natural resources based planning and will aid in addressing the priority objectives developed for the Lake Erie watershed as identified by DEP's *21st Century 2000 Report*. In this report, the following were DEP's Lake Erie watershed priority objectives:

- Increase participation in stormwater management in developing municipalities.
- Increase public awareness of the damage caused by improper agricultural practices.
- Improve environmental awareness (regarding the impact) of land-management practices.
- Reduce the negative impacts to aquatic life from inadequate protection or destruction of habitat from poor land-management practices, improper boating/recreation activities, and improper agricultural practices, including loss of riparian buffer zones.
- Increase the level of nonpoint-source-pollution education to that portion of the watershed population that exhibits significantly lower environmental knowledge levels.
- Increase environmental education outreach to the agricultural community within the watershed.

Under the direction of Pennsylvania Sea Grant, the NEMO-Erie project intends to provide educational support and resources to help local government officials make land-use decisions that positively impact water resources in the Lake Erie drainage basin. The intent of NEMO is to encourage a collaborative effort of citizens and governmental officials in the development of watershed-action and source-water protection plans.

The goal of the NEMO-Erie project is to improve water quality by increasing local land-use decision makers' knowledge of the link between land use and water quality.

Objectives include:

- Promoting a multidisciplinary approach to coordination of a nonpoint-education program and a collaborative planning process.
- Build on NEMO's educational message and tools to address the particular circumstances facing Erie and other Pennsylvania communities, such as the increase in impervious surfaces, sprawled development patterns, best management practice (BMP) use and design, and how these issues impact water quality and aquatic life.
- Incorporating natural resource information on soils, water resources, watersheds, land cover, and vegetation with land-use data on zoning, open space, and property lines to create a series of

colorful Geographic Information Systems (GIS) maps that translate complex relationships into understandable images.

- Using predictive GIS models of future growth build-out scenarios and other tools to effect change in municipal codes and on-the-ground development patterns.
- Assisting municipalities in complying with state environmental laws and regulations.
- Providing educational assistance to local municipalities and watershed organizations.

The NEMO-Erie project would include a two-phase approach:

- Phase I - development and piloting of the project.
- Phase II - statewide introduction of the NEMO program.

Funding from public and private sources would be sought to ensure continuing support of this program beyond the initial three-year funding period covered under the Growing Greener grant.

Under the first phase of this project the project team would focus on leadership development, model policies and regulations, and approaches that would help communities achieve their goals for watershed protection. This information may include development of fact sheets and other educational materials on land-use issues that would improve water quality and citizen participation in land-use decision processes, and presentations to community and governmental organizations.

Phase II efforts would begin with the adaptation and development of fact sheet material, PowerPoint presentations, Web sites, and other materials for other regions of the state. The material would be developed in a consistent format that would identify it as a part of the overall NEMO-PA program. All material would be categorized in a manner that can be adapted by individual counties or watersheds depending upon their specific needs and circumstances.

d. Coastal Processes

On occasion, fluctuating water levels throughout the Great Lakes have impacted the bluff erosion process for shoreline property owners. Water levels were much above average from 1996 through 1998 and then reached levels near the lowest point in the past 30 years in 1999 through 2001. Levels have returned to near normal in 2003. High water levels have had a profound impact on the erosion rate of shoreline property in Pennsylvania. CZM has been active in outreach activities concerning shoreline erosion. Staff from CZM has been working with Pennsylvania Sea Grant since 1998 in support of its outreach activities.

Coastal process activities/objectives include:

- Contribute to the enhancement of public understanding of coastal processes associated with lakeshore erosion. Pennsylvania Sea Grant has developed two fact sheets on CZM-related issues affecting ownership of shoreline property and the coastal erosion process: 1) *Living on Pennsylvania's Lake Erie Coast* provides information about how coastal erosion takes place as well as methods of mitigating erosion effects, and 2) *Pennsylvania's Bluff Recession and Setback Act* provides an overview of requirements as outlined under the law that regulates activities in bluff shoreline areas.
- Disseminate information about fluctuating lake levels and their impact on coastal erosion and recreational boating.
- Continue to incorporate CZM information in Pennsylvania Sea Grant's newsletter, *Keystone Shorelines*.
- Through an applied research grant from Pennsylvania Sea Grant, Mercyhurst College has updated information about native vegetation species that can be planted in support of efforts to prevent bluff erosion. Pennsylvania Sea Grant is assisting Mercyhurst College, which is the recipient of CZM grant funds, with a pilot demonstration project which utilizes native species to attempt to re-vegetate an eroding coastal bluff in the west county. Staff has been involved with fieldwork activities on this project. If successful, this process will likely be applied in other locations on Pennsylvania's bluff and be applied at other Great Lakes locations having similar bluff erosion problems. Pennsylvania Sea Grant would sponsor a one-day workshop on the results of these activities.
- Continue to work with CZM staff to identify other topics to be covered by fact sheets or other printed materials concerning bluff recession, shoreline erosion processes, and stabilization techniques. Property owners and contractors would be potential audiences for these items.
- Facilitate the update and dissemination of a list of contractors who work on bluff stabilization projects. In cooperation with CZM, facilitate a workshop for contractors who work on bluff stabilization to advance the most current techniques to stabilize bluffs.

e. Liaison to Watershed Organizations

Pennsylvania Sea Grant has had a very successful working relationship with numerous organizations whose goals and objectives pertain to coastal land use, coastal economics, and coastal erosion and nonpoint-source pollution processes.

Such organizations include:

- **Lake Erie-Allegheny Earth Force** - provides youth and educators with the skills, knowledge, and experience they need to become environmentally literate citizens.
- **BCMS** - incorporates boat building, sailing, and other maritime-related activities to promote environmental awareness of the watershed, especially Presque Isle Bay.
- **Pennsylvania Lake Erie Watershed Association (PLEWA)** - coordinates efforts of diverse watershed-related organizations. Sea Grant is a charter member and was instrumental in the development of PLEWA. PLEWA is organized under the Erie County Environmental Coalition and associated with Lake Erie-Allegheny Earth Force, one of Pennsylvania Sea Grant's affiliated environmental education programs. PLEWA's mission is to coordinate watershed groups in the Lake Erie watershed. Its establishment was in part funded by DEP's Growing Greener grant program.
- **Jr. Pennsylvania Lake Erie Watershed Association (Jr. PLEWA)** - provides avenues for youth to become involved in leadership roles in the watershed. Students formed the association to help coordinate their watershed projects as they progress from school year to school year. This group also received a Growing Greener grant from DEP in 2001 to establish the association.
- **Lake Erie Arboretum at Frontier (LEAF)** - promotes environmental stewardship in a unique coastal environment.
- **Tom Ridge Center at Presque Isle** - a visitor, education, and research center under construction by DCNR. Pennsylvania Sea Grant is coordinating the development of research space and a science consortium.

Efforts to promote sustainable coastal land use and economic development, education related to nonpoint-source pollution, and technical assistance regarding coastal erosion processes must, by their very nature, involve governmental entities. Pennsylvania Sea Grant intends to expand its efforts to collaborate with local, state, and federal legislators and their staffs regarding matters that pertain to these numerous Coastal Communities Program thrust areas.

3. OTHER COASTAL ISSUES

This section includes those coastal issues that Pennsylvania Sea Grant staff addresses, but that do not fit into one of the thrust areas. Extension areas include a report from our National Oceanic and Atmospheric Administration (NOAA) Coastal Management Fellow, updates on undergraduate and graduate interns, marina outreach and boater safety, waste reduction and prevention, searchable database of the caddisflies and stoneflies of Pennsylvania, Great Lakes Restoration Program, and mayfly monitoring and outreach.

a. Coastal Fellow Outreach

Background

Pennsylvania's NOAA Coastal Management Fellowship is a shared position with Pennsylvania's Coastal Zone Management Program (CZM) and Pennsylvania Sea Grant. Kirstin Wakefield, Pennsylvania's Coastal Fellow from October 2001 to September 2003, focused her fellowship on the development of a statewide invasive species management plan for Pennsylvania. In addition, Kirstin served on several invasive species committees associated with the Great Lakes States and the Chesapeake Bay Program (CBP).

Objectives

- Define ocean/coastal resources as it applies to Pennsylvania aquatic invasive species (AIS).
- Develop AIS policy for Pennsylvania.
- Develop an inventory of current research and monitoring programs, control activities, and outreach publications for AIS in the Delaware Estuary and Lake Erie coastal zones.
- Survey government agencies and nonprofit roles in AIS management.
- Conduct a comprehensive review of state and regional legislation.
- Develop a Geographic Information Systems (GIS) map of AIS distribution within Pennsylvania's coastal zones.

Progress to date

- Authored purple loosestrife briefing paper for CBP invasive species workshop; and was rapporteur for workshop breakout session on purple loosestrife.
- Assisted Pennsylvania Sea Grant with flathead catfish workshop and follow-up meetings to develop research and outreach programs.
- Assisted with ANS Hazard Analysis of Critical Control Points (HACCP) regional training workshop to train bait and aquaculture facility operators to minimize risk of AIS transport.
- Wrote grants for Delaware Estuary Invasive Species Workshop, and statewide AIS, and recreational boater survey.

- Conducted pilot survey of recreational boaters in coastal areas for comparison with statewide mail survey.
- Collaborated with Wisconsin Sea Grant on an request for proposal for AIS outreach from the National Sea Grant Office, entitled “Leave em in the lake: ANS education for scuba divers.”
- Poster presentation at The Coastal Society Annual Conference, “One if by land, two if by sea: Aquatic Nuisance Species Management in Pennsylvania’s Coastal Zones.”
- Presented “Managing Aquatic Invasive Species in PA” at the Pennsylvania Lake Management Society Annual Meeting.
- Designed outreach exhibit for Southeastern Pennsylvania Coast Days, based on e-mail survey to regional offices, natural resource managers, consultants, and academic researchers. Designed 10 large-format posters. About 5,000 participants attended the Coast Days exhibits.
- Authored article on blue crabs for Delaware Estuary Newsletter.
- Formed an Interagency Invasive Species Workgroup to draft state AIS plan (ongoing), and attended the following committee meetings:
 - Tri-state Flathead Catfish Consortium
 - Council of Great Lakes Governors Ballast Water Initiative
 - Great Lakes ANS Panel
 - CBP Zebra Mussel and Purple Loosestrife Panel for management plan development
 - CBP Ballast Water Task Force and Invasive Species Workgroup
 - Delaware River Invasive Plant Partnership and Pennsylvania Noxious Weeds Task Force as needed

Year 7 Approach

Kirstin Wakefield’s coastal fellowship concluded at the end of September 2003. Projects that were in progress at the end of her fellowship will be pursued by Delaware Estuary Coastal Outreach Specialist Shari Currey, in conjunction with other Pennsylvania Sea Grant staff.

b. Internships

Pennsylvania Sea Grant offers undergraduate and graduate students invaluable environmental education, research, and outreach experience through its internship program. Currently, Sea Grant supports four undergraduate and one graduate student intern.

Amy Jo Smith, Penn State Erie student majoring in biology, has been with Pennsylvania Sea Grant since July 2000. Amy Jo has been instrumental in assisting Education and Maritime Specialist Anne Danielski with several projects. Currently, Amy is the project coordinator for the Get W.E.T. (Watershed Education Team) program. Her responsibilities include supervising high school students and Mercyhurst College undergraduate student mentors in the development of watershed learning activities for

elementary-level students. Amy also served as the shore-side programming coordinator for the *Environmental Rediscoveries* program, mentor for the Bayfront Center for Maritime Studies (BCMS) summer migrant education program, member of the content development team for the *Environmental Rediscoveries* board game, and participated in numerous Sea Grant outreach activities.

John Cingolani, Penn State Erie student majoring in ecology, has been with Pennsylvania Sea Grant since January 2002. Currently, John is conducting a hybridization study on Presque Isle Bay bullheads. The purpose of this research is to determine if the bullheads residing in Presque Isle Bay, the forty-third Great Lakes Area of Concern, are pure brown bullheads, or hybridizing with black or yellow bullheads. Some fish hybrids have shown a greater susceptibility to tumor development. John's research is hoping to determine if hybridization plays a role in Presque Isle Bay's elevated tumor rates. John has also developed a series of AIS fact sheets, assisted with the Great Lakes Fisheries Leadership Institute curriculum development, participated in round goby research led by Penn State University researchers, and has taken part in numerous Sea Grant outreach events. John is planning to pursue a masters degree in fisheries management at University Park after graduating from Penn State Erie. This will be under the direction of Dr. Jay Stauffer, professor of ichthyology.

