

## NYSG's 2006 Impacts

**Sea Grant study estimates that the sport fishing, commercial fishing, and seafood industries contribute \$11.5 billion to New York State's economy.** NYSG's 2001 report values economic activity within these three sectors at \$5.7 billion which, in turn, creates an economic impact on sales of goods and services by NY businesses worth an additional \$5.8 billion. The supermarket/ fish market sector of the seafood industry alone contributed approximately \$700 million to the economy of NY and employed over 10,000 New Yorkers. Such estimates provided an objective starting point in negotiations between NYC and the Fulton Fish Market in its bid to relocate operations. The NY Seafood Council and NY Sportfishing Federation used the study to promote their industries to the public and government. NY's premier economic development agency (Empire State Development) used results to evaluate loans to commercial fishing businesses amounting to over half a million dollars in 2001 alone. Now in its second printing, the first-of-its-kind report continues to be invaluable to legislators, policy makers, resource managers and industry.

**Sea Grant study finds that New York's recreational boaters spend \$2.4 billion annually.** New York ranks seventh nationwide in boater registration with more than half a million registered recreational boats. A 2004 study found that boater expenditures had a \$1.8 billion impact on the state economy. With over 6,000 downloads from NYSG's Web site, the report is being used by the Great Lakes Boaters Federation and the New Jersey Marine Trades Association as a model for their economic studies. The New York Post quoted figures from the study when marine trades organizations sought to secure better dates for the National Boat Show at the Javits Convention Center in Manhattan. Data from the study has helped the Boating Industry Association of Upstate New York retool the marketing of its boat show, the largest in the state. On a local level, managers and planners use the data to make informed decisions regarding marina facilities operations while maintaining a healthy coastal economy.

**Research results presented at a Sea Grant symposium explain how environmental stressors and disease are linked to the 1999 lobster die-off in Long Island Sound and that pesticide spraying was an unlikely cause.** The lobster fishery in Long Island Sound (LIS), once the third major producer of American lobsters nationally with an annual dockside value of over \$30 million, virtually shut down with the 1999 massive lobster mortality in the western fishing grounds. The bi-state LIS Lobster Disease Research Initiative received approximately \$3 million in federal appropriations and funded 17 research projects. Research findings made public in a fall 2004 symposium included that pesticides were unlikely to be the cause of the die-off. Researchers also described effects of temperature and chemical stressors on lobsters, and characteristics of shell disease and a newly discovered immune disease. During the research phase, toxicologists developed a diagnostic tool to measure minute concentrations of pesticides, a technique now being used by Suffolk County to determine impacts of pesticide spraying in wetlands. NYSDEC is considering using the model developed by researchers to predict pesticide flow in coastal areas in their field data collection.

**NYSG seafood safety training expands nationally and internationally to train thousands.** New York's seafood industry is valued at more than \$7.9 billion and employs over 96,000 according to a Sea Grant study published in 2001. NYSG helps the industry identify and implement effective strategies to enhance food safety and quality via a Seafood HACCP Internet training course. More than 1800 students from seafood businesses and from federal and state food safety regulatory agencies in 49 U.S. states and 30 foreign countries have enrolled in the course which enables them to comply with FDA regulations efficiently and economically so that they can stay in business. In related activity, NYSG, its collaborators and the FDA were awarded over half a million dollars to develop a bilingual Internet course on Good Manufacturing Practices.

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**Bringing U.S. tuna and lobster to Japanese markets: knowing the customs helps reverse the seafood deficit.** Seafood products imported into the U.S. from all over the world in 2004 were valued at \$11.3 billion while seafood exports totaled just one-third that figure or \$3.7 billion. But thanks to a trend that started with a Sea Grant researcher, there has been explosive growth of Japanese imports of fresh seafood from the Mid-Atlantic and Northeast. The researcher's systematic examination of the socio-economic structure and cultural contexts that frame the international seafood trade has helped U.S. trade representatives, the American Seafood Institute and the Northeast seafood industry develop high-quality products for Tokyo's bustling Tsukiji Marketplace. The value of U.S. seafood products exported to Japan was 16 to 25 times greater from 2000 to 2005 than the value of seafood products imported from Japan. About 5 percent of all U.S. seafood products that are exported to Japan are from the Northeast, with an annual value of approximately \$1 billion.

