

2004 - 2008

*New Jersey Sea Grant
College Program*
Strategic Plan



NEW JERSEY
MARINE SCIENCES
CONSORTIUM



Sea Grant

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NEW JERSEY SEA GRANT COLLEGE PROGRAM **STRATEGIC PLAN 2004-2008**

VISION STATEMENT

The *New Jersey Sea Grant College Program* strives to make a difference in New Jersey and the region by fostering scientific research, facilitating technology transfer, improving marine science literacy among all citizens, contributing solutions to coastal issues, and by promoting sustainability through balanced economic growth and environmental stewardship.

BACKGROUND

The *New Jersey Sea Grant College Program* adopts a sustainability science approach (Kates¹ et al. 2001) to balancing economic growth with environmental stewardship and improved quality of life. The program facilitates collaborative, multi-institutional research and extension partnerships to address coastal issues, and through its extension and education based activities, reaches out to the public, builds bridges between academe, government, industry, and those in management needing reliable information for decision making. With ready access to the National Sea Grant network, *NJSG* is an important source of information for communities and stakeholders in the region. The strength of the *New Jersey Sea Grant College Program* and its parent organization, the New Jersey Marine Sciences Consortium (NJMSC), is manifested through the many cost-share partnerships that fund its marine and environmental science programs.

The Coastal Economy of New Jersey

More than eighty percent of New Jersey's counties border on oceanic or estuarine waters. Eighteen percent of New Jersey's land area is coastal, ranking it fifth in the nation. *Although New Jersey is the fourth smallest state, it is the most densely populated, and the New York and New Jersey metropolitan area is one of the most highly urbanized and industrialized regions of the nation.* The health of New Jersey coastal waters is coupled tightly to watershed management issues that relate to demographics and point and non-point source contaminant inputs. As with other states, New Jersey's coastal economy is integral to its sustained economic development:

- ✓ Port commerce supports a \$31 billion industry;
- ✓ Coastal tourism is a \$17 billion industry;
- ✓ Fishery and aquaculture industries are valued at over \$2 billion.

¹ Kates et al. 2001. Sustainability science. *Science* 292:641-642

Ports Commerce

Located in the midst of the largest and most affluent consumer marketplace in North America, same day access at the Port of New Jersey/New York is provided to more than 18 million consumers, and with its efficient inter-modal infrastructure, the Port provides second-day access to an additional 80 million customers in the US Midwest, southeast and eastern Canada. As a multidimensional transport and cargo center enjoying foreign-trade zone status, the Port of New Jersey/New York handles a wide range of waterborne cargoes – passengers, containers, roll-on/roll off, bulk and project cargo. It is the third largest container port in North America and the largest container center on the East Coast, handling more than 3.7 million TEUs (20-ft equivalent units) in 2002. It is the largest automobile port in the United States, and is also one of the leading centers in the nation for bulk cargo movement, including petroleum products. More than 75 ocean carriers provide regularly scheduled service between the Port and all major trade routes worldwide. Thousands of trucking companies make more than 10,000 pick-ups/deliveries per day and more than one dozen inter-modal rail terminals serve the region. Shipping activities and ports commerce in New Jersey supports 229,000 jobs.

Although individually smaller, New Jersey Ports along the Delaware River (Paulsboro, Camden, Gloucester, Salem, Eagle Point, Burlington, etc.) have a total import volume of \$17 billion. The Delaware River is the second largest petroleum center in the country with eight refineries and processing facilities. Delaware River ports also support high volumes of fruit, wood products, steel, paper, meat, cocoa and scrap metal. In total, Delaware River ports generate \$3.5 billion in revenues and support over 30,000 jobs.

Coastal Tourism

Coastal tourism comprises more than half of New Jersey's \$31 billion tourism industry with a market share largely derived from Philadelphia and New York City whose geographic province combined for more than 50% of overnight person trips in 2001. New Jersey's coastal tourism contributed more than \$17 billion in revenues to the state economy in 2001, supporting nearly 400,000 jobs. Coastal tourism also represents a healthy quality of life for New Jersey residents by serving the recreational, educational, and entertainment needs of individuals and families. These same "quality of life" factors are critical to sustain New Jersey as an ideal state in which to live, work and play.

