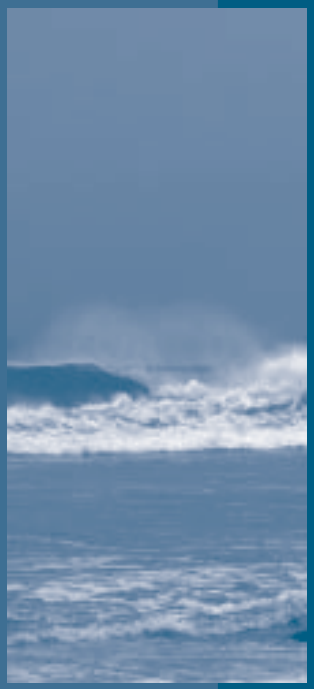
California Sea Grant College Program

2004–2005 Implementation Plan

Introduction



The purpose of this Implementation Plan is to take a manageable set of issues and topics from the California Sea Grant 2001-2005 Strategic Plan and develop those as two-year research and outreach priorities for the program. Many objectives of the Strategic Plan, which has been used as the overall framework for the Implementation Plan, are very broad and as such cannot be reasonably achieved in a few years. The Implementation Plan is intended to provide more specific guidance for California Sea Grant in 2004 and 2005.

The California Sea Grant College Program convened planning meetings in 2001 and 2002 to identify priority areas for Sea Grant support and development of research, education, and outreach programs in 2004-2005. Primary areas where investment of program funds could develop and disseminate sound science for use in managing coastal and marine resources were identified. These broad programmatic areas were further narrowed into goals and objectives for near-term implementation. The approach used by California Sea Grant in the Implementation Plan is not to expect all identified issues to be addressed in 2004-2005. Rather, the plan provides guidance on a wide variety of issues with the expectation that many but not all will result in specific action within the two-year time frame. Below are over 40 priority issues from the 2004-2005 California Sea Grant Implementation Plan.

For many of the issues listed below, activities are already underway and thus the plan provides affirmation that continued efforts over the next two years remain a priority. For other cases, priorities endure from the prior Implementation Plan as unfulfilled mandates. There are a small number of issues where the Implementation Plan calls for the initiation of research and/or outreach that is new to California Sea Grant.

While the Implementation Plan sets forth many priorities for California Sea Grant, all researchers are reminded that creative, basic and applied research directed towards solving problems remains the hallmark of the program. As such, good research ideas that fall outside of the identified priorities remain most welcome at California Sea Grant. In a similar vein, training of graduate students through Sea Grant supported research is an enduring priority.

The reader is encouraged to look through this Implementation Plan for more information on California Sea Grant priorities in 2004-2005, and then focus on the specific issue(s) of interest to them. Beyond what is available in the Implementation Plan, the reader is encouraged to contact California Sea Grant personnel to receive more specific guidance concerning particular research issues. As always, this program thrives on collaborations and partnerships.

Aquaculture Research & Outreach

California aquaculture production was valued at $83 million in 1999 and has the ability to expand significantly through diversification of species cultured and improvements in culture technologies.[1] The need for this expansion is highlighted by the fact that the United States experiences an annual edible seafood trade deficit of $7 billion and over 60% of the fish and shellfish consumed in the U.S. is imported.[1] In response to this need, and recognizing a significant opportunity, the U.S. Department of Commerce established a National Aquaculture Policy to encourage a fivefold expansion of annual domestic aquaculture production from around $1 billion to $5 billion by 2025. There are numerous research and extension needs to be addressed in order to insure California is a strong partner in fulfilling the Department of Commerce's new policy goals over the next quarter century. Examples of some of these challenges are found in California Sea Grant's strategic plan and in the compilation of industry needs developed by the California Aquaculture Association.

California Sea Grant is committed to fostering development of an aquaculture industry that provides high quality seafood for domestic and export markets, while protecting natural resources and enhancing coastal communities. To accomplish this, near term objectives include understanding the environmental interactions of aquaculture; improving animal health, well being, and production; improving product quality; and developing economical diets for cultured species.