Julie Heiser, Penn State Erie student majoring in general arts and sciences with a minor in biology, has been with Pennsylvania Sea Grant since September 2003. Currently, Julie is assisting Education and Maritime Specialist Anne Danielski with the development of the S.T.E.A.R. (Shipwreck Training Education Archeology Research) project. Her duties include the development of text for an interactive CD-rom program, which covers content relating to the shipwrecks found in Lake Erie. Julie has also served as a shore-side programming coordinator for the *Environmental Rediscoveries* program, and assisted with the Get W.E.T. program. Julie will serve as an educational assistant with Pennsylvania Sea Grant as she earns her Masters in Elementary Education from Edinboro University.

Marti Martz, Edinboro University student majoring in environmental studies, has been with Pennsylvania Sea Grant since September 2003. Currently, Marti is serving as Pennsylvania Sea Grant's liaison to Pennsylvania's Department of Conservation and Natural Resources (DCNR) in the final planning and implementation of facility goals for the research wing of the Tom Ridge Center at Presque Isle State Park. As facilitator for the development of the research wing, Pennsylvania Sea Grant is involved with structuring the daily operations of the facility and determining what equipment best suits the broadest spectrum of future research to be conducted there. Marti is also involved with a research project regarding the cultivation of native plants for bluff restoration

projects.

Jeanette Schnars, a lecturer in biology at Penn State Behrend is pursuing her doctorate in ecology at Penn State under the direction of Dr. Stauffer. Pennsylvania Sea Grant is supporting her doctoral research on snapping turtle toxin levels through a graduate research fellowship.

c. Marina Outreach and Boater Safety

Background

Recreational boating in the Pennsylvania waters of Lake Erie as well as in Presque Isle Bay is a popular activity, drawing many local as well as out-of-town participants. Pennsylvania Sea Grant is focusing its efforts in three areas: marina outreach, boater safety, and boater education.

There are 19 marinas located along the Pennsylvania shore of Lake Erie, with the majority being located in the vicinity of Presque Isle Bay. Concern has been expressed regarding the impact marine operations have on water quality and the potential lack of information available to marina operators. Information from the U.S. Coast Guard Marine Safety Office in Buffalo indicates that the major source of spills is marinas and small boats. Pennsylvania Sea Grant conducted a survey of these marinas, and results indicated that marina operators had a lack of information on spill response, recycling, and other environmentally sound business practices.

For boater safety issues, Pennsylvania Sea Grant staff works closely with the Erie Safe Boating Task Force in the development of information and materials to enhance safe and clean boating among recreational boaters in Presque Isle Bay and Lake Erie. The Erie Safe Boating Task Force, which has been active in the area since 1994, has developed a variety of educational initiatives to promote safe boating practices.

To address boater education, Pennsylvania Sea Grant is working with the Erie Power Squadron, the local representative of the U.S. Power Squadron. The Erie squadron is an organization dedicated to the advancement of safe boating education and provides educational materials and classes in a wide array of safe boating disciplines. Sea Grant staff is participating in the outreach and delivery of these classes.

Objectives

- Enhance the outreach of various public education initiatives undertaken by the Erie Safe Boating Task Force, Erie Power Squadron, and other boating organizations.
- Inform marina operators of how appropriate pollution prevention and spill response practices can not only protect the environment but also save them money.

- Provide information to recreational boaters concerning Pennsylvania boating laws, required and suggested equipment, proper use of equipment, safe boating procedures, and clean boating practices.
- Develop and distribute general extension information in support of marinas and boater safety.

Progress to Date

- In 1999, a survey of 19 local marinas was conducted which highlighted environmental topics of possible interest to marina operators. The survey was also sent to nine selected inland marinas. Operators from eight marinas responded, indicating that they were interested in receiving information about spill response and other environmental-oriented issues.
- In cooperation with officials from Pennsylvania's Department of Environmental Protection (DEP) and U.S. Coast Guard, two pollution prevention and spill response workshops were conducted for marina operators. Attendees included operators of marinas in northwest Pennsylvania and western New York. Both workshops concluded with a demonstration of how booms should be deployed in order to contain an oil spill.
- Purchased and distributed a gasoline spill prevention product to marinas, which reduces spills during fueling of recreational boats.
- Staff actively participates on the Erie Safe Boating Task Force, including support of several outreach efforts conducted by the group. Cooperated with the task force in the dissemination of emergency whistles that connect to flotation devices. As of November 2003, over 5,000 whistles have been distributed through Pennsylvania Sea Grant and Erie Safe Boating Task Force displays at various public events. Anecdotal information from several boaters indicated that the whistles have been instrumental in saving lives.
- In support of an Erie Safe Boating Task Force initiative, display cases containing message boards for use at public marinas were purchased. The cases contain information concerning safe boating, clean boating, exotic species spread prevention measures, avian botulism, and other Pennsylvania Sea Grant extension efforts. Currently, these cases are located at two local marinas: Wolverine Park and Lampe Marina.
- A series of aluminum signs were purchased and installed in cooperation with the Erie Safe Boating Task Force along the channel between Presque Isle Bay and Lake Erie. These signs serve as a checklist of equipment and responsibilities for boaters to review before entering Lake Erie. Items to check featured in this series of signs, include: gasoline, weather, life jackets, radio or cell phone, flares, anchors, and line, as well as a don't drink and boat sign.
- Two new fact sheets were developed: *Safe Boating Tips* and *Clean Boating Tips*. The safe boating fact sheet includes a checklist of equipment and procedures that should be reviewed before leaving the

dock or boat ramp, Pennsylvania equipment requirements and regulations, and recommended equipment. The clean boating fact sheet includes information regarding fueling, spill response, vessel cleaning, fish waste disposal, vessel sewage, sanding and painting activities, and AIS spread prevention.

- In cooperation with the U.S. Coast Guard, an informational poster warning boaters about fluctuating lake levels was designed and produced by Pennsylvania Sea Grant. In Pennsylvania, the poster was displayed at various locations along the bayfront and in Presque Isle State Park. The poster was also used in New York. In addition, local media now views Pennsylvania Sea Grant as an authority on the impacts of lake levels. Several reporters continue to check with Sea Grant staff for information and interviews on this subject.

Year 7 Approach

The working relationships that Pennsylvania Sea Grant has established with the U.S. Coast Guard, DEP, Erie Safe Boating Task Force, and Erie Power Squadron would be continued.

- The U.S. Coast Guard would be contacted to ascertain if there is any interest in conducting a spill workshop in 2004. Staff would continue to work with the DEP and U.S. Coast Guard to facilitate information dissemination to the marina community via workshops and other means.
- Staff would continue facilitation of the production of posters, fact sheets, and other appropriate forms of communication regarding topics of interest to marina operators, including spill response, recycling, and business issues.
- Staff would work with the Erie Safe Boating Task Force in the development of several posters in conjunction with the Pennsylvania Sea Grant Fleet Surgeon program.
- Survey local marinas to determine their interest in having a Web site established for marinas. Although some Web listings exist, these are limited to mailing addresses and phone numbers. An expanded Web site would highlight public access opportunities, a list of marinas, extension information for marina operators, as well as other information.
- Investigate the possibilities and logistics of starting a Clean Marina Program for Pennsylvania marinas. This a program that introduces marinas to basic environmental techniques to improve the health and cleanliness of the state's waters.
- In cooperation with the Erie Safe Boating Task Force, explore and co-fund ways of expanding extension efforts to reach more boaters with safety and environmental information. This would include the use of additional signage at several locations in the Presque Isle Bay area.
- Provide funding, as available, to support specific Erie Safe Boating

Task Force initiatives, including safety whistles and other handout items.

- In cooperation with the Erie Safe Boating Task Force, Pennsylvania Sea Grant would produce and help distribute a brochure with safe boating tips, as well as explore the development of other brochures that would be of value to the boating community.
- Provide technical and logistical support to the Erie Power Squadron so that they can develop information and present courses more broadly. Currently, the squadron provides the following boating courses:
 - ✓ *Boating Course* - designed to familiarize the public with fundamentals of safe boating and qualifies for the certification that Pennsylvania requires for the operation of personal watercraft.
 - ✓ *Seamanship* - builds on the basics learned in the Boating Course, seamanship is an important foundation for other “advanced grade” courses.
 - ✓ *Piloting* - first of a two-part program studying inland and coastal navigation. Its focus is on the fundamentals of piloting.
 - ✓ *Advanced Piloting* - final part of the inland and coastal navigation series, its emphasis is on the use of modern electronic navigation systems and other advanced techniques for position finding.
 - ✓ *Junior Navigation* - first of a two-part program of study in offshore or ocean navigation.
 - ✓ *Navigation* - second part of the study of offshore navigation, further developing the students’ understanding of celestial navigation.
 - ✓ *Cruise Planning* - designed for students who plan to cruise for just a weekend or a year in a sail or power boat.
 - ✓ *Engine Maintenance* - attempts to makes students more self-reliant afloat, with trouble diagnosis and temporary remedies given special emphasis.
 - ✓ *Marine Electronics* - teaches essential knowledge about a boat’s electrical and electronic systems.
 - ✓ *Sail* - provides a thorough study of the terminology and dynamics of sailing
 - ✓ *GPS* - designed to provide a thorough understanding of the operation of Global Positioning System (GPS) units.
- Develop a link on the Pennsylvania Sea Grant Web site to describe the boating courses offered by the Erie Power Squadron, and provide a schedule of courses and other squadron activities.
- Install display cases containing information concerning safe boating, clean boating, AIS spread prevention measures, avian botulism, and other Pennsylvania Sea Grant extension efforts at the Walnut Creek

Access area and Presque Isle Bay Boat Livery.

- Continue to work with appropriate agencies, including the U.S. Army Corps of Engineers, CZM, and other interested agencies, to disseminate information concerning fluctuating lake levels.

d. Waste Reduction and Prevention

Background

Pennsylvania's coastlines are major industrial centers, and products in over 135 different classifications are manufactured in these centers and sold throughout the world. Principal goods include plastics products, locomotives, boilers, petroleum products, ships, engines, meters, turbines, castings, forgings, pipe equipment, motors, diesel engines, and paper. Associated with this emphasis on manufacturing is the need to reduce and prevent wastes generated as part of the manufacturing process. In addition, hazardous wastes found in households and businesses are major concerns in the Lake Erie and Delaware Estuary drainages. Wastes such as mercury, pesticides, and paint are among those items targeted for reduction.

Providing for the environmentally safe disposal of unused or obsolete electronics is another area of growing concern. Pennsylvania is beginning efforts to promote community-based "e-cycling" efforts.

Objectives

- Support the efforts of business and industry, government agencies, and other organizations to reduce and eliminate waste in coastal watersheds.
- Promote the proper disposal of household and industrial hazardous wastes, and the recycling of electronic materials.
- Enhance public and organizational awareness of the benefits of ecological sustainability.

Progress to Date

- Pennsylvania Sea Grant has been an active member of the Pollution Prevention Partnership, Environmental Responsibility in Erie (P³ERIE) Steering Committee. Past participation has included efforts to publicize and support collections of mercury, pesticides, and household hazardous waste. Since 1998, P³ERIE has collected over 2,000 pounds of mercury and over 4,000 mercury-containing items.
- Over 62,000 pounds of electronic materials were collected in Erie County during the 2003 "e-cycling" event initiated by P³Erie.
- A microscale chemistry initiative has been implemented in several Erie-area schools, including Penn State Behrend. The initiative introduces teachers and students to the concepts and practices of reducing waste and toxicity in school laboratories through using minute amounts of

chemicals for experimentation.

- In cooperation with the Pennsylvania Department of Agriculture, an estimated 10,000 pounds of pesticides have been collected in Erie County.
- An ecological sustainability program continues to grow at Penn State Behrend. Pennsylvania Sea Grant director, Bob Light, is leading this effort, which includes efforts to conserve water, reduce waste, save energy, and incorporate wise land-use decisions into the campus plans such as delineation of green space.