Fisheries and Aquaculture

Among New Jersey's nine fishing ports, the largest, Cape May has ranked first in the region in value per pound landed for more than 20 years. It provides about half of the state's commercial seafood economy of \$110 million, and contributes to substantial employment in the region. The Port of Cape May-Wildwood consistently ranks among the top two to four largest ports on the East Coast in terms of value landed and in 2001 was the 10th largest fishing port in the United States. Other significant port facilities for the commercial fishing industry are located at Atlantic City, Point Pleasant, Highlands-Sea Bright and Belford-Port Monmouth. Diversity is the defining characteristic of the New Jersey fishing industry with more than 100 species of finfish and shellfish comprising the annual harvest. More than 400 commercial vessels ply New Jersey's back bays and sounds, and venture far offshore as far north as Iceland and south to Puerto Rico to harvest commercial species.

Recreational fishing is no less important to New Jersey. Anglers pursue game fish from beaches, piers, docks and jetties, and from a vast fleet of more than 200,000 state registered vessels, and more than 400 charter and party boats. In 1998, there were an estimated 800,000 recreational anglers making 4.3 million fishing trips for salt-water species in New Jersey. Almost half of these anglers were from out of state. The economic value of recreational fishing ranks New Jersey third among 14 East Coast states.

Biotechnology Potential

New Jersey's pharmaceutical industry also has substantial interest in products from the sea associated with a growing biotechnology infrastructure. The New Jersey Commission on Science and Technology estimates that over 125 companies ranging from the small entrepreneurial development firms to large pharmaceutical firms are active in biotechnology. Among the six states that account for half the nation's research and development expenditures, New Jersey ranks fifth with over \$9 billion invested. Marine biotechnology is a priority area for the *New Jersey Sea Grant College Program*.

SUMMARY

New Jersey is a state endowed with a rich array of both coastal and marine resources, and the value of industries they support is extraordinary, totaling more than \$50 billion dollars, and employing a workforce of more than 1.5 million individuals. This large diversity of economic and natural resources, contained within the nation's most densely populated state, creates intense competition for coastal lands, waters and

resources. Relatively undisturbed regions are under increasing pressure from development and other anthropogenic impacts. New Jersey's coastal communities face enormous pressures to balance growth demand with the protection of its marine and coastal resources. New Jersey's coastline is largely "built" making human safety and coastal hazard mitigation an area of increasing importance to New Jersey.

This brief summary provides the general rationale for the *New Jersey Sea Grant College Program's* emphasis and priorities, and defines its program of research, extension service, education and outreach, and communications. New Jersey's economic growth in ports commerce, marine biotechnology, coastal tourism and aquaculture, provides unique opportunities to build a stronger *New Jersey Sea Grant College Program*. Similar opportunities exist for partnerships with other industries, academe and government to address relevant user needs and viable coastal economic development — while improving the health of our coastal ecosystems.

A FRAMEWORK FOR STRATEGIC PLANNING

Research Programs

National Sea Grant publishes priority research categories in its Annual Program Guidance, and has developed a National Sea Grant College Program Strategic Plan. The intent of these documents is to provide uniformity within the National Sea Grant Network and to encourage multidisciplinary regional approaches.

As we embark upon the 21st century, emphasis on global commerce and the shifting priorities in the national economy make the basic precepts of marine research, education and advisory services even more important today than when NJMSC first introduced the *New Jersey Sea Grant College Program* to the State of New Jersey. The value of New Jersey Sea Grant has grown steadily by directing attention to the changes, challenges, and opportunities represented by the state's extensive and invaluable marine and coastal resources and sustainable economy. To achieve its strategic goals through NJMSC, the *New Jersey Sea Grant College Program* reaches out to all relevant federal and state institutions, industry, conservation organizations, coastal stakeholders, and the public to achieve consensus on coastal issues of concern.

