

**SEA GRANT PROGRAM
UNIVERSITY OF SOUTHERN CALIFORNIA**

ANNUAL REPORT: August 2006



THE URBAN OCEAN

**University of Southern California
SEA GRANT INSTITUTIONAL PROGRAM
Wrigley Institute for Environmental Studies
University Park, Los Angeles, California**

August 2006

**University of Southern California Sea Grant Program
Annual Program Report 2005-2006**

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I. Award Reporting

- Institution/Grantee: University of Southern California Sea Grant Institutional Program
- Award Number: NA 16 RG 2256
- Time period: March 1, 2005 – February 28, 2006
- Award Title: University of Southern California Sea Grant Omnibus

INTRODUCTION

The University of Southern California Sea Grant Program adopted The Urban Ocean as its program theme in the 1980s, to reflect the issues and concerns of metropolitan Southern California. This theme is strengthened by the University of Southern California's recognition of the Southern California region as an "urban laboratory" and USC's devotion to helping solve the region's urgent problems, including those associated with environmental quality and public welfare.

Primary areas of concern are detailed in the USC Sea Grant Strategic Plan 2003-2008 (published June 2003 -- USCSG-TR-01-2003). Primary strategic thematic areas are: Water Quality and Coastal Ecosystems, Society and Commerce, Coastal Hazards and Public Safety, and Education.

The USC Sea Grant Program is administered on the downtown campus of the University of Southern California, in the College of Letters, Arts and Sciences. Dr. Linda Duguay has directed the program since September 1999; she also serves as Deputy Director for the Wrigley Institute for Environmental Studies (WIES) and Executive Director of The Tyler Prize for Environmental Achievement. These and other close campus alliances at USC help Sea Grant to participate fully in USC environmental programs, enrich Sea Grant's commitment to education, develop urban and environmental planning initiatives, and ensure that Sea Grant takes advantage of the capabilities of a broad range of USC faculty and staff.

Advisory Bodies

The Sea Grant Advisory Council, comprised of government and industry representatives, stakeholders, and interest group participants, serves as our primary group of advisors for establishing research and outreach priorities. The Academic Coordinating Committee provides input on preliminary proposals and on research priorities; it represents different academic disciplines at USC and a consortium of California State University campuses and Occidental College through the Southern California Marine Institute. The long-standing Resources Agency Sea Grant Advisory Panel (RASGAP), comprised of representatives of state agencies in the California Resources Agency, advises on state research and funding priorities and provides guidance on expenditures of state matching funds at both the preliminary and full proposal stages. Two new statewide organizations, the California Ocean Protection Council (OPC) and the California Ocean Science Trust, provide input on Sea Grant research and outreach initiatives.

State Funding

State matching funds from the State of California continue to be provided at a minimum level. Since 2003, the amount of state funding is \$43,000 due to state budget deficiencies. We have been able to meet federal matching requirements with University funds and matching funds from grantees. In 2006, we will have an additional \$200,000 of funds from the OPC. These funds will be administered in a separate process from our federal omnibus funds. The Call for Proposals for these funds in early 2006 will stress projects contributing to ecosystem-based management for ocean and coastal resources.

ACCOMPLISHMENTS AND OUTCOMES

Partnerships

California Sea Grant. Our relationship with the California Sea Grant College continues as a mutually beneficial collaboration. During the ongoing budget crisis in California, we coordinated with the UC Sea Grant Program to educate California lawmakers and the Governor's Office about the benefits of Sea Grant to the state. We coordinated with Sea Grant Cooperative Extension on proposals for the national fisheries extension program, and we continue to seek new ways to coordinate the programs and develop our programs in cooperative and mutually beneficial ways

National Ocean Service. For three years, the National Ocean Service provided \$100,000 per year in funding for Dr. James A. Fawcett, the USC Sea Grant Marine Transportation/Seaport Specialist since 2002. We are currently seeking new sources to sustain our marine transportation/seaports initiative. With NOS, we have pursued collaborative projects, including participation in the NOS Coastal Storms Initiative (CSI). While primary funding for the CSI will be through the Scripps Institution of Oceanography, we have partnered with CSI to conduct workshops in the Los Angeles and Orange County regions on coastal storms preparedness and most recently on a hazards assessment tool. Our marine transportation program cooperates extensively with NOAA and NOS, with the American Association of Port Authorities, and with the two large ports in our region.

