Do Not Distribute
DRAFT
April 18, 2008

Strategic Plan of the College of Marine Science University of South Florida

Roadmap to International Premier Status
A Ten Year Plan: 2009 to 2019

Introduction

The College of Marine Science is positioned to become one of the premier graduate research programs in the marine and oceanographic sciences not only in the US but worldwide. Our performance over the past several decades not only in the sciences but in ocean engineering and technology development has placed us upon of verge of greatness. Our existing faculty members have national and international reputations for excellence. They are backed up by an outstanding research staff all of whom allow us to attract increasingly outstanding graduate students. These young people will provide tomorrow's solutions to today's global problems of climate change, food shortages, environmental degradation, and disease.

A critically important aspect of the College of Marine Science is that the faculty and graduate students work "hand in glove" together to solve problems. Essentially, the graduate students themselves work closer to the "abyss of the unknown" than the faculty thus providing these young people with invaluable real-world training.

More so than ever before, the scientific community realizes that the physical world and all life contained therein are intimately interlinked to land, the sea, and the atmosphere. No longer must marine scientists and oceanographers study just the brackish and saltwater. We understand that we are now global, earth systems scientists requiring new paths of inquiry into how the land, sea, and atmosphere all interact with each other and how all life responds to these interactions. Casting an even broader net, we need to engage our colleagues who examine the extraterrestrial world such as fluctuations in the Sun's output, variations of the Earth's orbit around the Sun, and even the long-term threat of meteorite impact.

So, with this vision of an unified earth system in mind, the College of Marine Science is poised to build new interdisciplinary research teams to provide answers to a myriad of societally-relevant issues such as overfishing, coastal erosion, red tides, dying coral reefs, hurricane prediction, and to build better, more environmentally-sustainable and secure communities in the US.

Do Not Distribute
DRAFT

Within the next 50 years the human population will expand from 6 billion to 11 billion people. Most of these additional people will live in emerging countries, most will live near the ocean, and all will require resources from the ocean. All will certainly impact the ocean. This human population growth will occur at the same time that scientific community is now convinced we will be entering a period of climate change perhaps greater than any previously experienced by human civilization. Hence, the challenges are enormous.

CMS Vision Statement: *To become one of the top oceanographic institutions in the world and one that is recognized as a leader in applying science to societal needs.*

CMS Abbreviated Mission Statement: *The primary mission of the College is to conduct basic and applied research in marine science.* Here, marine science is defined as the application of biology, chemistry, geology and physics to the marine environment, and to the interactions between that environment and the adjoining atmosphere and land systems, both presently and throughout the Earth's history. *Included in the primary marine science mission is the development of new technologies and tools for exploring the coupled ocean-atmosphere-land system and facilitating economic development*. The College expects its faculty to develop outstanding research programs and to engage the national and international scientific communities through the reporting of research results in the most respected oral and written venues and through professional service.

Integral to the marine science research mission is the education of graduate students. The College recruits, trains, and graduates productive, creative scientists at the Ph.D. and MS levels that are prepared to make independent contributions to marine science. The faculty are expected to develop outstanding graduate education programs that will afford students the opportunity to participate in all aspects of interdisciplinary research (full Mission statement can be found at: www.marine.usf.edu/PDFs-and-DOCS/Mission-Statement.pdf)

The College of Marine Science's strategic plan is designed to fully support the strategic plan of the University of South Florida whose mission statement is:

The University of South Florida envisions itself as a premier research university with state, national, and global impact, and positioned for membership in the ***Association of American Universities (AAU).***

Indeed, the College of Marine Science, through its performance over the past several decades, played a key role in propelling the University of South Florida to the Carnegie Foundation for the Advancement of Teaching highest tier (Research University with Very High Research Activity) it now enjoys. And, the core mission of the College of Marine Science matches the top strategy cited in USF Strategic plan: "Promote nationally and internationally distinctive research and graduate programs."

Do Not Distribute
DRAFT

The College of Marine Science fully embraces the University's mission statement, core values, goals, and strategies stated in its strategic plan as they pertain to a graduate research program of excellence. The College of Marine Science fully embraces the metrics of **centrality, demand, quality, and viability/sustainability** as defined by the Office of the Provost.

*In spite of our quality and past record, we are a small program in need of resources to expand our faculty and grow our research staff and to attract the best students being produced by the best universities in the country. Our search for **quality** in all that we do is unquestioned.*

Proposed Research Directions

We present broad arenas of research that we feel will be critical in providing science-based solutions to the impending collision between human population growth and marine environmental pressure. All of these research arenas are based on four fundamentals: (1) develop and use cutting edge technology to (2) define natural variables through numerical quantification, and (3) predict responses of these natural variables by placing the acquired data into sophisticated computer models to (4) address and solve societally-relevant problems.

Additionally, we have established three fundamental standards to be used when replacing and adding ranked faculty to the College of Marine Science: (1) viability, (2) complementary, and (3) pushing the envelope.