Research Priorities at the NJSGCP

The research priorities of the *New Jersey Sea Grant College Program* are both consistent with, and complementary to the National Sea Grant College Program's Strategic Plan. Seven relevant areas of research have been identified to meet the long-range needs of New Jersey and the region — 1) ecosystems, 2) environmental models, 3) coastal zone management, 4) marine technology and development, 5) biotechnology, 6) fisheries and aquaculture, and 7) socioeconomic, policy and legal studies.

Ecosystems

New Jersey's watersheds and estuaries have been subjected to tremendous development pressures, both industrial and residential. Pollutants in the form of toxic chemicals, pathogens, and nutrients, from a variety of point and non-point sources, have threatened the vitality and quality of local marine ecosystems and marine organisms, and have impaired use of these resources by the public. These pollutants degrade the marine environment and result in adverse health effects, ecological damage, and economic impacts. Consequently, research into watershed dynamics, fate and transport of pollutants, dredged materials management, coastal processes, and coastal ecosystem health remains a priority for the *New Jersey Sea Grant College Program*. Future Sea Grant ecosystems research will continue to provide useful data for management of the state's estuarine resources in light of the many competing, and often conflicting uses.

Environmental Models

The complex nature of marine ecosystems requires a research approach that extends beyond traditional, descriptive studies of local ecosystems. Investigations must focus on fundamental ecological processes that regulate ecosystem structure and function, and the response of ecosystems to natural variability and anthropogenic change. Appropriate management decisions related to coastal resources and coastal zone issues not only require quantitative understanding of the processes involved but also demand accurate models for predicting the impacts of natural and man-made changes.

Coastal Zone Management

New Jersey's inlets, back bays, passages and thoroughfares, barrier beaches, and other coastal features are environmentally, economically, and culturally important. New Jersey has nearly 200 kilometers (127 miles) of beaches, most on fragile barrier islands. However, relatively few of the state's beaches have been spared indiscriminate, haphazard development, which pose severe problems for coastal managers and barrier beach stability. Coastal hazards caused by hurricanes, nor'easters, or other coastal storms annually cause millions of dollars of damage to coastal businesses and communities. In addition, sediment shoaling of inlets, back bays, and other coastal waterways interferes with coastal navigation. New Jersey Sea Grant will focus its activities in this discipline on developing science-based analysis tools for coastal managers based on improved monitoring and modeling of coastal processes, and understanding coastal ecosystems behavior as a consequence of system dynamics and human intervention.

Marine Technology Research and Development

The *New Jersey Sea Grant College Program* will invest in state-of-the-art marine technology and engineering research that addresses coastal issues especially in the area of beach erosion control and coastal hazard mitigation. This focus on marine technology and engineering is partially fostered by the special competence and facilities offered by a number of member institutions.

Biotechnology

New Jersey is home to more than 175 companies that actively engage in research and development in the biotechnology field. Many of the products generated by these firms are household names and are constantly being improved as new technology emerges. New Jersey Sea Grant has engaged its research community in seeking new pharmaceutical and other bioactive products from living marine sources; developing new bioremediation methodologies to eliminate toxic and other chemical pollutants in the marine environment; improving living resource productivity and crop yields by introduction of new technologies in aquaculture; improving identification of different species of marine organisms through new methods of biotechnology including molecular probes; and developing new biotechnological approaches to enhance the quality, disease resistance and survivability of living marine resources.

Fisheries and Aquaculture

New Jersey's fishery resources contribute more than \$2 billion annually to the state's economy. Commercial fisheries in New Jersey rank among the most productive on the East Coast and in the nation. In addition, New Jersey recreational fisheries are among the nation's leaders in terms of angler expenditures, revenue generated, and angler participation. The *New Jersey Sea Grant College Program* conducts extensive fisheries research to assist managers in the development and conservation of commercial and recreational species.