Cal-Fed Bay/Delta Program. This program represents a joint federal/state program with a focus on water supplies and environmental issues in California centered on the huge Sacramento Delta/San Francisco Bay region. The Cal-Fed program previously provided matching funds for the marine transportation/ports and harbors program.

L.A. County Lifeguard Division. The Lifeguard Division of the Los Angeles County Fire Department secured a grant from the U.S. Department of Commerce National Telecommunications and Information Administration. This project developed a system of video surveillance equipment at Los Angeles County Beaches, for purposes of assessing lifeguard needs at underserved beaches, providing footage for use in training, and for monitoring beach use. With the California Coastal Commission and Army Corps of Engineers, Sea Grant made recommendations to the Lifeguard Division both for deployment of cameras, and for use of the video footage for assessing coastal erosion and storm damage, and other research related uses. Sea Grant Associate Director Phyllis Grifman serves as Chair of the Science Advisory Committee. This program has won numerous awards from Los Angeles County as well as from the U.S. Congress and the Department of Commerce. In 2005, Sea Grant collaborated with L.A. County on a full evaluation of the project and the final project report to the Department of Commerce.

University of California, Los Angeles. USC and UCLA were the recipients in 2002 of a five-year National Science Foundation award to create and develop a "Center for Ocean Science Excellence in Education" (COSEE). This program, funded at a level of \$500,000 for five years, has additional partners at informal learning institutions in Southern California – the Natural History Museum of L.A. County, the California Science Center, the Long Beach Aquarium of the Pacific, the Cabrillo Marine Aquarium, and the UCLA Discovery Center. The Los Angeles Unified School District is the major educational partner, along with other smaller school districts in the region.

CalCoast – California Shore and Beach Preservation Association. These two organizations are primarily concerned with coastal processes research and coastal hazards management in California. Sea Grant has for several years been a co-sponsor of statewide conferences aimed at examining management alternatives for beach management, bluff and shoreline erosion and developing plans for protecting public access and safety.

Heal the Bay, California Environmental Protection Agency. Sea Grant worked with local non-governmental organizations in 2004-05 on passage of AB1548, which requires California to incorporate environmental education principles into public school curricula. Since the bill's passage, we have served on the committee empowered to develop the concepts that would be incorporated in state science standards and state curricula.

URBAN COAST “THEME TEAM”

The Urban Coasts Theme Team has been active this past year. We submitted an action plan to the UCTT committee this past spring and asked for comments and suggestions on our proposed approach.

Basic themes on which we are working:

1. Ports and Harbors (including security, ports and coastal zone management, externalities of port operations, economic development aspects of seaports and regional competition for marine goods movement)
2. Coastal pollution and water quality (including sewage disposal, stormwater management, ballast water exchange, etc.)
3. Sea level rise
4. Coastal access and water use (including environmentally sustainable coastal land uses, competition for scarce coastal resources, recreation vs. industry, housing on the coast, boating and marinas, etc.)
5. Coastal structures (including erosion, bluff stability, etc.)
6. Dredging (including disposal and/or treatment of dredged material, beneficial use of dredged material, funding for dredging, etc.)
7. Urban waterfronts (including waterfront revitalization, economic development, conversion of waterfront land uses, coastal dependency, etc.)

Some of our theme team members are cooperating with other agencies in addressing these issues. For example, the seaport specialists have been busy in a joint effort with the National Ocean Service, EPA, and the American Association of Port Authorities as these agencies begin teaching seaports to plan and manage their operations using “Environmental Management Systems (EMS)” that conform to the new International Standards Organization (ISO) standard 14001. The objectives of ISO 14001 are to: 1) “minimize harmful effects on the environment caused by [an organization’s] activities,” and 2) “to achieve continual improvement of [an organization’s] environmental performance.” As the specialists become more involved in this effort, we anticipate that not only Sea Grant research but also training opportunities may arise in this emergent field. This is but one example of the multi-dimensional problems that we will address in the work of the UCTT.

COASTAL COMMUNITIES AND ECONOMIES

In 2005, we began developing a larger scale coastal communities development program using our existing extension staff. The effort, led by Susan Zaleski, accomplished the following.