[1] Marine Aquaculture: Economic Opportunities for the 21st Century. Developed by the Aquaculture Task Group of the Sea Grant Association, 1999.

Aquaculture

Understanding Environmental Interactions

The aquaculture industry is increasingly in need of sound science to document the environmental impacts of culture operations. This information is needed for existing fish and shellfish culture practices and also for proposed activities as the industry expands and moves to offshore environments.

Understanding Environmental Interactions

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Provide information on environmental interactions to involved parties	Knowledgeable resource managers and informed public	Track the number of individuals provided with information and management changes in response to information provided
Encourage publication of an environmental policy and codes of practice	Publication of an environmental policy and codes of practice	Adoption of environmental policies and codes of practice within the industry
Support research identifying impacts of aquaculture practices	Science-based understanding of the ecological interactions of aquaculture	Management and regulation based on sound science

Animal Health, Well Being, and Production

Fish health continues to be a major priority in California aquaculture production. Specific pathogens dramatically impact production economics and there is a need for improved management and treatment options.

Improved Animal Health, Well Being, and Production

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Support research on genetic improvement of cultured species including transgenics	Improved broodstock and enhanced production traits	Better performance of broodstock and production animals
Support research to refine and develop maturation and larval rearing protocols for new species	Greater availability of fingerlings for pilot and commercial production	Increased production of new species
Improved design and evaluation of culture systems	Improved production economics	Reduced production costs through system improvements
Support research to manage viral and bacterial pathogens	Reduction in disease related losses in cultured animals	Improved production on farms

Improved Product Quality

Aquaculture producers sustain significant losses in revenue when poor quality products reach the marketplace. A better understanding of what impairs product quality and means to improve color, texture, flavor, and shelf life will improve the position of individual producers and the overall perception of the aquaculture industry.

Improved Product Quality

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Support research to improve product quality in aquaculture	Reduced cases of off flavor and improvements in product quality	Monitor incidence of inferior products entering markets

Development of Economical Diets for Cultured Species

The development and refinement of diets for cultured species offers great potential to improve growth, health, and product quality. The California aquaculture industry would benefit from improved diets for abalone, sturgeon, striped bass, and white seabass.

Development of Economical Diets

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Support research to develop, evaluate, and improve diets for cultured species	New or improved diets available for California growers	Utilization of new diet formulations by industry

Coastal Ocean Research & Outreach

California occupies a prominent location on the West Coast of North America with a coastline of more than 1700 kilometers, three major coastal urban centers, an enormous coastal tourism industry, extensive marine resources, and several highly valued commercial fisheries. The California coastal environment ranges from highly urbanized in the southern region of the state to a more rural environment in the northern region. The preponderance of the California population lives near the coast with eighty percent of the residents living within the twenty counties bordering the Pacific Ocean and San Francisco Bay. This widely varying environment provides an enormous suite of resources to California that contributes substantially to the economy of the state.

Coastal tourism and recreation contributes more than $10 billion per year to the state economy and the commercial fishing/seafood industry generates an annual income of $3.5 billion. The competition for resources with urban coasts and intensive tourism creates a major challenge to maintain a high quality environment while at the same time sustain the economy of the region. Against this backdrop California Sea Grant aspires to play an important and vital role by expanding the knowledge of the coastal environment of the state.

Coastal Water Quality Research, Education, and Extension

Protecting California's coastal water quality is essential to support valuable economic activities such as tourism, commercial and sport fishing, shellfish culture, recreational boating, swimming, and surfing. These activities and the coastal and nearshore ecosystems they depend on are affected by point and non-point source pollution from surrounding watersheds and commercial and recreational vessels. The California Sea Grant Strategic Plan for 2001-2005 identified land-based sources of pollution as a priority research need, and the California and National Non-point Source Pollution Plans have also identified marinas and recreational boats as sources of pollution. In addition, the University of California's Division of Agriculture and Natural Resources has identified managing non-point source water pollution as a target issue for priority progress development. The United Nations' Global Program of Action sponsored a binational program in the late 1990's to address land-based sources of coastal pollution in southern and Baja California, and although this program achieved some successes, there remain considerable research challenges and outreach needs.