**Sea Grant's innovative research technique goes beyond measuring growth in economically-important clams.** In 2004, 234,000 pounds of soft-shelled clams were harvested in NY waters, translating into \$1.28 million paid out to the fishers who harvested them. Sea Grant researchers studying the growth of this economically-important species developed a novel technique to accurately measure small incremental growth of their shells. They found a direct link between metabolism (as measured by respiration rate) and growth, a relationship that can inform decisions by shellfisheries managers and aquaculturists as they plan shellfish harvests. A similar technique was used with hard clams, another economically significant species (with a 2003 dockside value of \$12.4 million) to analyze the growth patterns in years before and after the bays were affected by brown tide. Researchers found that extended exposure to brown tide did not appear to have a large negative effect on hard clam growth and investigation shifted to focus on juvenile clams. The innovative device developed for examining clam shells is now used by some anthropologists to hold and grind fossil teeth. The flow-through chamber used to study the clams has been adapted to examine other sediment-dwelling aquatic organisms.

**Sea Grant researchers provide agencies and anglers with in-depth analysis of Lake Ontario's economically significant salmonine population.** Chinook salmon plays an important role in the Lake Ontario sport fishery, providing multimillion dollar returns to local communities. Sea Grant researchers have extensively studied the relative abundance, growth, and survival of hatchery-reared salmon relative to naturally-produced salmon. Researchers focused on the Chinook salmon of the Salmon River, the major contributor of salmon to Lake Ontario, and developed methods of distinguishing hatchery versus wild Chinook salmon via analysis of otoliths, feeding habits, and water temperature preferences. They concluded that Chinook are successfully reproducing naturally and may contribute as much as 25% of available production to the fishery. Research results have been widely used by NYS DEC, Ontario Ministry of Natural Resources, USGS, and US Fish and Wildlife Service with regard to salmon stocking.

**Sea Grant researchers tackle a threat to the economically significant Atlantic Salmon—Swim Bladder Sarcoma.** The Atlantic salmon is a species vital to the northeast's recreational sport fishing industry. A virus new to North American Atlantic salmon, salmon swim bladder sarcoma (SSBS), was diagnosed in juveniles from Maine in the 1990s. Hatchery-maintained fish with the disease develop tumors that distend the abdomen and displace the swim bladder. Managers are concerned with the risk of transmission to the natural and stocked salmon populations as well as the commercial salmonid aquaculture industry. Sea Grant researchers investigating SSBS found that infected fish could be detected as virus-positive during the fall/winter spawning season, but appeared to be virus-negative if monitored in the spring. This seasonality is critical to developing a sound monitoring program for the disease by managers of sport fishery resources and commercial aquaculturists.

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**Sea Grant addresses uncertainties in Great Lakes fisheries and communicates results through reviews and workshops.** Freshwater recreational fishing has a \$2.3 billion impact on New York State's economy. In New York's Great Lakes region, fisheries managers are challenged with inherent unknowns such as how many fish are present, how many predatory fish can be stocked without overdepleting forage fish populations, and the impacts of invasive species. Sea Grant organized and funded an independent technical review of the Lake Ontario forage assessment program and then, with help from NYS Great Lakes Protection Fund, conducted a workshop for fisheries managers from the Ontario Ministry of Natural Resources and the NYSDEC. A summary report of the review was published and several recommendations have been implemented by USGS and the NYSDEC resulting in an increase in the accuracy of the Lake Ontario forage fish assessment.