The California Water and Land Use Partnership (CA WALUP), formerly known as the California NEMO (Non-Point Education for Municipal Officials) Partnership, brings together the California Coastal Commission, California EPA Office Of Environmental Health Hazard Assessment, State Water Resources Control Board, UC Davis Cooperative Extension, Resource Conservation Districts, NOAA Coastal Services Center, UC Santa Barbara, Local Government Commission, and USC Sea Grant.

CA WALUP's mission is to build and support a communication and delivery system that connects needed resources to local officials, land use planners and practitioners resulting in development and retrofit practices that integrate the natural values of CA's watershed and aquatic ecosystems with economic vitality of our communities.

CA WALUP recently secured funding through the State Water Resources Control Board to create educational materials and execute pilot workshops in coordination with a state funded Local Government Commission grant.

Expected Outputs of new project:

- Interactive toolkit of technical resources, models, case studies and policies/practices (CA specific as well as other arid/semi arid region)
- CA ISAT (Impervious Surface Analysis Tool)
- Technical presentation materials for workshops and seminars, and executed workshops, presentations, and seminars:

CA WALUP partners will serve as advisors and help implement workshops throughout the state. USC Sea Grant will continue coordination of the partnership and with strategic planning efforts. We are partnering with the NOAA Coastal Services Center to bring two training sessions to Southern California: (1) Project Design and Evaluation course will be tailored to CA WALUP and include professionals in the area with similar interests; (2) GIS course that will be held for coastal managers.

USC Sea Grant co-sponsored and helped organize a two-day workshop on hydromodification effects on arid streams in collaboration with the California Stormwater Quality Association and the Stormwater Monitoring Coalition. The goal of the workshop was to determine the research needs to answer management questions. This workshop brought together 175 people where researchers and managers presented and discussed the current state of technical understanding and management approaches to mitigating the effects of hydromodification. We wrote a white paper with Dr. Eric Stein from SCCWRP to summarize the workshop and provide research and management recommendations for California. This document will be used to help guide new research endeavors as well as communities' efforts for stormwater management in California.

CALIFORNIA OCEAN AWARENESS CAMPAIGN

USC Sea Grant Communications, in partnership with NOAA Marine Sanctuaries, the Long Beach Aquarium of the Pacific, Sea Web and several other partners, is one of the founders of the California Ocean Awareness Campaign. The campaign, entitled "Thank You Ocean," will be targeted at Californians, and is launching in September 2006. Television, print, Internet, outdoor signs and business-oriented components will convey a stewardship message to all Californians. The campaign will be expanded to national audiences.

MARINE TRANSPORTATION/PORTS AND HARBORS PROGRAM

The program on marine transportation and seaports has actively worked with citizens advisory groups in the San Pedro/Wilmington area to improve communications between the Port of Los Angeles and the public. Information important for the public to understand with respect to port growth and environmental and economic issues needs to be conveyed. Sea Grant has worked with the L.A. Harbor Commission, NGO's, the ports and the advisory councils to help gauge the most effective methodologies for two-way communication.

Sea Grant has also helped to foster communications among scientists and mariners, port managers and navigation officials in order to promote the use of new technologies for ensuring safe maritime practices in and around the Ports of Long Beach and Los Angeles. Researchers at USC and from the Southern California Coastal Ocean Observing System have the opportunity to coordinate available technology with the needs of mariners and maritime businesses. This is a new program which holds much promise for maritime safety and security.

K-12 MARINE SCIENCE EDUCATION

USC Sea Grant has a robust marine science education program, which provides curriculum, teacher training, on-site classroom support where needed, and specialized programs. In addition to playing an active role in the COSEE-West partnership with UCLA and local aquariums and museums, Sea Grant developed and promotes its "Island Explorers" science curriculum to teachers in the Los Angeles Unified School district and numerous other local school districts. This curriculum program, with its affiliated teacher training workshops, both on-site and online, stands as a national model. In addition, USC Sea Grant developed the "Parent-Child Education Program," a six week long science and social learning course for students and their parent partners. This program was adopted by the Exposition Park Intergenerational Learning Center, funded by the City of Los Angeles.

PROJECT COMPLETION REPORTS

Four projects funded in 2004-05 and 2005-06 have been completed or are nearing completion. Projects commenced late from 2004 through 2006 because of late receipt of NOAA funds.