Year 7 Approach

Pennsylvania Sea Grant would continue to support efforts to eliminate waste and promote ecological sustainability in Pennsylvania's coastal watersheds. Staff would identify areas in which involvement is appropriate, including assisting with project funding, dissemination of information, and adaptation of Sea Grant Network initiatives in Pennsylvania.

- Pennsylvania Sea Grant would assist in the procurement of grants and/or assist in the funding of specific P³ERIE projects that are important to the Lake Erie watershed.
- Pennsylvania Sea Grant would continue to seek opportunities, as appropriate, to co-host workshops, teleconferences, and seminars related to waste reduction. Staff would also add waste reduction and elimination resource links to the Pennsylvania Sea Grant Web site.
- Continue to work with P³Erie in coordinating and initiating "e-cycling" events and mercury collections in the Lake Erie drainage basin, as well as sponsoring microscale chemistry initiatives.

e. Searchable Database of the Trichoptera (Caddisflies) and Plecoptera (Stoneflies) of Pennsylvania

Dr. Edwin C. Masteller, professor emeritus of biology at Penn State Behrend, with the help of Pennsylvania Sea Grant staff, Penn State Behrend faculty, and Penn State Behrend student assistants Sang Lee, Jeremy Simons, and Dave Magee, has developed two interactive CDs with searchable databases. The first CD is a compilation of over 4,300 records of Trichoptera in Pennsylvania, including 325 species in 23 families that have been stored in an Access database. The second CD is a compilation of over 1,800 records of Plecoptera in Pennsylvania, including 135 species in nine families. The records are sorted by species, date of collection, collection site and area, latitude and longitude, county, physiographic province and drainage basin, state and national forests, and state and national parks. Over 1,000 maps with the Pennsylvania counties and North American records can be found on Dr. Edwin C. Masteller's Pennsylvania Aquatic Insects Web site: <http://paaquaticfliesrus.bd.psu.edu>.

The CDs are designed with two routes; one route for researchers and another route for anglers. The databases are organized in this manner so that the angler can quickly find the insects in the streams of their choice, but if more complete information is desired they can navigate through the researchers' database.

All the data to create the Trichoptera searchable database were obtained from literature; numerous museums; collections by Penn State Behrend students and Dr. Masteller from 1989 to 1998; and sporadic collections from several sources through August 2003. Data to create the Plecoptera searchable database were obtained from literature; museums; collections by Penn State Behrend students, Dr. Masteller, and Jane Earl (DEP) from the early 1980s to 1996; and sporadic collections from several sources through August 2003.

The Trichoptera CD is currently available through Pennsylvania Sea Grant.

f. Research Collaboration

Background

Pennsylvania Sea Grant staff is currently addressing several issues related to research collaboration of importance to the Lake Erie and Delaware Estuary watersheds:

- A historic lack of funding for watershed-related projects.
- A lack of research and laboratory space on or near Presque Isle State Park.

To address these issues, staff has helped local colleges and universities, secondary schools, and other organizations in submitting proposals for support of projects. In addition, staff has sought and received funding for special watershed-related projects. Staff has also taken a leadership role in the development of a research field station on Presque Isle State Park, and with development plans for a \$25 million dollar visitor, education, and research center to be built at the entrance to Presque Isle State Park – Tom Ridge Center at Presque Isle.

Objectives

- Establish a research field station on Presque Isle.
- Support the construction and development of a research component for the Tom Ridge Center at Presque Isle.
- Facilitate the development of regional conferences related to important watershed issues.
- Facilitate the acquisition of research and outreach funds related to important watershed issues.

Progress to Date

- Facilitated and hosted Lake Erie Millennium sediment conference at Presque Isle State Park. Lake Erie researchers and government agencies involved in sediment remediation of Areas of Concern (AOC) attended the conference.
- Helped develop and promote the annual Presque Isle Partnership Environmental Conference. The annual conference's focus is on invasive species control and ecosystem studies related to Presque Isle State Park, Presque Isle Bay, and Lake Erie watershed.
- Continued to work with DCNR on the development of a research field station on Presque Isle State Park. A DCNR building at the Presque Isle Marina has been designated for a field station as part of the park's master plan. This site is preferable due to its close proximity to the bay. Pennsylvania Sea Grant and Penn State Behrend staff are assisting in the design of the facility for use of bay water for fish holding facilities and flow-through research studies.
- Continued to work on the establishment of the Tom Ridge Center at Presque Isle. The Governor released \$25 million of funding for the construction of the center. The project includes land acquisition for green space, a state-of-the-art visitor's center, auditorium, gift shop, and restaurant. It would also include space for research labs, classrooms, and governmental offices. Pennsylvania Sea Grant is coordinating the development of the center's 6,000-square-foot research center and the incorporation of office space for coastal-related organizations. The center is currently under construction and should be opened in July 2005.
- Worked with the Governor's office and the Tom Ridge Center project team in developing the *Regional Science Consortium at the Tom Ridge Center at Presque Isle*. The consortium would support research and education at the center. Sea Grant staff would oversee day to day operations of research at the Tom Ridge Center. Pennsylvania Sea Grant Director Bob Light serves as president of the board of the Regional Science Consortium. Currently, there are eight institutions committed to consortium membership.
- Developed successful grant proposal to equip the research space at the Tom Ridge Center. The application was submitted in cooperation with DCNR to CZM for \$100,000. An equipment list has been developed.
- Developed second \$100,000 equipment grant request to CZM in conjunction with DCNR for research at the Tom Ridge Center.

Year 7 Approach

- Continue to develop all aspects of the Regional Science Consortium at the Tom Ridge Center including outreach efforts to new member universities, facility-use policy, and establish fees and schedules.
- Work with consortium to develop academic curriculum for graduate,

undergraduate, and pre-college students to be offered at the Tom Ridge Center.

- Support and promote Presque Isle Partnership's annual environmental conference and Discover Presque Isle fund-raising event.
- Work with local organizations to obtain watershed-related grants.
- Continue to work on the implementation of the field station on Presque Isle.

g. Great Lakes Restoration

Pennsylvania Sea Grant would coordinate Pennsylvania's Great Lakes Restoration efforts with Pennsylvania's Council of Great Lakes Governors office and the Great Lakes Cities Initiative (Mayor, Richard Filippi of Erie) in developing strategies and conducting stakeholder meetings to implement the Great Lakes Restoration Act (pending Congressional approval). Our objective would be to partner with The Council of Great Lakes Governors to host and facilitate a Pennsylvania workshop on the restoration of the Great Lakes. Stakeholders attending this workshop would help define priorities and strategies for implementation of restoration efforts in Pennsylvania waters.

h. Mayfly Monitoring and Outreach

The mayfly *Hexagenia*, a water quality indicator species, has been making a dramatic return to Pennsylvania waters. This species of mayfly was very abundant in Lake Erie until it virtually disappeared in the mid-1950s due to sewage inputs to the lake. Water quality improvements since 1987 have allowed this species to re-establish itself.

Dr. Ed Masteller, professor emeritus of biology at Penn State Behrend, has directed Pennsylvania Sea Grant's mayfly watch program since 1999 and has been conducting mayfly emergence research with the help of volunteers since 1997. He has conducted mayfly emergence research utilizing Doppler radar in conjunction with WJET-TV in Erie, Pennsylvania. The relationship he established with the weather staff at the station resulted not only in new scientific research, but also extended television coverage and publicity for the mayfly watch program.

The massive resurgence of these mayflies was first noticed in the shallow western basin in 1994 and has now moved to the central and eastern basins. The presence of mayflies is an indication that pollution controls established on Lake Erie have greatly improved the water quality and sediment conditions. In 1997, the return of the large mayfly, *Hexagenia* spp. provided continued signs that the water quality was good enough to support large populations of this insect. And the numbers for 1999 assured us that the mayflies were firmly established.

Pennsylvania Sea Grant has also produced posters and fact sheets related to

the return of the mayfly to inform the lakeside public of their importance to the lake ecology; became a participant in the mayfly watch program currently in place in Canada, Ohio, and Pennsylvania; and funded an applied research study to assess sediment habitat characteristics necessary to support mayfly nymphs in Lake Erie and Presque Isle Bay.

Pennsylvania Sea Grant would continue to monitor the return of mayflies as an indicator of cleaner sediments in Presque Isle Bay and Lake Erie, participate in the mayfly watch program, and relay updated information to the public.

C. EDUCATION

The educational component of Pennsylvania Sea Grant would continue to focus on the development of curricula and other programming related to Pennsylvania's Lake Erie watershed and Delaware Estuary, placing special emphasis on the incorporation of Sea Grant, Delaware Estuary, and Great Lakes related materials into elementary, middle, and high school curricula. The strategy would include a balance between classroom work and field experience. The ultimate goal is to promote environmental awareness and stewardship among our youth.

Staff would work cooperatively with existing providers of environmental education, including: Penn State Cooperative Extension; other Sea Grant Programs, especially Delaware, New Jersey, New York, Ohio, and other Great Lakes and mid-Atlantic programs; Department of Environmental Protection (DEP); the staff at Presque Isle State Park; Bayfront Center for Maritime Studies; Lake Erie-Allegheny Earth Force and Philadelphia Earth Force; and various other programs in the Delaware Estuary. This approach would help to ensure a reduced duplication of effort leading to a systematic and cooperative approach to the delivery of environmental education within the two watersheds.

Programming developed in conjunction with Pennsylvania Sea Grant would take into account the curriculum development that has been completed by other Sea Grant programs, especially those in the Great Lakes and mid-Atlantic regions. A special effort would be made to identify all available curricular materials. Lists and materials have already been compiled, including over 130 resources from the *Directory of Great Lakes Education Material*, and Dr. Rosanne Fortner's materials, such as *Earth Systems - Education Activities for Great Lakes Schools*. If appropriate, existing Great Lake and mid-Atlantic materials would be adapted for Pennsylvania coastal systems.

More detail follows on specific environmental education programs that Pennsylvania Sea Grant supports in the Lake Erie and Delaware Estuary watersheds.

1. LAKE ERIE WATERSHED

a. Bayfront Center for Maritime Studies (BCMS)

Background

BCMS is a unique, waterfront educational facility providing hands-on, maritime-related activities to area young people. BCMS uses boat building, sailing, and other maritime-related activities to teach and reinforce traditional academic subjects, stress environmental stewardship, and promote good citizenship skills. BCMS offers an engaging educational environment on the waterfront, grounded in life skills and functional tasks to provide youth with meaningful, enriching, and enjoyable learning experiences.

BCMS has formed many partnerships, including a strong one with Pennsylvania Sea Grant. The BCMS partnership with Pennsylvania Sea Grant includes financial and staff support. Anne Danielski, education and maritime specialist with Pennsylvania Sea Grant, spends over half of her time in support of BCMS activities. BCMS, in partnership with Pennsylvania Sea Grant, has also developed and begun the delivery of a hands-on environmental educational program, *Environmental Rediscoveries*, to a wide range of regional students (see *Environmental Rediscoveries* section for more detail).

BCMS has also formed a strong partnership with the Northwest Tri-County Intermediate Unit that facilitates the delivery of programming to the 17 public school districts in Erie, Warren, and Crawford counties as well as the ability to provide programming to all the juvenile placement facilities in Erie County.

BCMS employs several boat-building experiences: from constructing a 28-foot sailing replica of the Erie Boat; to restoring a 38-foot, 75-year-old historic workboat; to building canoes, kayaks, and skiffs. Young people involved in these projects are learning how to apply academic subjects such as math, language arts, and science to real life situations as well as the importance of teamwork, discipline, and following directions. These students are also learning about their community's significant maritime history and are keeping Erie's boat-building tradition alive.

Students also have an opportunity to learn how to sail aboard one of the center's keelboats. For many young people this is the only opportunity that they would ever have to enjoy the sport of sailing, but this is much more than a purely recreational experience. Participants learn navigational skills that are employed while sailing. It is not unusual for students who have had trouble with algebra to be calculating speed, time, and distance equations in their head while sailing with BCMS. Students also learn meteorology, basic physics, and the importance of teamwork and responsibility while sailing.