**Sea Grant developed a cutting-edge erosion monitoring Web site that disseminates \$7 million of data while saving the state \$10K annually in licensing fees.** Coastal audiences are making better hazard management decisions thanks to the Atlantic Coast of New York Erosion Monitoring Program (ACNYMP) developed and implemented by NYSG, the NY Departments of State and Environmental Conservation, and the Army Corps of Engineers. Three CD-ROMs created with a custom viewing application show \$7 million worth of data on shoreline conditions. With a \$40K grant to work with NOAA's Coastal Service Center, NYSG launched the ACNYMP Data Viewer Web site for use by coastal managers, planners and government officials. By having users view the data from the Web site, the site saves the state more than \$10,000 per year in software licensing fees associated with the CD-ROMs. The Long Island Power Authority used the site to quickly identify suitable locations for a proposed multi-million dollar wind energy farm offshore. Officials are using the site to identify areas in need of erosion mitigation before roads become damaged and to evaluation erosion management strategies for heavily used parks.

**Sea Grant helps Long Island's municipalities meet U.S. EPA Phase II stormwater management requirements.** Through workshops, consultations, and innovative use of GIS, the New York Sea Grant NEMO (Nonpoint Education for Municipal Officials) Program helped Nassau and Suffolk County communities (combined population of nearly 3 million) take a watershed-based intermunicipal approach to address common water quality concerns. For example, Nassau County's coalition of 55 municipalities received \$500,000 from NY State to co-implement their Phase II stormwater management programs, thus reducing the cost of implementation for individual municipalities and helping to avoid possible regulatory enforcement actions for failure to meet federal Phase II requirements.

**Sea Grant researchers found that physical and climatic factors play an important role in controlling dissolved oxygen levels in Long Island Sound, complicating plans by municipalities to implement daily limits of nutrient inputs known as Total Maximum Daily Load (TMDL).** Each year, Long Island Sound, an economically important estuary characterized by high population density and urban development along most of its shore and watershed, experiences conditions of low dissolved oxygen (DO) known as hypoxia. Low DO levels get even lower with the input of excess nutrients from the surrounding watershed. Limits to such inputs (TMDL) are mandated by law. Sea Grant researchers examined historical climatological data of DO, hydrography, salinity, temperature and stratification and found that DO levels are controlled, in part, by physical and climatic factors which are beyond human control. While municipalities are mandated to reduce nutrient loadings into their receiving waters due to current regulations, dealing with hypoxia is not just a matter of simply removing the nitrogen. Research results have been used in Rhode Island as researchers look at long term trends in winds and tides of Narragansett Bay. Results are also useful for agencies such as NYC DEP in conducting water quality surveys.

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**Sea Grant efforts promote stewardship, sustainable tourism, and safe cross-border travel along Lake Ontario.** With \$500,000 in funding from the NYSDEC, NYSG manages the supervision of the Eastern Lake Ontario and Salmon River Steward programs. Dune Stewards plant beach grass, maintain boardwalks and fencing and interact with the public on the responsible use of the beach and dune areas. Salmon River Stewards promote environmentally-sound recreational use of the Salmon River Corridor and provide outreach to the surrounding area, Oswego County, which generates annual revenues of \$45 million from sport fishing. Oswego County is part of the nationally designated Scenic Byways, where the coastal economy relies heavily on water-based recreation and tourism. Sea Grant was a leader in developing an interactive CD, *Driving Financial Sustainability for America's Byways*, to help tourism-related organizations broaden their potential for financially sustaining themselves. Many tourists travel across the NY/ Canadian border in both vehicles and boats. Sea Grant and its partner developed a Web brochure, *Border Crossing Tips for Recreational boaters, RV Owners and Motorists*, that is continually updated as changes in the nation's security level and border-crossing regulations warrant. Over 16,000 border crossing tips have been downloaded and the brochure is promoted by regional radio and TV, the US Power Squadron and Coast Guard divisions, Boating Industries Association of Upstate NY, and the Thousand Islands International Tourism Council.