University of Southern California, Jed Fuhrman and Burton Jones; (CE-13) (2004-06) *Factors Affecting Dispersion of Pathogenic Microorganisms in Coastal Waters*

Accomplishments/Outcomes:

This project had multiple goals, relating to the measurement of human-derived pathogenic bacteria and viruses in local outflow plumes, how these are distributed among different size classes that would disperse differentially, and how their distribution relates to other more routinely measured parameters like turbidity, fluorescence, salinity, and temperature. The objective was to provide data that could be used to begin to model pathogen dispersal, especially in the vicinity of outflow plumes such as Ballona Creek and the Santa Ana River.

The results of this research extend beyond the original goals proposed. From the results, watershed loading estimates for nutrients and fine suspended particulate material are being developed. The nutrient estimates are invaluable for interpreting phytoplankton bloom response (including Harmful Algal Blooms) to major storm runoff events. The results generated by collaborations with the ECOHAB and MERHAB programs, and Dr. David Caron's laboratory (USC) and additional funding from SCCWRP (for nutrient, chlorophyll and suspended particulate material analyses) and NASA (for ocean color imagery – to analyze remote sensing observations for the dispersion of particulate and nutrient components from the runoff events) are being presented in papers that incorporate the loading relationships from the various watersheds, evaluating the horizontal and vertical dispersions scales of these estimates, and linking these efforts to remote sensing and ultimately three-dimensional watershed modeling (through further collaboration with University of California, Los Angeles, Jet Propulsion Laboratory, U.S. Geological Survey and SCCOOS) .

There was significant progress in two additional microbiological research areas with the funds provided. First, the researchers fully developed and published (in a high impact ASM journal) a method for rapid and sensitive tests of enteroviruses from reasonably small volumes of fresh and marine water (Fuhrman et al. 2005). This permits sampling of a liter or less and yields good results within as little as 6-8 hours. We also participated in a multi-tiered study of microbial contamination of Ballona Creek that permitted tracking of fecal pollution to upstream sources within this major urban watershed (Noble et al 2006).

University of California Irvine, Raul Lejano and Dele Ogunseitan, and City of Costa Mesa, Gary LaForge; (CM-2) (2004-06) *The Industrial Ecology of the Urban/Ocean Interface: A Systems Perspective on the Optimization of Best Management Practices*

Accomplishments/Outcomes:

Environmental pollution from cities is a major ecological problem attributed to contaminated runoff from nonpoint sources. The US EPA's guidance on implementation of Total Maximum Daily Loads (TMDLs) does not adequately cover methods to improve waters impaired by nonpoint sources. To comply with TMDLs, cities may install filters in curb inlets, or use other Best Management Practices (BMPs). This project tested 10 different filters and found their effectiveness in retaining pollutants ranged from 0 to <90%, depending on combinations of pollutant types (metals, pathogens, and total suspended sediments (TSS)) and filter materials. Hence, the decision to deploy filters into curb inlets must consider land use patterns associated with specific categories of pollutants generated within cities. The researchers developed a geographic information system (GIS)-enabled model for estimating and mitigating emissions of pollutants from urban regions into watersheds. The model uses land use categories and pollutant loadings to optimize strategic placement of filters to accommodate TMDLs. For example, in a city where the land use pattern generates 4×10^6 kg of TSS, 55 kg of Cd, and 2×10^3 kg of Zn per year into 498 curb inlets that discharge into a sensitive watershed, the optimized placement of 137, 92, and 148 filters can achieve TMDL endpoints for each pollutant, respectively. This research has shown further that 158 strategically placed filters effectively meet the requirements simultaneously for all three pollutants, a result at least 5 times more effective than random placement of filters.

Romberg Tiburon Center, San Francisco State University , Richard Dugdale and Frances Wilkerson; (CE-15) (2004-06) *Impact of Anthropogenic Ammonium on Primary Productivity in Estuarine and Coastal Ecosystems*

Accomplishments/Outcomes:

San Francisco Bay has been considered an HNLC or HNLG (high nutrient low chlorophyll or low growth) region with non-limiting concentrations of inorganic nutrients yet low standing stocks of phytoplankton. Most of the studies leading to this conclusion come from the South Bay and little is known about nutrient processes and phytoplankton productivity in the northern and central parts of the estuary. The extensive time series data, collected over 3 years (1999-2003) in Suisun, San Pablo, and Central Bays, describe the availability of dissolved inorganic nitrogen (DIN), silicate, and phosphate and the seasonal contributions of different forms of DIN (ammonium and nitrate) and different sized phytoplankton to the development of seasonal phytoplankton blooms. Regional differences in bloom dynamics are observed with Suisun Bay than San Pablo and Central Bays, except in the abnormally wet spring of 2000. The data suggest that the HNLC condition in the northern and central parts of San Francisco Bay is due primarily to light availability modulated by the interaction between ammonium and nitrate, and the relative amounts of the two forms of the DIN pool available to the phytoplankton. These findings allow the effect of water management changes, i.e., changing DIN loading, to be modeled using the nitrogen productivity data as a framework to understand the importance of different nutrient concentrations in the development of phytoplankton blooms in the northern San Francisco Bay.