The demand for fish and seafood products in the United States has risen recently as a result of increasing public awareness of the nutritional and health benefits of eating seafood. This demand comes at a time when many traditional fishery resources are being harvested at, or near, sustainable yields. As a result, aquaculture has emerged as a growing US industry that supplements wild fisheries. Although some species are economically feasible to culture in New Jersey, much work remains to facilitate development of commercial-scale ventures. New Jersey Sea Grant will continue to invest resources in promoting the potential for aquaculture enterprises in New Jersey by raising awareness of aquaculture opportunities; helping to reduce impediments to initiate environmentally sound aquaculture businesses; developing proactive programs to manage aquatic organism health and mortality in culture systems; improving the quality of and efficiency of natural and artificial feeds; and improving the profitability of current aquaculture systems.

Socioeconomic, Policy and Legal Studies

Recognition of humans in the landscape, and the need to integrate the social sciences into sustainability approaches to coastal zone management is at the core of modern sustainability science. In order to provide relevant information for the wise use of New Jersey's coastal and marine resources, New Jersey Sea Grant is interested in studies that involve collection and analysis of appropriate socioeconomic and policy-related data and information, analysis of social change, analysis of natural resource management options, suggestions for alternative institutional arrangements, socioeconomic impact studies, and identification of legal and policy constraints to the development of coastal businesses.

NEW JERSEY SEA GRANT COLLEGE PROGRAM STRATEGIC GOALS 2004-2008

New Jersey Sea Grant College Program activities involve more than 50 percent of its member institutions currently focusing in the areas of:

- ✓ Coastal ecosystem health including atmospheric deposition, fate and transport of toxic compounds, harmful algal blooms, dredged materials management; homeland security and preparedness; innovative products from the sea, shellfish disease; habitat restoration; essential fish habitat and aquaculture technology;
- ✓ Technology transfer of ecosystem and marine technology research to product development, resource management, or policy-formulation; and
- ✓ Heightening public awareness of key coastal issues through multimedia tools and pre-college education.

Strategic Goal 1

- ✓ Match the national science agenda with New Jersey's local knowledge, skills and priorities; and
- ✓ Broaden the public knowledge through a wide-range of marine-related basic and applied research in New Jersey and the mid-Atlantic region.

Strategic Goal 1

Identify relevant New Jersey coastal issues through a collective stakeholder process, and seek a balanced and objective response to addressing consensus issues through research, education and outreach

Sea Grant Advisory Board (SGAB)

To strengthen ties between the research and user communities, the *New Jersey Sea Grant College Program* convenes a Sea Grant Advisory Board (SGAB). The primary responsibility of the Board is to provide advice to management and staff in all matters related to coastal issues and the *New Jersey Sea Grant College Program*. This advice encompasses a local perspective on coastal issues, program review and policy development by:

- ✓ Commenting on the focus, orientation and progress of the *New Jersey Sea Grant College Program* in context of changing needs and priorities, program balance, initiatives and new directions;
- ✓ Reviewing pre-proposals and full proposals;
- ✓ Holding discussions with the *New Jersey Sea Grant College Program* Director from the perspective of user groups in each major program area;
- ✓ Assisting the *New Jersey Sea Grant College Program* office in identifying and encouraging participation of appropriate talent in the program;
- ✓ Providing comments to the *New Jersey Sea Grant College Program* applicable to solving problems considered critical to New Jersey's marine-related economy and more broadly, to regional and national needs.

SGAB membership is drawn from a balanced cross-section of New Jersey's user community — marine industries, private citizens, advocacy groups, utilities, and federal, state and local governmental agencies representing: aquaculture, biotechnology, coastal zone management, commercial fishing, environmental advocacy, marine trades, maritime industry, petrochemical industry, pharmaceutical industry, policy and planning commissions, private citizens, recreational fishing, regulatory/resource agencies, and shore tourism.