**A Sea Grant study found that increasing compatibility through education can decrease conflict between traditional lakeside recreational users and Personal watercraft (PWC) users along New York's Lake Ontario waterfront.** Coastal recreation is key to the economy of communities along Lake Ontario's bays, harbors and beaches. The increase in Personal Watercraft (PWC) use has contributed to rising complaints of noise and collisions, and perceptions of crowding and unsafe behaviors by boaters, land owners, anglers and swimmers. Also of concern is shoreline erosion and oil from 2-cycle PWC engines. Using surveys and interviews, Sea Grant researchers looked at perceptions of social acceptability and conflict between traditional coastal recreational users and PWC users, finding that the best way to decrease conflict is to increase compatibility between different user groups as well as keep user groups informed about boating and PWC usage rules. Project results are helping recreational managers provide a forum for experience sharing among different user groups in which they can reduce perceived recreation conflict and increase tolerance. Such education provides PWC users with strategies to avoid conflict such as selecting a quieter 4-cycle PWC motor, acting courteously to other users, or selecting recreational areas that minimize impacts. Information from the research is also supporting policy making and regulatory efforts.

**Sea Grant researchers have made discoveries about the volatility of PCBs in the air and their behavior in the water column, presenting potential consequences of dredging contaminated sediment.** Polychlorinated biphenyls (PCBs), toxic compounds used widely in the electronics industries and banned since the 1970s, persist in river sediments near electronic plants such as those situated on NY's Hudson River. Sea Grant researchers examining PCBs in the water column found that PCBs show a great affinity for particles of sediments—the finer the particle, the greater the attachment. Thus whenever the water is disturbed, resuspension poses a serious risk to water quality. Researchers in another Sea Grant project found that PCBs in exposed sediments were far more volatile than previously recognized, causing a dangerous reduction in air quality. Conclusions from both these lines of research have dire implication for ports, marinas or rivers undergoing dredge operations and have added to what scientists and engineers know about these pervasive contaminants. Sea Grant has published a manual for Hudson River marina operators guiding them through the dredge permitting process; it details the kinds of contaminants (including PCBs) that must be tested for and pinpoints the parts of the River that are likely to contain the contaminants. Over 200 guides have been distributed to marina owners in the lower Hudson who are the stakeholders most acutely aware of the consequences of dredging on the Hudson.

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**A novel DNA technique developed by Sea Grant researchers aids fisheries managers, whether protecting fish species or controlling them.** An analysis of mitochondrial DNA sequences replicated from a tiny piece of a fish's fin can determine to which distinct regional population a fish belongs. Sea Grant researchers developed a DNA technique when determining that Gulf sturgeon is a distinct subspecies of the Atlantic sturgeon, thus reinforcing the designation of Gulf sturgeon as a threatened subspecies. Further Sea Grant studies determined the 19 distinct population segments of the shortnose sturgeon which show slight genetic differences depending on natal estuary. Knowledge of distinct population segments allows managers to reclassify populations doing well enough while leaving others classified as endangered. Currently, as the researchers apply the technique to Atlantic sturgeon populations, the Proactive Conservation Program Coordinator in the Protected Resources Division of NMFS has called for a status review team to assess if a threatened or endangered listing of the Atlantic sturgeon is warranted. The researchers also applied the DNA technique to Lake Ontario and Lake Champlain sea lamprey, concluding that the sea lamprey has been native to these lakes since the Pleistocene and is not a recent invader. This revelation has implications for managers who have based control and eradication policies on the sea lamprey's presumed status as an aquatic invader.

**Sea Grant provides Aquatic Invasive Species outreach to researchers, agencies and communities.** The National Aquatic Nuisance Species Clearinghouse (and its Web site [www.aquaticinvaders.org](http://www.aquaticinvaders.org)), maintained by NYSG has an international user audience, with 100,000 Web site hits from researchers and agencies and an estimated 5,000 bibliographic database searches monthly. The Clearinghouse hosts a library of more than 7,000 publications and publishes a quarterly digest, *Aquatic Invaders*. Another Web site, [www.waterchestnut.org](http://www.waterchestnut.org), is the result of a NY/ Lake Champlain collaboration to bring together prevention and management efforts across the northeast to control these invasive plants that reduce shoreline property values by thousands of dollars. Addressing another potential source of AIS, more than 100 federal, state, tribal, and private resource researchers, managers, baitfish dealers, and enforcement personnel have participated in Aquatic Invasive Species / Hazard Analysis and Critical Control Point (AIS-HACCP) training in New York's Great Lakes/ Lake Champlain region during a series of workshops. Participants bring back to their organization the ability to assess the risks that their activities pose to the spread of invasive species. How to cost effectively treat boating and fishing gear to remove the invasive fishhook waterflea (*Cercopagis pengoi*), which invaded NY's Finger Lakes and Lake Ontario was the subject of a fact sheet published and distributed by Sea Grant. The useful guidelines were distributed to boaters, anglers and field biologists. No further spread of the zooplankton has been reported.