A high priority in addressing water quality concerns is education and outreach to recreational users of the coast, such as fishers, boaters, swimmers, and surfers, as well as fish and shellfish farmers and natural resource managers. As direct users of the coastal environment, their activities have an impact on coastal water quality and they are in a position to note problems and effect improvements.

In southern California, U.S.-Mexico programs that address cross-boundary water quality concerns are a high priority. Issues of concern include antifoulant hull coatings, sediment transport, mass loading of pollutants, nutrients, agricultural waste, and the need for improved sewage treatment technology– especially wetland-based techniques.

Water Quality

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Encourage the development of cost-effective policies and practices to address pollution from boats, harbors, and surrounding watersheds	Reduced point and non-point pollution of coastal waters	Document development and effectiveness of these policies and practices and their adoption
Encourage development of rapid testing technologies for pathogenic bacteria and viruses to protect human health	Enhanced ability to detect potentially pathogenic microbes and track sources	Utilization of new techniques developed by management and regulatory agencies
Provide education and outreach to commercial and recreational users of coastal resources	Improved knowledge base among coastal resource users and reduced coastal pollution	Number of people receiving and using the information
Continue publishing the binational newsletter "Bight Bulletin"	Education of southern California and Baja California residents on the water quality issues of the Southern California Bight	Number of people receiving the newsletter and using the information it contains
Support capacity building in agencies for collaboration, outreach, facilitation, conflict resolution, and stakeholder participation	Improved resolution of conflicts arising from water pollution; improved collaborative ability among agencies and grassroots organizations; improved ability to conduct outreach	Utilization of facilitation and conflict resolution techniques in public meetings; document increase in collaborative programs and outreach efforts; document increase in stakeholder participation in water quality and watershed policy development, management, and outreach

Invasion of Exotic Species

Exotic species introductions have seriously impacted marine ecosystems in California causing ecological changes that alter food webs and displace native species, thereby incurring economic costs for removal and management, and arousing public health concerns from exposure to exotic pathogens. California Sea Grant has been a leader in supporting research and outreach on exotic species and supported projects that have addressed a range of issues related to understanding and managing marine introductions.

Invasion of Exotic Species

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Support basic research on the life cycle of marine invasive species	Greater understanding of marine nuisance species	Development of techniques to identify and potentially control invading species
Identify specific steps to reduce impacts and spread of invasive species	Effective mechanisms to control movement of invasive species and reduce impacts	New approaches to reducing spread of invasive species
Enhance outreach tools to inform more people about the consequences of new invasions	Continue invasive species outreach programs	Increase number of people reached with outreach information

Conservation Biology

The population of California will increase greatly over the next 20 years. Most of the expected growth will occur in the coastal zone, thus increasing stresses on natural resources. The resulting increased demands for seafood, coupled with improved harvest efficiencies, declining fish populations, and harvest closures will place severe demands on remaining fishery resources. These combined pressures have created a situation where resource managers are struggling to prevent degradation of marine resources while sustaining a commercial fishing industry. There is a need for improved resource management capabilities and new educational programs to prevent continued degradation and unsustainable use of marine resources.

Further complicating marine resource management is the cumulative impacts of stressors on coastal habitats and our lack of ability to understand their nature and mechanisms. The ability to predict changes in coastal marine systems requires an understanding of ecosystems and their responses to natural, physical, and biological stressors in order to differentiate them from the impacts of anthropogenic activities such as coastal development, pollution, resource extraction, habitat alteration, and introduction of exotic species. We also need the capability to improve society's understanding of ecosystem changes and the complex nature of research, education, and outreach in conservation biology.