Objectives

- Introduce and reinforce traditional academic subjects in a project-based learning environment.
- Introduce marketable vocational skills and appropriate work-related behaviors.
- Build self-confidence and develop personal growth initiatives.
- Provide safe, enjoyable, and engaging recreational opportunities for the entire community.

Progress to Date

- BCMS has provided programming to over 11,000 area young people, primarily from underserved populations.
- BCMS participants have built 60 boats since June 1998. The boats belong to the programs that built them. Many of these boats have been raffled off as fund-raisers, many are displayed in the schools or other facilities, and many are used in summer camp programs around the region.
- The Teaching Outdoors to Urban Communities Helps (T.O.U.C.H.) Nature Program developed and delivered by Presque Isle Park staff, BCMS, and Pennsylvania Sea Grant won Pennsylvania's Department of Conservation and Natural Resources (DCNR) Community Involvement Award for 2001.
- BCMS and Perseus House, Inc. coordinated the Broad Reach program for over 300 youth under support from the Department of Labor Youth Offender project.
- BCMS is one of only two U.S. Sailing Keelboat schools in the state of Pennsylvania. U.S. Sailing is the national governing body for the sport of sailing.
- BCMS, Pennsylvania Sea Grant, and other partners have created the Pennsylvania Lake Erie Underwater Preserve and successfully marked numerous popular shipwreck diving sites in Lake Erie.
- BCMS and the Junior League of Erie hosted the Great Lakes Access Dinghy regatta; hosting 15 racers and their families from three states and Canada.
- BCMS received funds to implement the Get W.E.T. (Watershed Education Team) program. Six high school and six undergraduate students participated in a week-long watershed camp, translating their experiences into learning materials for elementary school students.
- BCMS, in cooperation with the Erie-Western Pennsylvania Port Authority, has received funding from the state to build a 12,000-square-foot facility complete with classrooms and laboratory space. The facility will be completed in spring 2004.
- BCMS has applied for a charter school designation under the name Maritime Alliance Charter School. The school will serve sixth through eighth grades in hands-on, project-based learning activities relating to the maritime environment.

Year 7 Approach (in partnership with Pennsylvania Sea Grant)

- BCMS would conclude the restoration of the *Bureau of Water*, a historic boat used by the City of Erie for water quality sampling. The *Bureau* would become a floating, living history exhibit in cooperation with the Erie Maritime Museum.
- BCMS and Perseus House and other government and industry partners would create a youth employment incubator developing products and skills necessary for a growing maritime-based economy.

- BCMS, Pennsylvania Sea Grant, and other partners would continue to work on curricula and other educational projects relating to the Pennsylvania Lake Erie Underwater preserve, including an interactive CD ROM Flash program.
- BCMS would expand its U.S. Sailing certified Del A. Caryl Sailing Program to provide more community sailing school opportunities and therefore revenue to help fund other BCMS programming.
- BCMS and other partners would create an after-school program designed to create a maritime-themed, project-based learning environment. BCMS is currently identifying funding for this project.
- BCMS, in partnership with the Junior League of Erie, would host the 2004 North American Access Dinghy Championships designed for students with physical mobility limitations.

b. Lake Erie-Allegheny Earth Force

Background

Lake Erie-Allegheny Earth Force is a non-profit, youth-driven educational organization dedicated to providing young people, in western Pennsylvania, with the skills, knowledge, and experience they need to become environmentally literate citizens. Middle school students, directed by specially trained teachers participating in Earth Force, learn a range of civic, scientific, social, and environmental skills by selecting an environmental problem within their watershed and then designing and implementing a sustainable solution to the problem, and thus improving the quality of life in their community.

The staff of Lake Erie-Allegheny Earth Force provide training and technical support to educators and students participating in the Earth Force program. Currently, over 5,500 young people and 220 educators participate in Earth Force programs in western Pennsylvania and eastern Ohio.

Lake Erie-Allegheny Earth Force staff has been developing and delivering environmental education for over 30 years. Its reputation for presenting high quality programs for youth, families, and teachers is well known.

Lake Erie-Allegheny Earth Force is one of eight sites in the national Earth Force network and serves western Pennsylvania and eastern Ohio.

Pennsylvania Sea Grant supports the program in several ways:

- Leadership - Bob Light, Pennsylvania Sea Grant director, serves as local community advisory board chair and serves on the national Earth Force board of directors;
- Financial - provide funds for general program support and support for special programs and projects;
- Extension - Pennsylvania Sea Grant staff serve as resources for teacher professional development programs and for student

educational programs and projects.

Objectives

- Create an improved environment and quality of life in our communities.
- Create an expanded pool of youth with better civic and environmental stewardship skills, knowledge, and attitudes.
- Create an expanded pool of educators with more effective skills to facilitate youth-driven projects.
- Develop a program that promotes service among our young people in their communities.

Progress to Date

- During the last year, over 44 sites, 220 educators, and 5,500 youth were involved in watershed projects, training programs, and related activities.
- Examples of projects include: stream assessment and monitoring; conserving energy in school buildings; community park improvements; habitat and stream bank restoration; water conservation; cigarette butt disposal; clean air; school recycling; and inner-city neighborhood beautification projects.
- Annual youth summits are held to bring like-minded students and educators together to compare approaches to environmental stewardship.
- Lake Erie-Allegheny Earth Force is also serving as the facilitator for the Junior Pennsylvania Lake Erie Watershed Association, which is being funded by DEP's Growing Greener program. Pennsylvania Sea Grant serves as a community resource for information and support.

Year 7 Approach

- Pennsylvania Sea Grant would continue to support Earth Force due to its experiential-learning focus and its ability to reach so many young people and educators.
- Continue to support the expansion of Earth Force throughout western Pennsylvania.

c. *Environmental Rediscoveries*

Background

The *Environmental Rediscoveries* program was developed through a partnership with Pennsylvania Sea Grant, DEP, and BCMS. This program offers students the opportunity to participate in a unique hands-on environmental education experience on Presque Isle Bay.

The mission of the *Environmental Rediscoveries* program is to develop environmental awareness among youth and to provide teachers with the resources necessary to give their students unique learning opportunities in environmental science.

Preparation for the *Environmental Rediscoveries* experience begins in the classroom with the Pennsylvania standards-based curriculum that is designed specifically to prepare students for their *Environmental Rediscoveries* experience. Teachers attending summer workshops are able to obtain training to integrate the curriculum into their classrooms. The program offers students the opportunity to become sailors and scientists for a day as they raise and lower the sails and search for aquatic plants and animals. Part of the program experience encourages teamwork as students learn how to sail on *Momentum*, a historic, 42-foot traditionally rigged Friendship Sloop, while learning about the environmental quality of Presque Isle Bay. Through the *Environmental Rediscoveries* experience, teachers and students gain a deeper understanding of environmental issues that affect Presque Isle Bay as well as become active participants in caring for and protecting their environment.

Objectives

- Increase awareness among students related to the environmental health of Presque Isle Bay.
- Provide students with a unique alternative hands-on outdoor educational experience.
- Build students' teamwork skills, self-discipline, and self-esteem through the cooperative efforts of sailing and sample collection.

Progress to Date

- The curriculum, developed by Pennsylvania Sea Grant Education and Maritime Specialist Anne Danielski, includes Web-based, CD, and paper versions of the 130-page curriculum. The curriculum includes lesson plans in areas related to the physics of sailing, watersheds, exotic species, mayflies, Presque Isle Bay, and Presque Isle ecology.
- This program received the Governor's Award for Environmental Excellence in 2001.
- Approximately 140 teachers from 24 different schools in Erie County have received professional development training to incorporate the *Environmental Rediscoveries* curriculum into their classrooms.
- Approximately 3,500 students have participated in *Environmental Rediscoveries*.
- A training manual was developed to assist volunteers in their preparation for mentoring students that participate in the *Environmental Rediscoveries* program.
- An interactive board game was developed that provides a unique tool for teachers to assess student knowledge from participating in the *Environmental Rediscoveries* program. Students use latitude and longitude to navigate their way around Presque Isle Bay while answering trivia questions in an attempt to collect more "life rings" than their opponents.
- *Environmental Rediscoveries* program expanded into Crawford County

school districts including Meadville and Titusville.

Year 7 Approach

Environmental Rediscoveries program would continue to expand to offer a wider range of programming to attract returning participants. Construction of new facilities at BCMS, the host organization, would allow for expanded offerings due to expanded classroom and laboratory space. The focus would shift to concentrate on programming for grades four through eight, as this is the largest population that is currently served by *Environmental Rediscoveries*. Work would continue on the board game to include a version which would allow for distribution to markets outside of participating schools. New programming would include classroom outreach programs, and development of other smaller-scale programs focusing on issues affecting the Pennsylvania shoreline of Lake Erie.

d. Lake Erie Environmental Education Partnership

Background

The Lake Erie Environmental Education Partnership (LEEEP) was formed to increase the level of cooperation and visibility of environmental education initiatives in northwest Pennsylvania as well as to create greater collaborative opportunities for environmental education organizations to obtain grant monies. LEEEP consists of various environmental education partners throughout northwest Pennsylvania, including Asbury Woods Nature Center, BCMS, Lake Erie-Allegheny Earth Force, Lake Erie Arboretum at Frontier (LEAF), Pennsylvania Sea Grant, and Presque Isle State Park-DCNR.

The member organizations provide environmental education services, all focusing on watershed protection, reducing nonpoint-source pollution, and environmental stewardship.

Objectives

- Coordinate fund-raising for environmental education in the Lake Erie watershed, primarily targeting large federal, state, and foundation grants.
- Develop a Web site on regional environmental education resources and curricula for educators.
- Develop a comprehensive environmental curriculum.
- Develop a LEEEP public event that promotes environmental awareness and stewardship in the watershed.

Progress to Date

- Identified core partners and formulated mission and vision statements for LEEEP.
- Coordinated first annual watershed festival; *Coastal Connections*:

Celebrating the Land, Water and You. Hosted at Frontier Park in conjunction with the annual LEAF Festival; festival included 13 partnering organizations, hands-on environmental education activities, live music, Great Lakes carnival games and various other events.

- Coordinated advertisement piece for Earth Day celebrations hosted by various organizations throughout the Erie region.

Year 7 Approach

LEEEP would continue to increase its presence throughout the community through development of a Web site and other activities. Efforts would also be made to compile a database of available regional environmental education resources that would be made available via the Web. LEEEP would assume a leadership role in coordinating educational outreach efforts for the Presque Isle Bay Public Advisory Committee.

e. Pennsylvania Sea Grant Office of the Fleet Surgeon

Background

Pennsylvania Sea Grant has the unique opportunity to offer the services of its newly created position of Fleet Surgeon. John C. Lyons, MD, FACS, MSME, has been recently appointed to the position of Fleet Surgeon for Pennsylvania Sea Grant. Dr. Lyons brings a wealth of medical experience in waterfront and open water health and safety issues to the National Sea Grant Network. He is an author and lecturer on various emergency and health safety issues such as extraction methods for boat passengers with serious spinal injuries, scuba hazards on Lake Erie, cold water immersion and drowning, fish hook injuries, and impaired night vision on the water. Dr. Lyons also instructs Presque Isle State Park's large contingent of lifeguards on surf rescue techniques and recently presented medical advice at the Pennsylvania, Ohio, and New York Sea Grant avian botulism workshop for Lake Erie fish and wildlife.

Objectives

- Develop a list of health and safety related subject areas for which Dr. Lyons can provide professional medical advice and lectures.
- Act as medical counselor and speaker at various Sea Grant education and outreach initiatives.
- Provide health and safety seminars to rescue first responders with a need for medical expertise, such as lifeguards, Coast Guard officers, Sheriffs' dive teams, firefighters, search and rescue teams, marina operators, law enforcement officers, and charter boat captains.
- Develop "train-the-trainer" courses for power squadrons, yacht clubs, dive clubs, crew clubs, and angling organizations.
- Provide training on a limited basis to local angling, boating, and sailing organizations.

Progress to Date

- Solicitation conducted of local non-profit, community-based, and governmental organizations as to their interests for services rendered through the Office of the Fleet Surgeon
- Work has begun on promotional literature that would be disseminated to the general public to inform them of the capacity of the Office of the Fleet Surgeon.
- In cooperation with Penn State Erie, a waterfront safety techniques course would be offered in summer 2004 for undergraduate students interested in health issues related to waterfront activities.