Scientific Advisory Committee (SAC)

The Scientific Advisory Committee consists of experienced senior scientists from the region, but outside of New Jersey, with expertise in the following: aquatic ecology, biogeochemical cycling, biotechnology, coastal ecology, dredged materials management, ecological engineering, education, environmental chemistry, environmental modeling, fish and shellfish aquaculture, fisheries science and management, shore process and coastal engineering and social, policy and economic sciences.

The SAC provides technical advice and ranking of proposals (or pre-proposals). Working interactively, the SAC and SGAB recommend a "slate" of relevant and technically meritorious proposals to the Sea Grant Director for potential funding.

Strategic Goal 2

- ✓ Integrate ecological with socioeconomic studies to address issues associated with the “coastal commons” – fisheries management, public access, ports, sustainable coastal communities and aquaculture;
- ✓ Promote regional approaches to improved management of limited coastal resources;
- ✓ Contribute to the development of ecosystem-based approaches to fisheries management;
- ✓ Focus landscape level research on essential habitat and “bottom-up” management of fisheries vis-à-vis better understanding between habitat and early life history stages.
- ✓ Meld the science and practice of restoration ecology and habitat restoration;
- ✓ Promote marine biotechnology as a source of useful products from the sea;
- ✓ Employ genetic engineering and other biotechnology techniques to address oyster diseases, improved culture of hard clams and finfish;
- ✓ Develop sustainable, economically feasible, and environmentally “friendly” aquaculture production for existing, new or alternative species;
- ✓ Address source control, fate and transport of toxic compounds in the New Jersey-New York Harbor and Delaware Bay; develop cost-effective and environmentally benign methods for stabilization and beneficial uses of dredged materials, contribute to understanding the underlying basis for harmful algal blooms;
- ✓ Develop applicable solutions for ameliorating coastal hazards, sand retention and promoting the application of natural beach platforms as protective of the public well-being;
- ✓ Improve the understanding of regional coastal sediment transport and shoreline stability factors including bayshore processes;
- ✓ Incorporate existing and future coastal ocean data streams in improved coastal models, forecasting and analysis;
- ✓ Understand the underlying processes of bay shoreline evolution; and
- ✓ Contribute natural and bioengineering solutions to the stabilization and restoration of bay shorelines.

Strategic Goal 2

Develop a coastal research agenda that addresses ecological, social, cultural, and economic issues built on the needs of marine industries, government, resource managers and the public; focus relevant research on stakeholder generated issues whose outcomes and products reach the broadest possible number of New Jersey and regional constituents

Strategic Goal 3

Coastal issues in New Jersey are no less prominent than in other Sea Grant states and, in an austere economic environment, alternatives are constantly sought to supplement limited federal funds with local partnerships. In addition to expanding the overall pool of dollars, partnerships enhance the probability that sufficient funds will be available to support large-scale multidisciplinary projects. In recent years, the *New Jersey Sea Grant College Program* has increased its core funding by more than 40% in local and regional partnerships.

Habitat Initiative

A unique collaboration has developed among the *New Jersey Sea Grant College Program*, other regional Sea Grant institutions, state and federal agencies and the private sector to co-fund basic and applied research in coastal habitats. With an investment of approximately \$700,000 Sea Grant dollars over the past five years, the NJSGCP has secured grants, contracts, co-sponsorship and donations to build a \$4.2 million Habitat Initiative in the region and nationally. Originally focused on one of the largest wetland projects of its kind in the world, the restoration of more than 4,050 hectares of degraded salt marshes on Delaware Bay, a golden opportunity has been proffered to the NJSGCP and its partners to greatly advance our understanding of coastal wetland processes and restoration ecology. The effort will continue to be extended to other coastal habitats in the region, and the melding of science and practice in the restoration process.