University of California Santa Barbara, Gail Osherenko; (CM-3) (2005-07) *California Coastal Zone Management Program: Retaining Agricultural Land in the Face of Urban Growth.*

Accomplishments/Outcomes:

Many factors affect land use decisions in the coastal zone. Agriculture is increasingly threatened by urban growth in California. USC Sea Grant researchers have assembled a rich database and are using it to generate quantitative GIS maps for Santa Barbara and Ventura counties, which range both in scale and in time and content. Coupled with maps that can visually demonstrate not only urban growth in and out of the coastal zone but also the concomitant loss of agricultural land, is a storytelling component compiled from anecdotal evidence gathered through interviews with farmers, government employees and advocacy groups. Finally, the researchers have constructed a sophisticated survey, the results of which will be distributed to both farmers and California public agencies. The results demonstrate the decision-making processes that have led to farmland conversion in coastal areas from the perspectives of landowners as well as the jurisdictional entities that mediate land use change throughout the region. Taken together, these tools (GIS maps and surveys) will inform and educate citizens, coastal zone managers and government officials on the impact of land use decisions and help in the development of better management practices

II. IMPACTS

a. Recent Impacts

Sea Grant develops rapid, sensitive and affordable test for Enteroviruses in fresh and marine water. Pathogenic viruses in nearshore waters present significant threats to human health, and are not detected under current regimes that test for bacterial contaminants in beach waters pursuant to California

state law and Environmental Protection Agency regulations used around the U.S. Sea Grant funded researchers have fully developed and published (in a high impact ASM journal) a method for rapid, sensitive and relatively inexpensive methods to detect enteroviruses from reasonably small volumes of fresh and marine water by real time RT-PCR (Fuhrman et al. 2005). This permits sampling of a liter or less and yields good results within as little as 6-8 hours. Los Angeles and Orange Counties and Southern California Coastal Waters Research Project (SCCWRP) are already utilizing this new technology to monitor and accurately assessing water quality along their recreational coastline. The application of this technology could revolutionize recreational water quality testing and significantly improve protection of human health.

Sea Grant discovers unexpected impact of anthropogenic ammonium on San Francisco Bay ecosystem. Marine ecosystems are complex and their natural cycles can be adversely impacted by even the most well intentioned actions. This appears to be the case in San Francisco Bay where USC Sea Grant researchers have found that the long-term decline in productivity may be due to high levels of NH_4 (ammonium) resulting in part from runoff and from sewage treatment plant effluent. About 30 years ago, as mandated by the Clean Water Act, the San Francisco treatment plants were converted from primary to secondary treatment to correct the problem of low oxygen in some areas of the Bay, however the resulting increase in NH_4 has created the new problem of reduced ecosystem productivity. The San Francisco Regional Water Quality Board is considering the potential management implications of these findings.

Sea Grant research reveals high survival rates in study of barotrauma on rockfishes. Rockfishes released back into the water at depth show few impacts of barotrauma. This is vital and useful information for the development of sustainable recreational catch-and-release fisheries targeting rockfish in California. Fishes released properly at depths similar to those where they were captured show high survival rates. For popular recreational fisheries targeting declining rockfish populations, this study by California State University Long Beach researcher Christopher Lowe will be vital as California State Department of Fish and Game managers develop new management plans under the California Marine Life Protection Act.

Sea Grant and County Partners foster public safety and beach awareness. Sea Grant, with partner L.A. County Fire Department, Lifeguard Division created the “Coastal Monitoring Network,” a web-based portal primarily aimed at promoting safety at L.A. County beaches. L.A. County has successfully and economically adopted the system to improve planning for public safety. Thirty cameras on heavily-used beaches allow the Lifeguard Division to effectively staff lifeguard towers. Beach use varies on a day-to-day basis, and the monitoring program is used by administrators to accurately assess needs. In addition, the website provides a portal for beach users, providing information on water temperature, waves, rip currents, crowd conditions and parking, and beach amenities. For its ability to help the County determine community needs, the project was awarded L.A. County’s “Golden Eagle Award.”