Year 7 Approach

Continue to develop the Office of the Fleet Surgeon, including compilation of fact sheets relating to topics such as fish hook injuries, boating and the environment, and ice fishing. A new page would be added to the Pennsylvania Sea Grant Web site to increase awareness of the Office of the Fleet Surgeon. Lectures and conferences would be coordinated for the public and private sector on a local or possibly regional scale.

2. DELAWARE ESTUARY EDUCATION PLAN

Pennsylvania Sea Grant staff would continue to develop relationships with schools and environmental education groups in the Delaware Estuary to assist in identifying target audiences and educational needs. In Year 7, staff would work with the Delaware Estuary Advisory Council to evaluate the feasibility of transferring successful programs from Lake Erie to the Delaware Estuary community. New programs would parallel existing Pennsylvania Sea Grant programs that emphasize problem solving, activity-based learning, teacher training, and curriculum development. The Year 7 approach would also involve collaboration with local organizations to extend the impact of existing aquatic resource education programs.

Background

With a population of approximately 2 million, Philadelphia ranks as the fifth largest city in the United States. Like other older cities, financial problems and the exodus to the suburbs have left the school district with an aging infrastructure and a declining tax base. Adding to the teaching challenge, 75 percent of the district's students are Black or Hispanic, and many teaching positions are vacant. This amplifies the need for enrichment activities and teacher training to help compensate for inadequate school funding and support.

Objective

Enhance student and teacher science and environmental literacy through the adoption of activity-based aquatic resource education methods into classroom instruction.

Progress to Date

- Delivered middle and high school programs for 450 participants including: *Growing Your Future Environmental Career Day*, *4-H Summer Day Camp in Fairmount Park*, *Women in the Natural Sciences*, and the *Philadelphia County Spring Fling* (a special event attended by 3,000 teachers and students).
- Conducted a teacher training workshop with support from a \$30,000 Bay Watershed Education & Training (B-WET) program grant award; developed a five-day residential watershed program, *Chesapeake Bay Watershed Faculty Development Scholarship Program*, July 14-18, 2003. This program utilized instructional support of faculty members from West Chester University of Pennsylvania, Dickinson College, and Penn State's College of Forest Resources to facilitate an understanding of watersheds and their problems. The program provided field activities and educational methods to promote *A Meaningful Bay Experience* for 10 secondary school science teachers from the Chesapeake and Delaware watersheds whom we estimate instruct approximately 600 students annually. Lessons learned from developing this program would be applied to teacher training development for the Delaware Estuary.
- Invited by Delaware Sea Grant to give an *Aquatic Supertramps of the Delaware Estuary* seminar that was part of a 15-hour workshop attended by 18 teachers. Participants are estimated to instruct about 1,000 students annually.

Year 7 Approach

- Co-instruct four 15-hour teacher-training programs in conjunction with Delaware and Maryland Sea Grant and the Fairmount Park Commission of Philadelphia. This would be accomplished with funding provided by the NOAA Aquatic Invasive Species program. A target of 100 teachers from Delaware, Maryland, and Pennsylvania has been set for 2004, and an additional 75 teacher participants are expected in 2005. A summer 2004 workshop is planned for Philadelphia School Teachers at Cobbs Creek Environmental Center, a Fairmount Park Nature Center that conducts environmental education programs dealing with invasive species.
- Provide teacher follow-up consultations with participants from the 2003 *Chesapeake Bay Watershed Faculty Development Scholarship Program*. This contact would help ensure implementation of summer learning.
- Continue to make inroads to serve the troubled Philadelphia School District by developing teacher training.
- Work with Penn State Great Valley Continuing Education staff to investigate the feasibility of developing a distance learning and traveling field course entitled *Susquehanna River of Dreams*. The course would combine a rigorous preparatory distance learning module with a traveling residential program to explore the Chesapeake Bay from the Pennsylvania headwaters to the mouth of the Virginia portion of the Chesapeake Bay. The course would build on the 2003 Chesapeake teacher workshop experience to provide multidisciplinary field activities that trace a

watershed from its headwaters to the lower bay in order to fully experience the implications of land use on water quality on the environmental and economic vitality of the lower Chesapeake Bay.

- Investigate the feasibility of developing a school-based boating program as part of the City of Chester Waterfront Redevelopment initiative that would serve students and teachers of the impoverished Chester Upland School District which is now in receivership by the Commonwealth of Pennsylvania. This task would involve working with the Chester Redevelopment Authority as well as Edison Schools Inc., the Commonwealth-appointed administrator for the Chester-Upland School district.
- Work with University City High School and Lincoln High School to develop fish consumption education programs to integrate in their Environmental Health course curricula. These units would utilize Geographic Information Systems (GIS) technology and files and local fish consumption surveys to explore Delaware Estuary fish consumption issues and safe consumption practices.

D. COMMUNICATION

Pennsylvania Sea Grant continues to maintain an active communication effort designed to create public awareness about Sea Grant outreach and research, and to serve as a contributing partner in the National and Great Lakes Sea Grant Networks. In addition, program staff has initiated a variety of communication initiatives to promote its activities.

Please note that each section includes Purpose, Progress to Date, and Year 7 Approach.

1. SEA GRANT WEB SITE (www.pserie.psu.edu/seagrant)

a. Purpose

To establish a method for Pennsylvania Sea Grant constituencies to access information about the program, a Web site was established on the Penn State Behrend server in October 1998.

b. Progress to Date

Following a redesign in December 2000, the Pennsylvania Sea Grant site continues to be updated as necessary. Guidelines as established in the *Sea Grant Web Site Guidebook* continue to be implemented wherever possible. The site is used to highlight information related to mission, vision, and staff; project activities; furnish links to other Web sites of interest; and provide the capability to contact staff. Additions to the Web site in Year 6 included updated results from selected applied research projects funded by Pennsylvania Sea Grant, continued posting of the program's newsletter and other publications, and promotion of several conferences and events produced by Pennsylvania Sea Grant and other organizations.

c. Year 7 Approach

As Pennsylvania Sea Grant activities continue to grow, the Web site would be updated to reflect these changes. Initial updates would include:

- a format revision of the Photo Gallery section to incorporate more timely photos and captions;
- additional applied research results as they are available from researchers;
- broader list of resource links;
- promotion of selected events in the Current Events section of the Web site;
- major update of the Extension and About PA Sea Grant sections;
- incorporation of a link to promote safe boating courses offered by the Erie Power Squadron;
- continued evaluation of the Web site to incorporate changes as necessary.

2. NEWSLETTER

a. Purpose

In an effort to inform its constituencies about Pennsylvania Sea Grant activities, a quarterly newsletter, *Keystone Shorelines*, was established in late 1998. In addition to allowing readers to keep up with Pennsylvania Sea Grant activities, the newsletter provides Pennsylvania Sea Grant's affiliated organizations the opportunity to publish information about their projects and activities that have an impact on Pennsylvania's coastlines.

b. Progress to Date

Keystone Shorelines has a mailing list of over 2,000, up from an initial readership of 1,500. Issues are also posted on the Web site. The newsletter incorporates information from several coastal resource agencies in addition to Pennsylvania Sea Grant, including organizations such as Coastal Zone Management (CZM), Erie-Western Pennsylvania Port Authority, and other Great Lakes and Delaware Estuary related sources. In Year 6, the newsletter content was expanded to include more information about activities in the Delaware Estuary and other areas of the Commonwealth, and a listserv was created to distribute the newsletter and other information. Chris McCammon of Write Away Communications Services coordinates production of the quarterly newsletter.

c. Year 7 Approach

As in previous years, newsletters would be published in January, April, July, and October. Efforts to expand the mailing list to include contacts in southeast and central Pennsylvania would continue. In addition, themes would be established for each newsletter, with each theme augmented by several related articles.

3. FACT SHEETS AND REPORTS

a. Purpose

One method of sharing information with the public and other Sea Grant programs is the production of fact sheets and reports. Fact sheets and reports allow topical information to be easily produced and disseminated.

b. Progress to Date

Pennsylvania Sea Grant staff has worked with a variety of local and regional organizations to identify topics that could be promoted through fact sheets. Fact sheets have been and continue to be distributed at public events as well as posted on the Web site.

The existing Pennsylvania Sea Grant fact sheet template has been redesigned to incorporate information about both the Lake Erie and Delaware Estuary regions.

Fact sheets developed to date include:

- A series of six fact sheets about aquatic invasive species, including *Zebra Mussels*, *Quagga Mussels*, *Spiny & Fishhook Waterfleas*, *Round Goby*, *Ruffe*, *Rusty Crayfish* (2003 Updates)
- *Asian Carp* (November 2003)
- *Rudd* (November 2003)
- *Mayfly Fact Sheet* (2003 Update)
- *Flathead Catfish* (2002)
- *Map of Erie County Watersheds* (October 2000)
- *About Pennsylvania Sea Grant* (2003 Update)
- *Fish Habitat Structures in Presque Isle Bay* (February 2000)
- *Living on Pennsylvania's Lake Erie Coast* (July 2000)
- *Pennsylvania's Bluff Recession and Setback Program* (July 2000)
- *Botulism* (2003 Update)
- *Mayflies Return to Lake Erie* (January 1999)
- *Introducing Pennsylvania Sea Grant* (January 1998)
- *Clean Boating Tips Fact Sheet* (November 2003)
- *Safe Boating Tips Fact Sheet* (November 2003)

The 2003 Pennsylvania Sea Grant biennial report, which summarizes Pennsylvania Sea Grant activities conducted during the 2001-2003 calendar years as well as outlines plans for future growth, was distributed along with our Summer 2003 newsletter.

c. Year 7 Approach

A series of fact sheets related to boating emergencies have been developed in conjunction with Erie surgeon Dr. John C. Lyons as part of Pennsylvania Sea Grant's Fleet Surgeon program. It is our plan to make these available throughout the Sea Grant Network. Selected topics include:

- *Fish Hook Injuries*
- *Boating Night Vision*
- *Lightning on the Water*
- *Safety Aboard the Ship*

Additional fact sheets will be developed as needs and issues arise.

4. PUBLIC AWARENESS

Pennsylvania Sea Grant's communication efforts include several activities that are designed to enhance its image and public awareness, while providing information of value to community groups and individuals.

a. Media Relations

Purpose

Use of news media allows Pennsylvania Sea Grant to reach a mass audience

with information about activities and accomplishments.

Progress to Date

During Year 6, Pennsylvania Sea Grant solicited the media expertise of Jim Stewart, executive director of the Bayfront Center. Jim has years of direct experience with television production and promotion. Jim assisted staff as it cultivated relationships with local and regional media sources. These relationships have resulted in the generation of positive coverage as well as the use of Pennsylvania Sea Grant staff as experts for various issues. Media outlets on Pennsylvania Sea Grant's distribution list for the Lake Erie area include two wire service offices, three daily newspapers, six weekly newspapers, five television stations, and 17 radio stations. Media outlets on Pennsylvania Sea Grant's distribution list for the Delaware Estuary include 38 daily and weekly newspapers, 10 television stations, and 15 radio stations.

In addition, Sea Grant staff has been involved in five television interviews and over 30 newspaper articles. Topics have included the development of the Presque Isle Center, aquatic invasive species (round goby, zebra mussels, water fleas), avian botulism, local land use, Lake Erie water levels, and educational programming.

Year 7 Approach

Pennsylvania Sea Grant would use the services of Jim Stewart as it continues the cultivation of relationships with media outlets that serve the Lake Erie and Delaware Estuary watersheds. In addition, staff would maintain existing contacts with regional newsletters published by the Great Lakes Commission and the International Joint Commission while exploring the establishment of new contacts with other agencies.

b. Displays

Purpose

To set up the Pennsylvania Sea Grant display in order to create increased awareness of activities. Pennsylvania Sea Grant staff identifies local and regional events with high visibility for the display.