Coastal Ocean Observing System Support

As part of the US component of the Global Ocean Observing Systems (GOOS), the coastal component of the US Integrated Ocean Observing System (IOOS) is being developed through regional federations of existing coastal ocean observatories. The Northeast Observing System (NEOS) is currently comprised of 44 academic, industry, state, private and industry partners located between Maine and Cape Hatteras, North Carolina. The establishment of a relevant and useful coastal ocean observing system depends on the identification of constituent needs as well as the form or formats in which the resultant products would be most useful. Because such a wide spectrum of needs are intended to be served by the IOOS, ranging from data for basic research to prediction of evacuation areas in advance of natural hazards to surf forecasts for specific beaches, the broad charge of 'identifying user needs' presents a significant challenge. The fortuitous overlap of spatial coverage and disparate user groups between the Sea Grant effort and NEOS permits a ready collaboration at a regional level.

Strategic Goal 3

Expand the New Jersey Sea Grant College Program capabilities through local and regional, academic, municipal, private sector, and government partnerships

Scientists involved with the initial implementation of NEOS have already begun to establish contacts with state and federal agencies actively working with ocean information. However, outreach to those outside of science-based investigation-management of the coastal zone is needed. The *New Jersey Sea Grant College Program* will seek collaborations with other Sea Grant extension offices and regional federations including the Southeast Atlantic Coastal Ocean Observation System (SEA-COOS) to engage coastal data users and address their needs.

Strategic Goal 4

The economic importance of New Jersey's coastal margin has subjected it to increasing development pressure over the past several decades. This trend is expected to continue well into this century. The high economic value of coastal land in the developed state creates tremendous resistance in New Jersey, particularly at state and/or local levels, to alternative, more environmentally attractive uses. Development has led to human-induced perturbations such as eutrophication, degraded water and sediment quality, habitat alteration and stressed ecosystems. In coastal areas in particular, *science-based* management and effective public policy are absolutely critical to both ensuring human health and preserving ecological systems in a state that will not preclude or severely reduce their ecological services and productive uses (Baird 1996).

To a large degree, New Jersey's coastal economy rests on ports commerce, coastal tourism, and fisheries/aquaculture. The state has adopted a watershed management approach to controlling point and non-point source pollution (including atmospheric deposition), reducing contaminant loads and improving water/sediment quality in coastal bays and estuaries, and restoring habitats. The *New Jersey Sea Grant College Program* has been in the forefront of research, education and outreach in coastal ecosystem health (contaminant reduction, TMDLs, etc), habitat restoration, biotechnology, coastal engineering, hazard mitigation, fisheries and aquaculture, and environmental modeling, and has developed working partnerships with the New Jersey Department of Environmental Protection (NJDEP), NJDOT Office of Maritime Resources, the NJDEP Coastal Management Program, New Jersey Department of Commerce, Office of Travel and Tourism, state legislators, and the private sector. To the extent practicable, the Sea Grant Marine Extension Program operates in a *balanced capacity* to address New Jersey's coastal issues, and promote technology transfer and job creation.

Strategic Goal 4

Build capacity in the New Jersey Sea Grant Extension Program (NJSGEP) to reach a statewide audience in all programmatic areas through partnerships and external funding

New Jersey Sea Grant continues to struggle with a lack of growth in the federal Sea Grant program, and currently only 1.5 full time equivalents (FTE) are available from the national funding base for extension personnel in New Jersey, a bare minimum of support to build the statewide program New Jersey desires to implement. Despite these challenges, the NJSGEP is reaching out to its member institutions to develop a quality extension program through the development of Memoranda of Agreement (MOAs) and co-funding of qualified personnel.

NJSGEP, Strategic Objectives

- ✓ Putting MOAs in place to ultimately achieve 1:1 funding partnerships between the *NJSGCP* and the host institutions for a Sea Grant Coastal Processes Specialist; Coastal Ecosystem Health Agent; Recreational Fishing Agent, Commercial Fisheries and Aquaculture Agent, and a Fisheries Specialist;
- ✓ Building accountability into NJSGEP activities by reviewing, updating and assessing impacts of activities (and modifying as necessary) in the previous four-year cycle;
- ✓ Expanding into new geographic and programmatic areas and different geographical regions in the state;
- ✓ Increasing the level and quality of communications within the NJSGEP and its partners;
- ✓ Increasing NJSGEP participation in regional (mid-Atlantic) Sea Grant extension efforts;
- ✓ Strengthening ties to Sea Grant researchers; and
- ✓ Increasing statewide awareness of the NJSGEP.