Coastal Ocean

Conservation Biology

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Research to better understand cumulative impacts on coastal habitats	Improved predictions of impacts on coastal habitats	Degree of match between prediction and outcome in coastal habitats
Develop strategies to understand and improve sustainability of marine resources	New strategies in marine resource management	Improved resource management capability
Research to document natural and anthropogenic stressors in coastal and estuarine areas	Clear distinction between human-induced and natural stressors in coastal areas	Explanations of natural variations in coastal and estuarine areas
Study coastal systems in an ecosystem context	Identification of key linkages within coastal ecosystems	Adoption of new ecosystem-based resource management
Enhance methods to identify and determine intrinsic values of natural resources	Improved understanding of the value of non-consumptive uses of natural resources	Greater public awareness of marine resource management

Coastal Watersheds, Estuaries, and Nearshore Ecosystems

Bearing many similarities to issues of concern in conservation biology mentioned previously, the science underlying relationships between watersheds, estuaries, and nearshore ecosystems is in a nascent phase. To better understand the complex dynamics of coastal and nearshore ecosystems, specific topics of interest to California Sea Grant include sediment transport, mass loading, non-point sources of nutrients and pathogens, biological diversity, and primary productivity. Studies undertaken to better understand ecosystem interactions include habitat quality utilization and assessments, documenting connections between aquatic habitats, and understanding how estuarine filtering capacity impacts juvenile fish and shellfish populations.

Watershed restoration is a high priority for research and extension programs in California in part because there are three federally threatened anadromous fish species in the state, and one is listed on the State's endangered list. In particular, research and outreach involving estuarine restoration and interactions between upland watersheds, the estuary, and coastal processes are of significant interest. California Sea Grant encourages research related to estuary function and restoration, native and non-indigenous fauna, trophic structure, sedimentation, channel morphology, and hydrology.

Coastal Watersheds, Estuaries, and Nearshore Ecosystems

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Identify essential coastal/ estuarine habitats	Agreed-upon list of essential coastal/estuarine habitats	Essential habitats are acknowledged
Investigate sediment, microbial, and pollutant transport in coastal/ estuarine systems	Better knowledge of transport dynamics for key materials	Successful prediction of how some key materials will move in coastal/ estuarine systems
Research and outreach into watershed and estuarine restoration	Improved knowledge about restoration and successful practices and outreach materials	More effective restoration and demand for the products providing information

Fisheries Research & Outreach

California Sea Grant regards numerous fisheries management issues as a high priority. The issues tend to be multidisciplinary and an integrated research and extension approach is needed to help with the difficult resource management problems plaguing the state and nation. The state has embarked on an especially ambitious path to develop fishery management plans that could benefit from Sea Grant collaboration. The Natural Resources Program Planning Advisory Committee of the University of California Division of Agriculture and Natural Resources has also identified Marine Fisheries Management as a high priority target issue. Some of the objectives identified to improve fisheries management include improved communications between managers and stakeholders, integrate social and economic data into management decisions, improved methods for fish population assessments, evaluation of new management schemes, and the need to provide training for current and future fishery managers.

Fish and Shellfish Population Assessments

Improved methods to assess fish and shellfish populations and trends are needed to develop sound fishery management plans in California and elsewhere. In addition to population assessments it is also essential to identify environmental variables that influence population structure, reproductive success, recruitment, and survival. California Sea Grant will encourage proposals that seek to develop cost-effective assessment techniques that provide new approaches and knowledge to increase the effectiveness of fishery management. Increasing knowledge about the impacts of ocean climate on fisheries resources is also a high priority.

Fish and Shellfish Population Assessments

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Develop cost-effective assessment techniques	More cost-effective and accurate information on fish and shellfish populations	Document the data generated by new methodologies in developing management plans; measure costs to obtain assessments
Support research that identifies environmental variables influencing fish populations and quantifies effects	Enhanced ability to forecast fluctuations in fish and shellfish populations	Document improvements in fishery management and population predictability

Developing and Integrating Social and Economic Data in Fisheries Management

There currently is a dearth of information, analyses, and research-based science about social and economic issues related to major California commercial and recreational fisheries. There is also a need to effectively integrate social and economic information into fishery management plans and policy decisions; especially those related to recent fishery-related legislation in California and the design and evaluation of Marine Protected Areas.