Progress to Date

Pennsylvania Sea Grant has two displays: a four-panel display and a new multipanel floor display. Information, photographs, and graphics have been used to convey introductory information about Pennsylvania Sea Grant as well as details on fish advisories, aquatic invasive species, watershed delineation, and other specialized topics. In Year 6, Pennsylvania Sea Grant set up displays at the Erie Outdoor Show, Discover Presque Isle, Coastal Connections, Southeast Pennsylvania Coast Day, and Penn Aquaculture Conference.

Year 7 Approach

Pennsylvania Sea Grant would set up exhibits at and participate in the events noted above, as well as at additional events as opportunities arise.

c. Promotional Items

Purpose

To create an awareness of Pennsylvania Sea Grant through the development and dissemination of informational and novelty items.

Progress to Date

A variety of promotional items have been used by Pennsylvania Sea Grant to create awareness in the Lake Erie and Delaware Estuary regions, while delivering valuable information to selected audiences. One approach has been the continued production and distribution of items that incorporate useable information and the Pennsylvania Sea Grant logo:

- Emergency whistles that connect to flotation devices were produced in cooperation with the Safe Boating Task Force in Erie
- Revised bumper sticker, now 23-inches, with fish consumption advisory information related to the Pennsylvania waters of Lake Erie and Presque Isle Bay
- 11-inch bumper sticker with information about the round goby, an aquatic invasive species inhabiting Lake Erie
- 15-inch bumper sticker with information about the flathead catfish, an aquatic invasive species found in the Delaware Estuary
- 6-inch ruler with the Pennsylvania Sea Grant Web site address, primarily for a student audience
- Lake Erie watershed map with Pennsylvania Sea Grant information
- Zipper pulls with Pennsylvania Sea Grant logo
- Hats and jackets for advisory council members and staff members to increase recognition of Pennsylvania Sea Grant along the coastline
- Pennsylvania Sea Grant poster with tear-off return address postcards for requesting information
- Coffee cups and mugs with logo
- Floating key containers with logo
- Compass and thermometer keychains with logo
- Pennsylvania Sea Grant flags on the Lake Erie bayfront
- Additional items with the Pennsylvania Sea Grant logo, including pencils and plastic bags

Year 7 Approach

Plans include continuation of these efforts in the Lake Erie and Delaware Estuary regions, including the addition of other products as determined by staff.

d. Involvement in Community Initiatives

Purpose

Pennsylvania Sea Grant staff collaborates with various community initiatives and organizations that have related missions in order to complement its outreach activities.

Progress to Date

Staff has represented Pennsylvania Sea Grant at a variety of events throughout the years and continues to be directly involved with numerous local, state, and national organizations. Involvement includes provision of advice, leadership, etc. In addition, staff has made numerous presentations to community-based organizations.

Current organizational involvement and representation by staff:

- Earth Force national board of directors
- Lake Erie-Allegheny Earth Force Community Advisory Board chair
- Pennsylvania's sport fishing representative on the Lake Erie Advisory Committee for the Great Lakes Fishery Commission
- Chair of the research subcommittee of the Presque Isle Partnership
- Member of the fish research subcommittee of the Presque Isle Advisory Committee
- Member of Presque Isle State Park's Presque Isle Center task force
- Chair of the research oversight team for the Presque Isle Center
- President of Regional Science Consortium at Tom Ridge Center at Presque Isle
- Member of Presque Isle State Park Advisory Board
- Chair of program leaders for the Great Lakes Sea Grant Network
- Great Lakes Aquatic Nuisance Species Panel - Pennsylvania alternate
- Member of Pollution Prevention Partnership, Environmental Responsibility in Erie (P³ERIE) board of directors
- Member of Great Lakes Information Network (GLIN) advisory board
- Member of Erie Safe Boating Task Force
- Member of Northwest Pennsylvania Regional Outreach Council
- Member of Partnership for the Delaware Estuary Public Participation Implementation Team
- Member of Delaware Estuary Program Fish Consumption Advisory Team
- Member of Delaware River Basin Fish and Wildlife Management Cooperative Committee
- Member of Heritage Conservancy Nonpoint Pollution Education for Municipal Officials (NEMO) Steering Committee
- Member of Route 5 Scenic Byway Corridor Management Plan Committee
- Member of Pennsylvania Lake Erie Watershed Association (PLEWA)

- Member of Millcreek Township Planning Commission
- Member of Northwest Pennsylvania Planning Association
- Member of Weed and Seed Program Economic and Neighborhood Revitalization Committees

Samples of speaking engagements include:

- Geographic Information Systems (GIS) presentation for local high school students involved with the Pennsylvania Sea Grant educational program “Get Watershed Education Team (W.E.T.)”
- Aquatic Invasive Species (AIS) presentation for the Erie Power Squadron
- *Environmental Rediscoveries* educational program presentation for various groups and events, including Erie Rotary Club, Sertoma Club, Y-Mens Club, Great Lakes Sea Grant Network Conference, Presque Isle Partnership Environmental Conference, and the Penn Future Environmental Conference
- Environmental issues presentation for Penn State Behrend students
- Great Lakes Environmental issues presentation for Thiel College
- Exotic species presentation for Glenwood Elementary School’s science fair
- Botulism presentation for various groups and events, including Kiwanis Club, Presque Isle life guards, Presque Isle Bay Advisory Committee meeting, and Great Lakes Fisheries Commission meeting in Thunder Bay
- Pennsylvania Sea Grant presentation for Outreach Roundtable at Penn State Behrend
- Tom Ridge Center presentation to Penn State Behrend biology department
- Electroshocking demonstration for the “Get W.E.T.” program and Pennsylvania Governors School of Excellence
- Aquatic Invasive Species and an Introduction to Hazard Analysis of Critical Control Points (HACCP) Training at PennAqua 2002
- Flathead Catfish and Other Invasive Species, Fairmount Park Environmental Education Staff Meeting
- Flathead Catfish and other Delaware Estuary Invasive Species, Delaware River Fishermen’s Association
- Pennsylvania Sea Grant Overview, Fort Mifflin on the Delaware Board of Directors

Year 7 Approach

Pennsylvania Sea Grant would maintain existing involvement with various community groups while seeking new opportunities in the Lake Erie and Delaware Estuary watersheds.

e. Legislative Support

Purpose

Critical to the success of Pennsylvania Sea Grant is the need to generate legislative support for the program and its activities. Generation of such support is accomplished through the development of relationships with legislators and their support staff, thereby allowing Pennsylvania Sea Grant to provide services of value to their constituents.

Progress to Date

Pennsylvania Sea Grant staff provided state and federal legislative offices with information about Sea Grant and continues to act as a resource for office staff. This outreach effort has been successful in generating awareness of and support for continuance of a \$250,000 line item for Pennsylvania Sea Grant in the Commonwealth of Pennsylvania's budget, and support of Sea Grant's federal reauthorization and appropriations.

Year 7 Approach

Pennsylvania Sea Grant would maintain existing relationships with state and federal legislators while seeking to establish new relationships with legislators in the Delaware Estuary region. In addition, staff would explore the establishment of a possible "open house" or other outreach event designed to acquaint government representatives with Pennsylvania Sea Grant activities.

E. SEA GRANT NETWORK INITIATIVES

Pennsylvania Sea Grant staff has become active participants within the regional and national Sea Grant Networks. Pennsylvania Sea Grant now has two offices, Penn State Behrend (Lake Erie) and Delaware Estuary (Chester City). On the national level, Pennsylvania Sea Grant has become an active member of the Sea Grant Association and attends other national meetings such as Sea Grant Week and the Assembly of Program Extension Leaders, Sea Grant Educators Network, and Nonpoint Education for Municipal Officials (NEMO) University. Regionally, staff has been active in a variety of grant submissions and program initiatives in cooperation with the Great Lakes Sea Grant Network, the Mid- Atlantic Sea Grant Network, U.S. Fish & Wildlife Service, U.S. Geological Survey, Great Lakes Commission, and U.S. Environmental Protection Agency (EPA) regions 3 and 5.

Pennsylvania Sea Grant is active in the following network grants and activities.

1. INTERNATIONAL ACTIVITIES

- ***Avian Botulism***
Maintain avian botulism listserv and updates for the Great Lakes Region for United States and Canadian users. Networking with Environment Canada, Canadian Ministry of Natural Resources, U.S. Geological Survey, U.S. Fish & Wildlife Service, and EPA; Ohio, Michigan, New York, and Pennsylvania conservation and health agencies; and Ohio, New York, and Pennsylvania Sea Grant.
- ***Standardized Fish Tumors***
Pennsylvania Sea Grant is leading efforts to develop standardized criteria for conducting histological and fish impairment assessments in United States and Canadian Areas of Concern (AOC), under the jurisdiction of the International Joint Commission (IJC).

2. NATIONAL ACTIVITIES

- ***Aquatic Nuisance Species Hazard Analysis of Critical Control Points (ANS HACCP)***
Facilitated ANS workshops for the U.S. Fish & Wildlife Service North East Region, and presented material at the Penn Aquaculture Conference for the Northeast states.
- ***National ANS Outreach Campaign for the Aquarium Industry and Hobbyist Consumers***
Working with the Great Lakes Sea Grant Network, U.S. Fish & Wildlife Service, and the pet trade industry in developing a national awareness campaign on stopping the intentional release of nonindigenous species into U.S. waterways.
- ***NEMO: Nonpoint Source Education for Municipal Officials***
Working with the National NEMO program housed at Connecticut Sea Grant on the development of a NEMO program for the Erie watershed with possible statewide implementation.

3. REGIONAL ACTIVITIES

- ***Exotic Species Compendium of Activities to Protect the Ecosystem (ESCAPE)***
Collaborated with Great Lakes Sea Grant educators to develop and teach AIS curriculum to secondary and elementary school teachers.
- ***A Collaborative Approach to Advance Implementation of State Management Plans for Prevention and Control of Aquatic Invasive Species in the Great Lakes Region (Great Lakes Commission)***
Great Lakes Sea Grant Network states work with Great Lakes ANS Panel facilitated by the Great Lakes Commission to host workshops to develop state invasive species management plans.
- ***Great Lakes Fishery Leadership Institute***
The institute is a Great Lakes Sea Grant Network initiative to educate angling and conservation groups, and the media on fisheries management principles for the Great Lakes and to encourage active participation in leadership and interaction with governing agencies.
- ***Great Lakes Restoration Workshops***
The Great Lakes Sea Grant Network is working in partnership with the Council of Great Lakes Governors and the Great Lakes Commission to host state-specific workshops to develop priorities for Great Lakes Restoration. Pennsylvania Sea Grant would host a workshop of stakeholders to determine Pennsylvania's priorities.
- ***ANS Mass Media Audience locations***
Worked with the Great Lakes Network to help developed AIS video. This was an AIS outreach campaign on preventing the spread of AIS by angling groups. A professional video was produced by Babe Winkleman and shown on segments of his national show.
- ***Multistate ANS Boater Survey***
Participated in a 2002 multistate boater survey to help assess Delaware Estuary boater risk of interbasin transfer of AIS.
- ***Horseshoe Crab Web site***
Assisted Delaware Sea Grant with the development of a comprehensive Web site on Delaware Estuary horseshoe crabs.
- ***Chesapeake Bay Watershed Faculty Development Scholarship***
Delivered five-day teacher education program to teachers from Chesapeake Bay watershed of Pennsylvania with support of Maryland Sea Grant.
- ***ANS Mid-Atlantic Teacher Training Project***
Two teacher training programs to be done in conjunction with Delaware Sea Grant which specifically address ANS.
- ***Seafood Sense Workshop***
In collaboration with Delaware Sea Grant and Philadelphia County Cooperative Extension, Pennsylvania Sea Grant was instrumental in creating and delivering an annual three-day residential program, *Seafood Sense 2002 and 2003*, which covered seafood safety and preparation issues.
- ***Delaware Estuary Fish Consumption Survey***
Served on the multistate Delaware Estuary Fish Consumption Advisory

Team. The purpose of the group is to pool data and resources and promote consistent, estuary-wide advisement.

- ***Mid-Atlantic Flathead Catfish Symposium***
Hosted a multistate flathead catfish round-table discussion in March 2002 to increase awareness of the flathead introduction and help develop research and outreach agendas.