Strategic Goal 5

New Jersey Sea Grant Communications

New Jersey Sea Grant Communications supports the mission of the New Jersey Marine Sciences Consortium and its *New Jersey Sea Grant College Program* by providing accurate and useful information based on sound science, and delivering it to the public via all appropriate multimedia venues. This, in turn, increases marine science literacy in New Jersey and works in concert with the National Sea Grant Program's Strategic Plan, which lists Education and Human Resources as one of the plan's three key elements.

New Jersey Sea Grant Communications utilizes all available means and media, including print, radio, television, video, compact disc and computer technology, to create products and provide comprehensive services to the New Jersey Marine Sciences Consortium and its *New Jersey Sea Grant College Program*.

Strategic Goal 5

Forge strong ties with the media, legislators, civic leaders, and the public to ensure continued support for marine science research and education

Sea Grant Communications Program Objectives

- ✓ Upgrade *The Jersey Shoreline*, NJSG's coastal magazine by improving the content and quality, and expanding the breadth of coverage, format and readership;
- ✓ Further develop outreach communication geared toward New Jersey legislators, and focus on legislative issues;
- ✓ Increase the number of media contacts and facilitate transfer of information to the National Sea Grant Office and among network colleagues;
- ✓ Increase participation in regional and private partnerships for greater visibility and an opportunity to produce high-quality resource products; and
- ✓ Enhance capability in advanced technology and improve information access via the Internet and the World Wide Web.

Strategic Goal 6

New Jersey Sea Grant Education (NJSGE)

Marine and related environmental science education at all age and grade levels promotes much needed resource awareness and environmental stewardship. It can also serve as a significant tool for achieving greater science literacy. It is impossible to overstate the value of marine and environmental science education in overcoming the well-documented state and national science education shortfall and the perception of general public disinterest in the sciences.

The long-term goal of NJSGE is twofold; a) to deliver educational products and programs that increase environmental awareness, promote economic vitality, and foster stewardship for the marine environment and, b) through these marine science based initiatives, provide support for local, state and national projects that strive to reform and improve the overall quality of science and technology education for all students.

NJSGE currently offers a summer college program for undergraduate and graduate students, field trips, after school and classroom programs for pre-college audiences, professional development for pre-college educators, family science initiatives including weekend seminars and camp programs and a number of public outreach events. All offerings promote marine and environmental science literacy while fostering greater understanding and stewardship for the marine environment.

Strategic Goal 6

Provide and promote marine science literacy for all New Jerseyans and contribute to the development of a more scientifically literate citizenry in possession of the skills and knowledge to make informed decisions that bring about desirable change

NJSGE's pre-college programs, known collectively as *The Coastal Experience*, serve more than 22,000 students each year. Students and teachers from school districts throughout the state as well as members of organized youth, adult, scout and civic organizations participate in this series of programs "hands-on" with education staff. Typical activities include field and classroom investigations of barrier beach and salt marsh environments. Professional development workshops are offered that support these student programs, help educators integrate ocean science into their classroom program and model best teaching practices. All education programs, including self-produced curriculum materials are aligned to state and national Core Content Standards to support New Jersey's efforts in education reform.

New Jersey Sea Grant Education Program Objectives

- ✓ Develop and deliver marine education programs to college and pre-college audiences, educators, and other interested parties;
- ✓ Develop and deliver marine education programs that increase public awareness of marine resources and the need to conserve and wisely manage them;
- ✓ Strengthen, support and enrich other activities at the NJMSC/NJSGCP by integrating appropriate education and extension components.
- ✓ Develop and implement education programs that reach under-resourced and under represented groups, including women, minority groups and underprivileged students.