APPENDICIES

a. Management Team and Staff Composition

FTEs (Full Time Employees = 12 man months) Devoted to Sea Grant

Sea Grant Staffing	# of Individuals	# of FTEs funded by Sea Grant \$	# of FTEs funded by Non-Sea Grant \$
Administrative	2.5	1	1.5
Communications	1.5	.75	.25
Extension	2.5	1.5	1
Education	1	.5	.5
TOTAL	7.5	3.75	3.25

Mgmt. Team Member	Position	FTEs devoted to Sea Grant
Linda Duguay	Director	0.35
Phyllis Grifman	Assoc. Director	1.0
Lyndell Whitley	Marine Education Coordinator	1.0
James Fawcett	Marine Transportation/Seaports Specialist	1.0
Susan Zaleski	Coastal Resources Specialist	1.0
Richard Hayduk	Administrative Services Coordinator	1.0
Ruth Dudas	Administrative Assistant	1.0

b. Program Development Projects

Project Title	PI	Federal Funds	Matching Funds
Workshop establishing a research agenda for introduced seaweeds	Steve Murray CSU Fullerton	\$5,000	CSU Fullerton
Stingrays as indicators: assessment of mitigation ponds in the Seal Beach National Wildlife Refuge	Christopher Lowe and Katherine Jirik CSU Long Beach, Department of Biological Sciences	\$5,000	CSU Long Beach
Travel funds to 4 th International Conference on Applications of Stable Isotope Techniques to Ecology, New Zealand. Paper: "Sources of primary production in suspension-feeding mussels (<i>Mytilus californianus</i>) from urban Southern California shores."	Lisa Gilbane (Trainee on Steve Murray project) CSU Fullerton	\$2,000	CSU Fullerton
Study of site fidelity in whitefish around Catalina Island	Christopher Lowe CSU Long Beach	\$5,000	

Sea Grant sponsored the first lecture, at which Judith Kildow and Charles Colgan presented preliminary results of the California section of the National Ocean Economics Project	Linwood Pendleton UCLA	\$2,000	
Funding to purchase bacteriological testing supplies for two research projects in Ballona Estuary and Wetlands.	John Dorsey Loyola Marymount University	\$5,000	LMU
Support for the 4 th International Surfing Reef Symposium, to be held January 05 in Manhattan Beach, CA	Jose Borrero USC Viterbi School of Engineering	\$1,000	Surfrider Foundation
Evaluative study of USC Sea Grant education programs – Parent Child Education Program, Summer Science Programs for Young Women and Men	Tara Rose USC, School of Social Work and Social Science Research Institute	\$15,000	USC Sea Grant
Student intern to work on K-12 science education curriculum	Friends of Ballona Wetlands, L.A.	\$5,000	USC Sea Grant
Student intern to work with the L.A. Lifeguards	L.A. Lifeguards		L.A. County
Funding to develop treatment for education video on coastal processes in California.	Lesley Ewing California Coastal Commission, California, Shore and Beach Preservation Association	\$6,000	
Pilot project on barotraumas in rockfishes (resulting in funded Sea Grant project in 2006-2007)	Christopher Lowe CSU Long Beach	\$5,000	
The Impact of Fire on Mercury Cycling in Coastal Watershed Systems	Terri Hogue, Jennifer Jay UCLA Dept. of Civil and Environmental Engineering	\$5,000	UCLA, NSF
An Investigation of the Link Between Mercury Cycling and Tidal Cycles in a Coastal Wetland Using a Wireless Embedded Sensor Network	Jennifer Jay UCLA Dept. of Civil and Environmental Engineering	\$5,000	UCLA, NSF
Funding to print and distribute to educational institutions (through COSEE and other free-choice learning institutions) posters and learning materials on the kelp forest.	Dawn Navarro Manta Publications	\$2,000	USC Sea Grant
International workshop on sensor-based research in the marine environment	Christopher Lowe CSU Long Beach	\$5,000	CSU Long Beach
Sponsorship of the California World's Ocean Conference 06, September 2006		\$7,000	USC Sea Grant
Funding to implement Parent Child Education Program at Exposition Park Intergenerational Community Center	Lynn Whitley, USC Sea Grant Program	\$7,000	