4. STATEWIDE ACTIVITIES

- ***Pennsylvania Invasive Species Management Plan***
Pennsylvania Sea Grant 's NOAA Coastal Management Fellow Kirstin Wakefield helped facilitate the development of a statewide invasive species management plan. The plan is being developed with input from all the state agencies that have jurisdiction or an interest in the plan's objectives.

V. RESEARCH

A. BACKGROUND

In Year 7, Pennsylvania Sea Grant will receive the designation as Coherent Area Program. This redesignation will result in the addition of a research component to the highly successful outreach activities already in place.

The research component would build on the successful applied research mini-grant program established by Pennsylvania Sea Grant in Year 3. The mini-grant program funded small, focused projects that directly supported ongoing outreach activities. During Years 3-6, nearly \$140,000 of grants were funded. (See Pennsylvania Sea Grant's Web site for more detail – <http://www.pserie.psu.edu/seagrant.>)

The first step in the development of a research component involves the affiliation of Pennsylvania Sea Grant with Penn State's Institutes of the Environment (PSIE). This affiliation would incorporate the administrative and scientific strengths of PSIE. PSIE's mission is to expand Penn State's capacity to pursue the newest frontiers in environmental research by encouraging cooperation across disciplines and the participation of local, state, federal, and international stakeholders.

In particular, the affiliation would allow Pennsylvania Sea Grant to align its environmental research goals with those of the University and take advantage of PSIE's considerable research experience - technical and administrative.

Several actions to be undertaken, which would strengthen the research program of Pennsylvania Sea Grant include:

- The director of Pennsylvania Sea Grant would report to the PSIE director. For purposes of Sea Grant, the PSIE director reports to the vice president for research and dean of the graduate school and the vice president of outreach. This adjustment provides Pennsylvania Sea Grant with a broader, University-wide approach to research, giving it a seat at the University's "environmental table" and better access to University resources.
- Pennsylvania Sea Grant would focus its research efforts in order to have the most impact. To this end, Pennsylvania Sea Grant would select three of PSIE's six research theme areas for its focus: biodiversity and ecosystems, health and the environment, and water resources. Other areas could be added through consultation with Sea Grant's advisory councils.

With the administrative infrastructure in place, Pennsylvania Sea Grant would

administer \$150,000 of research funds in Year 7. In consultation with the National Sea Grant Office (NSGO) staff, it has been determined that the first thrust area would be aquaculture. NSGO and Pennsylvania Sea Grant would initially work with the University of Pennsylvania's School of Veterinary Medicine to identify and support areas of expertise that would be a resource to the entire Sea Grant Network. Areas of interest include nutritional and disease prevention aspects of aquaculture. The funds would be used to support a series of proposals previously submitted to NSGO. Among those projects under consideration would be:

- A fish integrated nutrient system for hybrid striped bass.
- Water quality control, aquatic toxicology, and waste management in recirculating aquaculture systems.
- Control and prevention of infectious salmon anemia.

In subsequent years, continuing efforts would be made to incorporate the statewide resources of Penn State and the expertise of colleagues at other institutions of higher education, especially those within Pennsylvania. Beginning in Year 8, a research competition would be developed and be open to all institutions of higher education in the Commonwealth. Priority would be given to projects that include graduate student involvement and support. Funds would be awarded to Pennsylvania Sea Grant based on successful review of proposals by the National Sea Grant office.

Preliminary details for the competition are included in the next section - Guidelines for Research Proposal Preparation.

B. GUIDELINES FOR RESEARCH PROPOSAL PREPARATION

1. Proposals are due:

- Letter of Intent 5 April 2005
- Full Proposal 7 June 2005

2. Send Proposals to:

Director, Pennsylvania Sea Grant
Penn State Erie
Station Road
Erie, PA 16563

3. For Questions, Contact:

- Logistics - preparation, eligibility, budget, etc.: Director: 814-898-6160
- Technical questions: Eric Obert: 814-898-6453

4. Overview

The goal of Pennsylvania Sea Grant is to increase public awareness and solution of environmental and economic coastal issues through extension, education, research, and communications outreach, thereby improving the overall environmental and economic "health" of the Commonwealth's coastal regions, including the Lake Erie watershed and the Delaware Estuary.

Proposals addressing one or more of the following thrust areas would be considered for inclusion in Pennsylvania's proposal to the National Sea Grant Office: biodiversity and ecosystems, health and the environment, and water resources.

5. Proposal Submission

a. Document Format

Letters of intent and full proposals must be submitted electronically as Microsoft Word or WordPerfect documents. In addition, three copies of each proposal should be forwarded to the Pennsylvania Sea Grant director.

Director, Pennsylvania Sea Grant
Penn State Erie
Station Road
Erie, PA 16563

Letter of intent and full proposal formats can be found on Pennsylvania Sea Grant's Web site: <http://www.pserie.psu.edu/seagrant/new.html>.

b. Principal Investigator Eligibility

Principal investigators must be affiliated with a Pennsylvania academic institution. Principal investigators are encouraged to develop collaborative relationships with researchers at other academic, governmental, or private organizations inside and outside of Pennsylvania.

c. Project Length

Proposals can be up to two years in length and begin on or after 1 September 2005.

d. Primary Proposal Criteria

- Projects must have a direct bearing on Pennsylvania Sea Grant's two geographic areas of interest: 1) Lake Erie watershed of Pennsylvania, including the upland watershed, Presque Isle and Presque Isle Bay, and the adjacent waters of Lake Erie; and 2) Delaware Estuary area of Pennsylvania, including the drainage area of the Schuylkill River and the main stem of the Delaware River, including the 57-mile stretch of coastline.
- University- or college-based projects that have the potential for regional or national application or implication are encouraged.
- Projects should relate to identified Pennsylvania Sea Grant research

thrust areas.

e. Other Project Criteria

- Clear and realistic objectives
- Relation to Pennsylvania Sea Grant objectives
- Relation to Pennsylvania Sea Grant outreach
- Quality and timeliness of deliverables
- Qualifications of principal investigator
- Quality of matching support
- Quality of science or business component
- Potential to further knowledge base of thrust area
- Level of collaboration

f. Selection Process

The selection process would include five levels of evaluation:

- Review of preliminary proposals by panel of non-Pennsylvania experts.
- Review of full proposals that are selected from the preliminary proposals by panel of non-Pennsylvania experts.
- Review of high priority full proposals by advisory councils to ensure relevance to Pennsylvania Sea Grant’s mission.
- Final selection of full proposals by Pennsylvania Sea Grant director, incorporating the three previous reviews and recommendations.
- Review of full proposals by the National Sea Grant program staff and review panels.

g. Matching Funds

At least one-third of the funds must be non-federal. Any combination of state, college/university, and local funds are allowable, including cash and in-kind contributions. All matching funds must be documented and are subject to audit.

h. Proposal Checklist for Full Proposal

- ___ Project Summary
- ___ Proposal
 - ___ Title
 - ___ Key Personnel
 - ___ Background
 - ___ Objectives
 - ___ Approach
 - ___ Timeline
 - ___ Expected Results and Benefits
 - ___ Outreach Component

- ___ Budget Page
- ___ Budget Justification
- ___ Vitae/Resumes
- ___ Appendices (optional)
- ___ Three Copies
- ___ Electronic Submission
- ___ Suggested Reviewers

VI. LONG-RANGE PLAN

A. BACKGROUND

The National Sea Grant Program was established in 1966 to promote wise stewardship of coastal resources. The National Oceanic and Atmospheric Administration (NOAA) within the U.S. Department of Commerce administers Sea Grant.

Until 1998, Sea Grant was represented in all states bordering the Great Lakes and/or oceans, with the exception of Pennsylvania. However, after a decade of effort led by Penn State Behrend, a three-year Sea Grant project was established in Pennsylvania in March 1998.

The Pennsylvania Sea Grant Office is housed at Penn State Behrend. During its initial phase Pennsylvania Sea Grant is referred to as a “project.” Its mission is to increase public awareness and solution of coastal environmental and economic issues through extension, communication, applied research, and education outreach and to improve the overall environmental and economic “health” of Pennsylvania’s coastal regions. The project’s initial geographic focus was the Lake Erie watershed of Pennsylvania. During its fourth year, the project expanded into the Delaware Estuary. Future plans call for an expansion to the Chesapeake Bay watershed.

The project received an initial three years of funding from NOAA totaling \$484,000; with an additional \$416,000 from the Commonwealth and Penn State. Non-federal funds during the initial three years included \$85,000 from the Pennsylvania Department of Conservation and Natural Resource’s (DCNR) general budget, \$81,000 from the Pennsylvania Department of Environmental Protection’s (DEP) shares from the Great Lakes Protection Fund’s interest account, and \$250,000 in Penn State’s budget as mandated during the Commonwealth’s FY 2001 budgeting process.

Pennsylvania’s initial three-year project was funded with the expectation of renewal if the quality and relevance of the project was maintained. The project has received high marks from the National Sea Grant Office (NSGO).

In March 2001, Pennsylvania Sea Grant requested and received an additional three years of funding from NSGO. It is during this period that Pennsylvania Sea Grant began positioning itself to expedite the attainment of Coherent Area Program status. (See Appendix 1, *Sequential Steps to Sea Grant College Status*, for additional information on the various stages of Sea Grant activities.) As a first step, Pennsylvania Sea Grant began to address the five principles for a successful Sea Grant program, which were outlined by NSGO:

- A Pennsylvania program should capitalize on the considerable intellectual talent located throughout Pennsylvania’s universities, public and private.

- Program management should be located at a major research institution, with sub-programs located and administered where appropriate.
- The program should be statewide with research and outreach that focus on Lake Erie, Delaware Estuary, and Chesapeake Bay watershed issues.
- There should be one Sea Grant program in Pennsylvania.
- The institutional framework must establish a way for all eligible institutions to have fair and open access to compete for research funding.

During Years 4 - 6 the following funding amounts were received by Pennsylvania Sea Grant: NSGO (\$515,759), Commonwealth of Pennsylvania (\$955,000), and Penn State (\$152,378). In addition, Pennsylvania Sea Grant attracted a number of extension and applied research grants totaling over \$500,000.

In October 2003, NSGO leadership determined that based on Pennsylvania Sea Grant's performance during its initial six years, that it would be redesignated as a Coherent Area Program beginning in Year 7.

Funding requested for Year 7 (March 2004-February 2005) reflects program status and includes \$386,051 from NSGO, \$380,000 from the Commonwealth of Pennsylvania, and \$46,480 from Penn State.

The long-range plan that follows outlines Pennsylvania Sea Grant's past, present, and future approach to the five NSGO principles listed above.

B. LONG-RANGE PLAN

The long-range plan addresses the following five principles as identified by NSGO leadership.

1. Principle One

A Pennsylvania program should capitalize on the considerable intellectual talent located throughout Pennsylvania's universities, public and private.

a. Current Status

During the initial six years, Pennsylvania Sea Grant has included talent from many colleges and universities: Allegheny College, Mercyhurst College, Edinboro University of Pennsylvania, Gannon University, Westminster College, Philadelphia University, State University of New York - College at Buffalo, State University of New York at Buffalo, University of Windsor, University of Maryland - Eastern Shore, University of Pennsylvania, Penn State University Park, and Penn State Behrend. Faculty, staff, and students from these institutions have served several important functions: advisor on critical issues, augmenters of outreach staff, educators, and applied researchers.

b. Future Plans

As Pennsylvania Sea Grant continues the expansion of its efforts geographically in the Chesapeake Bay watershed and programmatically to include a research program, staff would continue to develop relationships with faculty and staff at other colleges and universities.

Collaborators would augment the broad expertise of the faculty, staff, and students of Penn State University, including strengths in fisheries ecology and management, brownfield issues, soil science, chemistry, GIS and remote sensing, nonpoint pollution, wetlands and toxicology, and environmental resources and engineering.

In addition, beginning in Year 7, Pennsylvania Sea Grant would develop a strategic affiliation with the University of Pennsylvania, especially in areas related to nutritional and disease aspects of aquaculture, and farm pond and closed-system aquaculture strategies. Penn's veterinary program's approach to aquaculture is expected to serve as a resource for the entire Sea Grant Network.