These objectives guide the pre-College and College Education Program both in content and inspiration. Current and future NJSGE activities are planned in concert with the National Sea Grant long-range education plan to:

- ✓ Contribute to the development of a more scientifically literate citizenry who possess the skills and knowledge to make informed decisions and bring about desirable change;
- ✓ Improve the environmental ethic of our populace; and
- ✓ Better educate and train pre-college teachers in science, mathematics and technology.

In addition these objectives will be directed towards:

- ✓ Improved student interest and performance in the sciences and strengthening the pool of students attracted to and retained in graduate and undergraduate studies in science and engineering;
- ✓ Increased participation of women and minorities in science and engineering;
- ✓ Developing, improving and disseminating relevant curricula and providing educators with effective teaching tools; and
- ✓ Encouraging partnerships with other groups, including corporate entities, to further marine science education.

Marine Science Education for Under-Represented Groups

Although NJSGE programs reach a wide audience, they are often inaccessible to New Jersey's less affluent students. In general, little marine and environmental science education *in any form* is readily available for these students. The contribution these disciplines might make towards correcting the shortfalls faced by these students in science, mathematics, and technology education goes largely untapped.

The issue manifests itself in our colleges and ultimately in our workforce. Individuals of African-American and Hispanic descent make up nearly 25% of the nation's population yet comprise only 7% to 9% of the engineering, science and technology workforce (National Science Foundation 1999). To address this inequity, NJSGE has implemented several minority outreach projects:

- ✓ *A Partnership for Learning (APFL)* supports the NJMSC's long-standing policy towards equal access for *all* students in marine science education. The program proactively seeks to increase minority student interest in marine and environmental science through hands-on experiences. The program starts with professional development that gives teachers the tools and skills they need to realize the benefits of marine and environmental science education for their students. These include increased science literacy, environmental stewardship and greater achievement in all subject areas, especially science, mathematics and technology. The program is also designed to help teachers meet and exceed their goal of proficiency in New Jersey's Core Curriculum Content Standards. For NJSGE, not the least of our goals is the purely "selfish" motive to help recruit the next generation of marine and environmental scientists from a vastly underutilized pool of talent. Over the past four years, seven corporations have joined NJSGE to co-sponsor *APFL* professional development, field programs and in-school visitations for more than 8,000 students and 150 teachers.
- ✓ NJSGE has partnered with the New Jersey Institute of Technology (NJIT) to initiate PROJECT GRAD, an intensive summer college experience for high performing freshman and sophomore students from Newark's inner city high schools. Each summer, approximately 100 minority group students spend a week in-residence with NJSGE education staff to explore the discipline of marine science. PROJECT GRAD also includes the contribution of NJMSC researchers as guest lecturers and mentors.
- ✓ Lastly, NJSGE enjoys a long-standing and fruitful partnership with the New Jersey Statewide Systemic Initiative (NJSSI), a National Science Foundation education reform project that works with the state's neediest school districts, known in New Jersey as Abbott or Title One Districts.

Higher Education - Program Development Funds

Program Development funds are essential for program flexibility. Development grants and development funds allocated to research scientists at NJMSC member institutions are used for a variety of purposes, but primarily to support preliminary investigations and background work leading to full research proposals to the *New Jersey Sea Grant College Program* or other competitive grants program. In addition, the *NJSGCP* will institute two additional funding opportunities for *undergraduate students*: 1) a Senior Honors Thesis Program that solicits proposals from undergraduates who will conduct a research study in the summer of their junior-senior year and prepare a research report (modeled after a peer reviewed manuscript) during the fall semester; and 2) Sea Grant research internships for undergraduates to provide experiential field and laboratory opportunities with NJMSC/Member Institution scientists. Other funding opportunities include planning and development of interdisciplinary initiatives, development of innovative education and outreach initiatives, assembling scientists to address emergency situations, or developing state-of-the-art conferences and workshops.

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This publication was supported by the National Sea Grant College Program of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration under NOAA Grant # NA16RG1047. The views expressed herein do not necessarily reflect the views of any of those organizations. **NJSG-03-540.**