Developing and Integrating Social and Economic Data into Fisheries Management

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Support research to document social and economic impacts of different fishery management options Interact with agency staff to facilitate integration of social and economic data into management and policy decisions	Increased availability of science-based information on economic and societal impacts resulting from different management schemes; integration of this data in management and policy development	Document the use of this information in fishery management plans and policy development

Evaluation of Alternative Fishery Management Schemes

Formal fishery management plans have rarely been done in California, but are a high priority. California Sea Grant encourages work that examines management techniques related to spatial management, restricted access, stock enhancement, harvest rights, bycatch reduction, quota-based fisheries, and other management systems. Learning from current management systems and applying that to improve future management efforts is most valuable.

Evaluation of Alternative Fishery Management Schemes

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Encourage work that evaluates different management techniques	Better knowledge base regarding alternative management techniques and their applicability to specific fisheries	Development and acceptance of research on management techniques in mediums useful for fishery managers and stakeholders
Communicate results and evaluations of different techniques to fishery constituents and managers	More knowledgeable stakeholders and resource managers	Survey or interview fishermen and managers on knowledge levels; maintain records on individuals/ groups contacted regarding management techniques

Training Current and Future Fisheries Managers

Training current and future fisheries managers has been identified as a high priority by Sea Grant staff, agencies, academics, and the fishing industry. California Sea Grant will examine additional training opportunities and pursue funding partnerships with agencies and industry to address training and other fishery management issues comprehensively.

Training Current and Future Fisheries Managers

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Expand training capabilities in population dynamics, fisheries economics, and stock assessment	Capacity building and increased understanding by management personnel	Document numbers participating in trainings and capacity building; document effectiveness at capacity building
Encourage reciprocal internships between agency and university professionals	Increased number of internships and enhanced staff capabilities	Document number of internships and their effectiveness at capacity building

Improved Communications in Fisheries Management

Enhanced communications are a priority in fisheries management. Efforts to increase fisheries stakeholders' collaboration in research and close collaboration between Sea Grant Extension Program Specialists and Advisors, fisheries researchers, and management agencies will strengthen fisheries management efforts significantly.

Improved Communications

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Develop a Sea Grant fisheries and seafood newsletter and website	Improved access to and dissemination of information	Maintain mailing list and document distribution and web hits
Improve stakeholder input in management plan development and needed research	More stakeholder involvement and more complete buy-in and acceptance of management plans	Document stakeholder involvement in plan development and acceptance of final plans

Seafood Technology

The California aquatic food product industries provide jobs, healthful food, and useful processed byproducts to the people of California, the nation, and the world. Identified needs in seafood technology include improved handling of products to ensure higher quality seafood to consumers; a need for better seafood safety information among importers, processors and consumers; new or enhanced processing technologies to improve processing efficiency, safety and quality; and new technologies to improve the quality and consistency of aquaculture products. The seafood technology program will emphasize seafood safety and quality during the period from 2004-2005 through research and outreach.

Seafood technology activities will continue close regional and national networking with seafood specialists and researchers, seafood industry representatives, consumer educators, and state and federal regulatory agencies. During the next few years, communications will be facilitated through the use of e-mail, electronic mailing lists, internet video-conferencing, and interactive internet sites. The Seafood Network Information Center (SeafoodNIC) website at the University of California, Davis will be updated and expanded. This will include adding seafood training visuals and materials to the website so that they will be available worldwide, expanding links to related seafood quality and safety websites, and updating the Compendium of Aquatic Product Processes, Hazards, and Controls. Materials to improve consumer and industry knowledge of seafood safety are being generated and/or added routinely.

The seafood technology program will continue to cooperate with the California Department of Health Services, Food and Drug Branch, and the U.S. Food and Drug Administration in conducting three-day Basic Seafood Hazard Analysis and Critical Control Point (HACCP) courses and one-day Sanitation Control Procedures courses for seafood processors and importers in northern and southern California. The program will also continue to cooperate with the National Fisheries Institute, the California Fisheries and Seafood Institute, the Department of Commerce, Western Inspection Branch, National Food Processors Association, and the U.S. Food and Drug Administration in conducting seafood decomposition workshops for commercial analytical laboratories and seafood processors.