c. List of Partnerships

Federal
Cal-Fed Bay/Delta Program
Department of Interior, Minerals Management Service
Environmental Protection Agency
NASA Satellite Imagery
National Marine Fisheries Service, Southwest Region
National Weather Service Forecasting Office, Los Angeles
NOAA Office of Global Programs
NOAA National Ocean Service
NOAA Marine Sanctuaries Program
National Aeronautics and Space Administration
U.S. Army Corps of Engineers
U.S. Coast Guard, Marine Safety Office of Los Angeles, Long Beach
Channel Islands National Marine Sanctuary
National Park Service
Office of Naval Research
Naval Research Laboratory
U.S. Coast Guard
U.S. Geological Survey

State Government
California Aquaculture Association
California Resources Agency, California Coastal Commission
California Resources Agency, California Department of Boating and Waterways
California Resources Agency, California Department of Conservation
California Resources Agency, California Department of Fish and Game
California Resources Agency, California Department of Parks and Recreation
California Resources Agency, California Office of Oil Spill Prevention and Response
California Resources Agency, California State Lands Commission
California Resources Agency, California State Water Resources Control Board
California Cooperative Oceanic Fisheries Investigations (CalCOFI)
California Department of Health Services
California Department of Education
California Department of Energy
California Environmental Protection Agency
California Science Center

California State Assembly
California State Senate
California Regional Water Quality Boards: Los Angeles, Santa Ana, San Diego
State Water Resources Control Board
Local Government
Los Angeles County
Los Angeles County Fire Department – Lifeguard Division
Chamber of Commerce
City of Los Angeles Bureau of Sanitation
City of Los Angeles Public Works Agency
City of Los Angeles Environmental Monitoring Division
City of Calabasas
City of Costa Mesa
City of Encinitas
City of Huntington Beach
City of Laguna Beach
City of Malibu
City of Newport Beach
City of San Clemente
City of San Diego
City of Santa Monica
Department of Beaches and Harbors
Department of Environmental Affairs
Department of Parks and Recreation
L.A. County Museum of Natural History
L. A. County Office of Education
Port of Long Beach
Port of Los Angeles
Regional Planning Commission
San Pedro Chamber of Commerce
Sanitation District
Southern California Council of Environment and Development
Superintendent of Education
Topanga/Las Virgenes Resource Conservation District
City of Los Angeles Hyperion Sewage Treatment Plant
County of Los Angeles Department of Public Works
Los Angeles County Sheriff's Department
Los Angeles Harbor Department
Orange County
Bolsa Chica Reserve

City of Dana Point
City of Huntington Beach
City of Laguna Beach
City of Newport Beach
Department of Harbors and Beaches
Orange County Marine Institute
Orange County Sanitation District
San Diego County
City of Coronado
City of Encinitas
City of San Clemente
City of San Diego
City of San Diego Metro Wastewater Department
San Diego Zoo
San Diego County Office of Education
San Diego Bay Interagency Water Quality Panel
County of Orange Health Care Agency
Orange County Department of Public Works
Ventura County
City of Ventura
Ventura County Port District
City of Oxnard
City of Port Hueneme

Non-Governmental Organization
Long Beach Aquarium of the Pacific
Cabrillo Marine Aquarium
California Science Center
Los Angeles County Museum of Natural History
Santa Monica Pier Aquarium
The College of Exploration (Maryland)
American Cetacean Society
Audubon Society
Santa Monica Baykeeper
California Coastal Conservancy
California Coastal Coalition
Ocean Conservancy
Santa Monica Bay Audubon Society
Santa Monica Bay Restoration Project

Surfrider Foundation
California Science Center
California Shore and Beach Preservation Association
Orange County Coastal Coalition
Santa Monica Bay Audubon Society
South Carolina Aquarium
Heal the Bay
Cal Coast

Industry/Business
The College of Exploration
Shelton Fish Descenders
SeaWeb
Quicksilver
Waterborne, Inc.
Responsive Management, Harrisburg VA
Systems Science Applications
URS Greiner Woodward Clyde
United Fisherman's Organization