Other current and potential collaborators and examples of their areas of expertise include:

- Temple - stream and lake ecology, trophic interactions of plankton;
- Drexel - environmental policy, groundwater, wastewater, contaminant fate;
- Lehigh - environmental policy, hydrogeology, aquatic ecosystems;

- Widener - ecological education;
- Philadelphia University - contaminant removal from sediment and water;
- Other potential collaborators - Villanova, Millersville University of Pennsylvania, Mansfield University of Pennsylvania, West Chester University of Pennsylvania, and Delaware Valley College.

2. Principle Two

Program management should be located at a major research institution, with sub-programs located and administered where appropriate.

a. Current Status

The current program, with an emphasis on outreach, is housed and administered at Penn State Behrend. Penn State Behrend is an undergraduate and graduate college of Penn State, with approximately 3,700 students and 30 undergraduate and graduate degree programs. In Year 6, the project has a part-time director, four outreach staff in Erie and two in Philadelphia, a liaison to Sea Grant from Pennsylvania's Coastal Zone Management program in Harrisburg, and several student interns.

Beginning in Year 7, the director, located at Penn State Behrend, would report to the PSIE director. PSIE is a University-wide organization that brings together the entirety of University environmental resources.

b. Future Plans

Plans for program status, as outlined in Figure 2, include:

- Program director who reports to the director of PSIE who in turn jointly reports to Penn State's vice president for research and dean of the graduate school and the vice president for outreach.
- Associate directors who oversee each of the program's watersheds - Lake Erie, Delaware Estuary, and Chesapeake Bay (longer-term).
- Penn State Deans Council that provides guidance to the director of the Environmental Consortium.
- Statewide Advisory Council that provides guidance to the program director.
- External review panels for research grants.

3. Principle Three

The program should be statewide with research and outreach that focuses on Lake Erie, Delaware Estuary, and Chesapeake Bay (longer-term) watershed issues.

a. Current Status

Pennsylvania Sea Grant staff act as facilitators for the implementation of many action items that have been identified by local and state organizations. The staff works in tandem with the appropriate individuals and

organizations to determine priority issues and subsequent actions to be taken to address those issues. Staff has cooperated on projects with DEP and DCNR, Pennsylvania's Coastal Zone Management program, Pennsylvania's Fish & Boat Commission, U.S. Geologic Survey, U.S. Fish & Wildlife Service, U.S. Coast Guard, U.S. Environmental Protection Agency, other Sea Grant programs, and others.

The initial focus of the program was outreach in the Lake Erie watershed. More recently, in Years 4-6, staff continued the expansion of outreach to the Delaware Estuary and continued its applied research program. This expansion has been possible through funding from the state and University. As a result of these efforts, Pennsylvania Sea Grant has established outreach programs in the Lake Erie and Delaware Estuary regions and funded over \$125,000 of applied-research projects.

In Year 7, with funding from the NSGO, Pennsylvania Sea Grant would continue its current outreach programs in the Lake Erie and Delaware Estuary watersheds. Future plans call for expansion of the outreach program to the Chesapeake Bay watershed.

As an outreach program, Pennsylvania Sea Grant focuses its efforts in four primary areas:

- Extension - Developing and addressing priority lists of environmental and coastal development/tourism issues in conjunction with regional advisory councils.
- Education - Developing coastal- and watershed-related curricula, out-of-class experiences, and other environmental awareness-raising programs.
- Applied Research - Developing and providing resources for small, applied-research projects that directly support extension activities.
- Communications - Developing outlets for dissemination of extension, education, and applied-research information.

Now in its sixth year, Pennsylvania Sea Grant has made great progress. (See Short-Term Outreach Approach section for detail.)

b. Future Plans

By the end of Year 7, Pennsylvania Sea Grant plans to have the following activities in place:

- An outreach program fully established and staffed in the Lake Erie and Delaware Estuary regions. Delaware Estuary plans include two major thrust areas:
 - Urban coastal land-use thrust would focus on issues such as public access to the river and estuary, habitat restoration, wetlands protection and watershed management, urban coastal smart growth

- development, nonpoint and point sources of pollution, and marine managed areas.
- Coastal environmental thrust would focus on aquatic invasive species (AIS), including development of a statewide management plan in conjunction with related agencies and organizations, threats to native and endangered species, prevention of their spread, ANS Hazard Analysis and Critical Control Point (HACCP) training; and issues such as fish consumption advisories, and fish migration.
- Education programs related to the Delaware Estuary region and to the adjoining Chesapeake Bay watershed, including curricula related to the estuary, living along an urban coast, and aquatic nuisance species.
- Larger research projects would be added in Year 7. It is anticipated that research funds would be allocated in collaboration with the University of Pennsylvania to support an initial aquaculture thrust area.
- Plans for research would be implemented to include processes for:
 - requests for proposals;
 - proposal evaluation;
 - project implementation;
 - measurement of research project impact.

4. Principle Four

There should be one Sea Grant program in Pennsylvania

Based on Pennsylvania Sea Grant's performance over its initial six years as an extension project, in October 2003, NSGO leadership determined that Penn State should be the Sea Grant institution for Pennsylvania. As the institution that led the decade-long effort that brought Sea Grant to Pennsylvania and as the Commonwealth's land-grant university, it is fitting for the University to maintain the lead role.

Having Penn State lead the Pennsylvania effort accrues many benefits to the National Program:

- State financial support - over \$300,000 in annual cash support already procured, including a \$250,000 line item in the DEP's budget.
- State program support - the Governor's Office and staff, State Senator Jane Earll and her staff, DEP and DCNR, and others have given their support to Penn State's effort.
- Statewide outreach program - expanded to include Lake Erie, Delaware Estuary, and Chesapeake Bay watershed regions, including involvement of cooperative extension.
- Connection to other programs - Pennsylvania's strategic location and Penn State's reputation facilitate the ability to collaborate with five other contiguous Sea Grant programs: New York, Delaware, Ohio, New Jersey, and Maryland.
- Penn State mission - the land-grant mission of the University that emphasizes research, technology transfer, and outreach; including over

\$545 million in research expenditures and \$30 million of environmental research expenditures, annually.

- Faculty, staff, and student expertise - as outlined in Principle One.
- Penn State's statewide network - the statewide network of colleges, campuses, and cooperative extension offices gives the program a wide reach and numerous contacts across the state.
- Connections to state's talented faculty - the intellectual capital of the many colleges and universities located throughout the state would serve as resources.

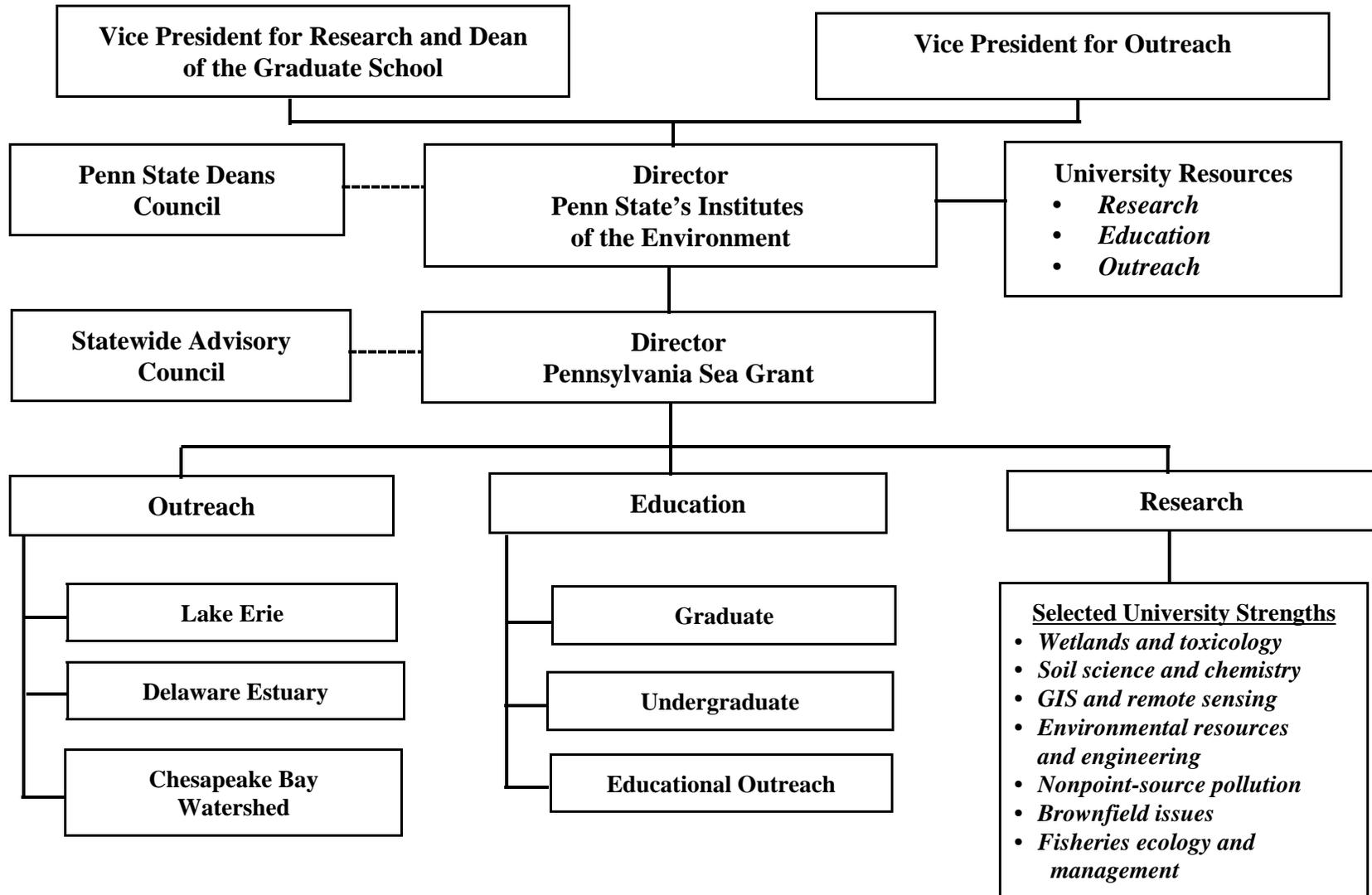
Long-term plans (Year 7) also include an enhanced collaboration between Penn State and the University of Pennsylvania, especially as it relates to Pennsylvania Sea Grant's research component and an initial aquaculture thrust area.

5. Principle Five

The institutional framework must establish a way for all eligible institutions to have fair and open access to compete for research funding.

The research grant program would include a series of grant review panels to evaluate proposals. The purpose of the research program is to support the National Sea Grant Network's mission and specifically the Pennsylvania program; therefore, proposals would be selected based on merit and relevance to the Sea Grant mission and not based on institutional association.

Figure 2. Pennsylvania Sea Grant Long-Term Organizational Vision



Appendix 1. Sequential Steps to Sea Grant College Status

STEP 1 - PROJECT GRANT: This is simply a proposal from an eligible institution to initiate a Sea Grant programmatic activity/project for a given time period.

STEP 2 - COHERENT AREA PROGRAM: Upon successful demonstration of competence, an institutional entity may apply to the National Sea Grant Office (NSGO) to become a Coherent Area Program to conduct Sea Grant activities in a limited geographic area or field. Grants are made to Coherent Area Programs with the expectation of renewal if the quality and relevance of the program is maintained. *Pennsylvania is in this stage of the process, having completed five years of its program.*

Crucial benchmarks during this phase include:

- competency in delivery of outreach program;
- progress in development of statewide outreach program;
- competency in selected applied research area;
- procurement of state funding; and
- progress toward consensus on long-term Sea Grant College organization, including cooperation among state's interested institutions of higher learning.

STEP 3 - INSTITUTIONAL PROGRAM: Eligible institutional entities with demonstrated competence as a Coherent Area Program may propose to the NSGO to become Institutional Programs. Criteria to be met are similar to that for a Sea Grant College.

STEP 4 - SEA GRANT COLLEGE: This is Sea Grant's highest program category. Sea Grant Colleges have broad responsibilities for state, regional, and national activities and engage all of the institutions of higher learning in a state. Only Institutional Programs are eligible, after an appropriate period of time. The Secretary of Commerce, as set forth in the Federal Register, makes the designation. *Average time for attainment of Sea Grant College status is six to eight years after Coherent Area Program is completed.*