Seafood Technology

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Enhance communications through list servers, videoconferencing, interactive internet sites, and improvements in SeafoodNIC	Improved and readily accessible information on seafood technology and safety for fishermen, processors, marketers, and consumers	Number of people who access and use information provided
Research on product handling and processing	Improved product quality and safety	Document product quality and safety
Continue basic seafood HACCP courses and one-day sanitation control procedures courses	Enhanced knowledge of HACCP and sanitation at all levels of the seafood industry	Number of individuals who receive training

Marine Affairs & Policy

Many of the important marine and coastal issues in California and other coastal states rely heavily on policy decisions to develop good solutions to long-standing problems. Reliance on these decisions for marine resource management and the development of good policy was included in the California Sea Grant 2001-2005 Strategic Plan. The section on Marine Affairs articulates four major research and programmatic initiatives, which are: legal, institutional, and policy-process studies; economic studies of fisheries and habitat management; coordination with Sea Grant Extension and other institutions and agencies; and specific research projects. These four initiatives remain the cornerstone of the priorities in marine affairs and policy for California Sea Grant and as such research and outreach are encouraged in all four.

In conjunction with supporting the initiatives identified in the California Sea Grant Strategic Plan, it is important to recognize that various institutional aspects have an important bearing on the ability of the university community to effectively mount research and outreach activities. The view of California Sea Grant is that currently academic marine policy programs are spread diffusely among private, University of California, and California State University system campuses. Addressing California's ocean and coastal resource issues effectively can best be accomplished through coordination and enhancement of marine policy programs including research, graduate education, and outreach among the aforementioned institutions in California and beyond. This is included in the California Sea Grant College Strategic Plan for 2001-2005, and is further developed in this Implementation Plan.

Marine Affairs

Research Priorities and Programmatic Initiatives

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Support legal, institutional, and policy-process studies in marine and coastal issues, outreach, and international law	New insights of law, policy, and social sciences for resolving marine and coastal issues	Document use of findings from policy studies of marine and coastal issues
Economic studies of fisheries and habitat management	A better understanding of the economics of fisheries and habitats	Development of economic frameworks of fisheries and habitats
Additional studies of specific policy topics such as ports and harbors, user conflicts, and ocean governance	As needs arise, studies will be focused on pressing needs such as port and harbor safety	Development of timely information for making key policy decisions

Institutional Development of Research and Education in Marine Affairs, Policy, and Law

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Work to develop marine affairs and policy programs at California universities	A higher level of opportunity for California to develop an academically based set of marine policy programs	Concrete steps taken to develop such programs on a system-wide basis

New Marine Products

California Sea Grant has enjoyed playing a catalytic role in supporting research that has fostered the discovery and development of new marine products. The successes from this research have led to the identification of key products such as anti-inflammatory chemicals, development of a biotechnology company, and identification of molecular probes. Despite the successes of the California Sea Grant research as mentioned above, relatively few other entities have stepped forward to support this type of program. As such, California Sea Grant remains committed to an enduring program in new marine products. The Strategic Plan identifies several topics that are fertile areas of study for potential future discovery in new marine products. This Implementation Plan continues that focus with specific objectives over the next two years.

The objectives of new marine product research will focus on stimulating a fledgling industry where a relatively modest investment can make a large impact. California Sea Grant will be guided by an implementation strategy that aims toward the investment of funds in critical areas where a long-term payoff is possible. For the next two years, two primary objectives will be followed as outlined in the California Strategic Plan.