**Sea Grant researchers recommend a halt to the practice of mid-ocean ballast water exchange to decrease the likelihood of transporting invasives.** Since the late 1980s, zebra mussels and other exotic species have invaded the Great Lakes via ballast water from cargo ships, and have caused ecological disruption and infrastructure damage estimated in the billions. A Sea Grant researcher studying trans-Atlantic ships has shown how the practice of mid-ocean ballast water exchange can increase the chances of transporting invasive species. The thin "biofilm" left on ballast water tank walls contains organic slime made of microscopic larvae and bacteria that energetic, gravity-fed reballasting at sea redistributes and resuspends within ballast tanks, hence increasing their viability. Research recommendations made to the Great Lakes Science and Policy Project include inspecting ships entering the Great Lakes via the St. Lawrence Seaway system, even if declared "No Ballast on Board." The researchers recommend that the first re-ballasting of a NOBOB vessel should be modulated to minimize resuspension and water mixing with the settled sediments at the tank bottoms. Furthermore, the researcher recommended that all ballast water discharges be from beneath the water line to minimize the escape of invasives in aerosol form.

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**Sea Grant researchers discovered that invasive species have caused a decline in average dissolved oxygen (DO) in the freshwater tidal Hudson River.** The scenic, historic Hudson River is ecologically unique and commercially valuable. NYSG researchers found a decline in average DO in the Hudson River due to respiration of the invasive zebra mussel (*Dreissena polymorpha*). They also found that the European water chestnut (*Trapa natans*) depletes DO because its leaves cover the water surface, cutting what is below the water line off from atmospheric oxygen; during photosynthesis, the plant releases oxygen back to the air instead of the water. Changes in the food web caused by these invasive species can cause DO declines which are a novel factor to include when considering sources of hypoxia or anoxia (low or zero oxygen). NYS DEC has expressed interest in this research, and as new sewage treatment plants are proposed to accommodate the needs of a growing Hudson Valley population, state and local officials will have to factor in the presence of invasive species while balancing development with safe DO levels.

**Diverse and innovative educational Sea Grant programs reach out to over 16,000 participating students in New York and beyond.** 2004 through 2005 saw a huge jump in the number of educational programs hosted or managed by NYSG educational staff and likewise a quantum leap in the number of K through 12 student participants. In Fall 2005 Sea Grant educators hosted Estuary LIVE, a Web-based field trip, to one of the nation's most densely populated urban estuaries, New York/ New Jersey Harbor Estuary. This NOAA/EPA sponsored event was connected to more than 500 classrooms (58 in NYC) and 11,000 students nationwide. A Sea Grant educator hosted an E-LIVE field trip to eastern LI's Peconic Estuary in 2004, when 700 students from 30 schools logged onto the Web cast. An innovative program to teach students about aquatic invasive species hosted by a Sea Grant educator in partnership with the Buffalo Museum of Science reached 1500 students during 17 distance learning sessions. The Long Island Sound Study small grants program, managed by NYSG for the last decade, has to date funded 131 educational programs totaling more than \$512,000. On National Estuaries Day 2005, nearly 900 students participated in LISS funded activities in NYC and Long Island. The two NYSG educators that teach the NYSDEC sponsored I FISH NY program brought fisheries education to the five boroughs of NYC and to Long Island, reaching more than 1400 students. Over 80 students participated in beach grass plantings at the Beaver Dam Creek habitat restoration site overseen by a multi-agency task force to which Sea Grant belongs.



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