Academic Institutions
University of California, Los Angeles
University of California, Irvine
University of California, Santa Barbara
University of California, Riverside
California State University, Fullerton
California State University, Long Beach
California State University, Los Angeles
California State University, San Francisco/Tiburon Marine Laboratory
Southern California Coastal Water Research Project
Monterey Bay Aquarium Research Institute
Moss Landing Marine Laboratory
Romberg Tiburon Center, San Francisco State University
Scripps Institute of Oceanography – Coastal Data Information Project
Southern California Academy of Sciences
University of Southern California School of Architecture
University of Southern California School of Engineering

Educational Organizations
Los Angeles County – El Segundo School District
Los Angeles County – Hawthorne School District
Los Angeles County – L.A. Unified School District
Los Angeles County – Lawndale School District
Los Angeles County – Maniatan Beach Unified School District
Los Angeles County – Redondo Beach School District
Los Angeles County – Palos Verdes Unified School District
Orange County School District
San Diego County School District
Santa Barbara County School District
South Bay Advanced Educational Technology Consortium (ADTECH/GOALS 2000)
Ventura County School District
Marine Ecology Institute

Sea Grant Programs
California Sea Grant Program

d. Leveraged Funds (Not shown as match)

Project	Source	Amount	Years
COSEE	NSF	\$250,000	5 (50K/yr)
Calerpa Prevention Outreach & Training	U.S. Fish & Wildlife	\$25,000	2 years
Calerpa Prevention Outreach & Training	U.S. Fish & Wildlife	\$50,000	2 years
Research Experience for Undergraduates	NSF	\$189,990	3 years

e. Publications List (print or electronic)

Reprints:

Peng, Jian, Zeng, Eddy Y. “*An Integrated Geochemical and Hydrodynamic Model for Tidal Coastal Environments*” *Journal of Marine Chemistry*, 45 Pages, (accepted, in print) 2006
(USCSG-R-06-2006)

Wilkerson, Frances P. , Dugdale, Richard C., Hogue, Victoria E., and Marchi, Albert “*Phytoplankton Blooms and Nitrogen Productivity in San Francisco Bay*” *Estuaries and Coasts*, Vol. 29, No. 3, Pages 401-416 2006
(USCSG-R-05-2006)

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Heupel, Michelle; Simpfendorfer, Colin; Lowe, Christopher “Passive Acoustic Telemetry Technology: Current Applications and Future Directions - *Results of the VR2 workshop held on Catalina Island*”
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Bullard, Aimee “Macrophyte Community Structure And Productivity Of Two Southern California Rocky Shores” M.S. thesis, CSUF, Department of Biological Science, USC Sea Grant 2005

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Outreach Materials:

Don’t Release A Pest: Alternatives to Dumping Aquarium Plants and Pets, USC Sea Grant Program, 2006.

Caluerpa Key: Identifying Invasive Species, USC Sea Grant Program, 2006.

Electronic:

University of Southern California Sea Grant Program, *California Water and Land Usage Partnership*
(URL - <http://ca-walup.usc.edu/>)

University of Southern California Sea Grant Program, *Coastal Monitoring Partnership*
(URL - <http://www.watchthewater.org/index.cfm?>)

Don't Release Invasives, Information DVD, USC Sea Grant Program, 2006.

Category	# of Pubs
Peer-reviewed journal articles/book chapters	23
Technical reports	3
Proceedings/Symposia	1
Theses/Dissertations	2
Videos/CDs/DVDs	1
Handbooks/manuals/guides	2
Press Releases	6
Newsletters/Periodicals	
Other (e.g. websites, such as Haznet or SGNIS)	2

f. Students Supported

Students supported by any Sea Grant funds (i.e., hourly support, tuition and/or stipend).

Category	# of new students	# of continuing students	# of Degrees Awarded
Knauss Fellowship	3		
Coastal Management Fellowship	0	0	
Industry Fellowship	0	0	
NMFS/SG Fellowship	0	0	
State Fellowship	0	0	
Sea Grant Supported MS/MA Graduate Students	3	0	3
Sea Grant Supported PhD Graduate Students	5	1	4
Sea Grant Supported Undergraduate Students	2	2	0
Other			
TOTAL	13	3	7

g. Program Awards and Honors

L.A. County Fire Department, Lifeguard Division. L.A. County “Golden Eagle Award” for “Coastal Monitoring Network.” USC Sea Grant Program, partner

CEA-CREST best-poster session award for graduate students at Annual CEA-CREST Conference - Rachel Andrus, San Diego Creek Watershed Project