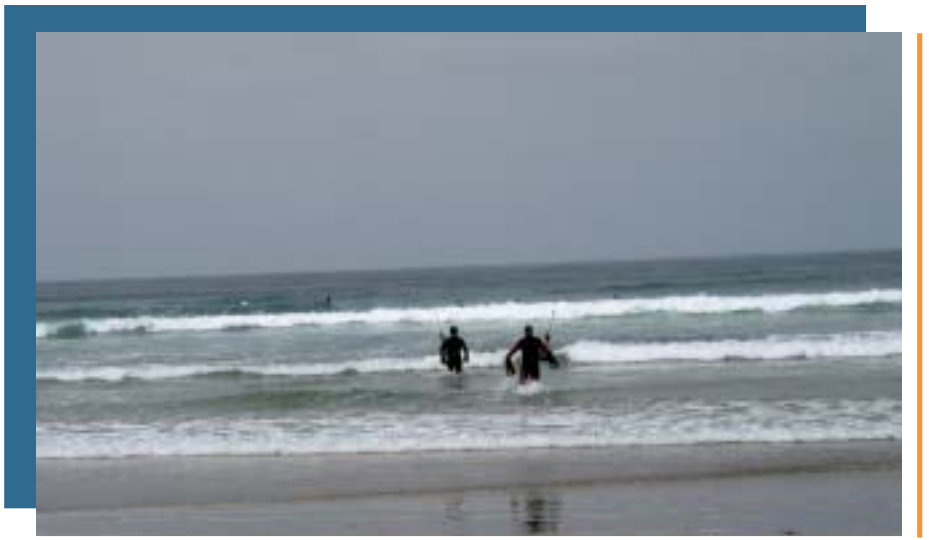
Research and Education

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Support new marine products research that directly impacts California	Development of new products that have potential benefit to the state, nation, and world	Research results that support state and regional industry either through new markets or patents
Support high-risk research projects that might otherwise go unfunded	Some of the projects will yield novel and intriguing outcomes for developing new marine products	Number of research products that lead to new lines of investigation

Coastal & Ocean Engineering

California Sea Grant continues to support research and outreach in marine and ocean engineering that make important contributions to the state, region, and nation. This is viewed in a broad context and includes studies of marine processes such as embayment circulation and development of structures in the coastal and nearshore marine environment. There is a strong correspondence between ocean engineering and marine affairs and policy in that the development of coastal areas is very much based on informed decisions about how to make best use of coastal resources while at the same time protecting coastal property. Three key issues that have been paramount along the California coast are the stability of coastal bluffs, port and harbor maintenance, and the circulation of water immediately adjacent to the coast. In the case of bluff stability, coastal erosion continues to cause bluff slumping with resultant loss of life and high property damage. With Pacific Rim shipping and trade constantly increasing, West Coast ports and harbors are under increasing pressure to accommodate higher levels of maritime commerce. A consequence of this increased traffic is a greater opportunity for Sea Grant to assist ports and harbors personnel to cope with a wide variety of new issues. Nearshore water quality has been a key issue in beach closures and health of wildlife in the coastal environment. Increasing evidence points toward a better understanding of water movement in these areas as a means of knowing where discharges might impact nearshore water quality.

Ocean engineering studies can contribute to resolution of these issues through development of science-based information and as such, represents a priority for California Sea Grant in the next few years. Thus, three of the key areas identified in the California Sea Grant Strategic Plan are identified as important implementation priorities for 2004-2005.



Ocean Engineering

Research Priorities

STRATEGIES	ANTICIPATED OUTCOMES	EVALUATION
Studies of sediment processes including deposition of nearshore sediments and erosion of coastal bluffs	Better understanding of the movement of sediments including collapse of bluffs and movement of beach sediments	Development of better tools to understand and manage critical sedimentary materials in the nearshore environment
Research and outreach of environmental factors affecting the operation of ports and harbors	Improved operations of ports and harbors based on a better understanding of environmental factors	Adoption of newer operating procedures by ports and harbors
Water circulation studies in nearshore environments and embayments	A much clearer understanding of the movement of water carrying pollutants in areas of critical importance	Completion of high quality circulation models for these important areas

California Sea Grant College Program

"Science Serving California's Coast"

California Sea Grant is a statewide, multiuniversity program of marine research, education, and extension activities, administered by the University of California. Sea Grant-sponsored research contributes to the growing body of knowledge about our coastal and ocean resources and, consequently, to the solution of many marine-related problems facing our society. Through its Marine Extension Program, Sea Grant transfers information and technology developed in research efforts to a wide community of interested parties and actual users of marine information and technology, no only in California, but throughout the nation. Sea Grant also supports a broad range of educational programs so that our coastal and ocean resources can be understood and used judiciously by this and future generations.

The national network of Sea Grant programs is a unique partnership of public and private sectors, combining research, education, and technology transfer for public service and dedicated to meeting the changing environmental and economic needs in our coastal, ocean, and Great Lakes regions.

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