Viability

a) Economically – The program/people should be able to acquire and sustain external research support for their own summer salary, for graduate students, and for postdoctoral associates and technical support staff. We need people who will improve the economic situation in our college rather than being a drain on our limited resources, especially given the fact that the value of our college to the university is, like it or not, often judged on the indirect cost return from our external contracts and grants.

b) Societally relevant, and/or relevant to the USF master plan – The research direction could also score highly if we can expect highly positive responses from the upper administration and the public at large. Ideally such a program would also be self-sustaining, but we recognize that good press and complementarity with the university's master plan has definite value to our college. Ultimately, it is the responsibility of our faculty to decide what the proper direction for Marine Science is, but we should actively

search for directions that we consider proper and that will also bring us positive marks from the public at large and our upper administration.

Complementary

a) To existing CMS strengths – Given the size of our college it seems to make sense to start by building on existing strengths. Can we identify areas where 2-3 additional faculty members would push us from involved to being a serious player at the national and international level? We are thinking specifically of areas where at present we have a small presence that could be usefully expanded rather than expanding in areas that are already well-represented.

b) Interdisciplinary in nature – This is related to the previous sub-criterion, with the distinction being that we should look carefully for ways to build nationally competitive groups by crossing disciplinary lines. This has the advantage of playing to the present push to become more interdisciplinary, while also allowing us to form significant and potentially dominant foci with a relatively small number of faculty overall.

Pushing the intellectual envelope

a) Intellectually at the forefront of our field – We feel strongly that an academic program has a responsibility, and a unique opportunity, to not just respond to external suggestions for research directions, but to create these directions. Operational or applied research has a role in any organization, including ours, but we suggest that identifying areas and people who are at the cutting edge will ultimately work better for us. That is, we will do better in the long-run with people who do not only "do chores" for others, but foresee and invent the areas of future growth.

b) Expanding the intellectual portfolio of the CMS – A related idea is that we need to identify and support expansion into developing areas that are new to the CMS, but where we are presently weak. Again, the proposed direction should be at the cutting edge, but at an edge that we presently do not have. Realistically, we need to identify possibilities that do not require huge investments, but we should definitely look for places to expand our portfolio.

Building on Strengths

The College of Marine Science has a large core of outstanding researchers and graduate student mentors. Four of our faculty members are USF Distinguished University Professors—the highest percent of any academic unit at USF. Our faculty members enjoy positions of leadership in their disciplines and all have excellent national and

international reputations. Additionally, the quality of graduate students recruited increases each year.

A great strength is our unique group of engineers and technologists embedded into the CMS as the Center of Ocean Technology (COT). Most marine science or oceanographic programs do not have a group working within the academic framework to provide new sensors and other technologies directly to the principal investigators. The CMS also maintains two ocean observing systems Physical Oceanographic Real Time System—PORTS and Coastal Ocean Monitoring and Prediction Stations—COMPS. These two significant coastal ocean monitoring systems make the CMS to be a significant contributor to the rapidly growing field of ocean observing—nationally and internationally. Using data obtained from ocean-observing sensors, the CMS's new Center for Predicting Redtide (CPR) funded through recurring state resources and extramural funding provides the blend of data acquisition, modeling, and prediction we desire for additional centers of concentration.

A unique strength is our close working relationship with a number of federal, state, and private sector marine oriented programs—particularly the newly formed SRI-St. Petersburg a high-technology firm. All together, there are ~1,200 individuals employed in the marine sciences in St. Petersburg—the largest concentration in the SE US. Finally, through a 2006 $8.5 million legislative initiative, the College of Marine Science's infrastructure and major research instrumentation facilities have been enormously enhanced.

What We Value

1. Produce high-quality research and excellent publications and student theses/dissertations
2. Develop/deploy leading-edge technology; include graduate students in technology research and development
3. Provide one-on-one mentoring of graduate students and provide rigorous, well-taught courses
4. Exposure of students to outstanding scientists by attending national/international meetings and seminars to build confidence
5. Provide students with significant at-sea experience
6. Develop and enhance a collegial and stimulating work place for all CMS members
7. Enhance collaboration with other USF academic units and external partners
8. Increase CMS faculty membership and leadership on high-level national and international level panels and commissions
9. Faculty members providing leadership for new national science initiatives

10. Participation of CMS members in societally- relevant issues—making a difference by connecting with the general public through the news media; building a strong relationship with the community.
11. Share our knowledge with K-12 students and their teachers
12. Diversify our faculty, staff, and students
13. Favor a bottom-up approach in dealing with problems
14. Enhancing international research opportunities; recruiting students from Caribbean and Latin America
15. Develop strong ties to elected officials.
16. Maximize entrepreneurship to fund research; enhance private fundraising
17. Protect intellectual property through patents and licenses
18. Work closely with SRI-St. Petersburg and other private sector companies
19. Develop a strong linkage with our alumni.

The Power of Cluster Hiring

We promote the concept of cluster hiring as part of our strategic plan. A cluster is a group of faculty hires built around a particular theme or strategic initiative. These hires will embrace existing or newly defined strengths by creating a group of faculty who are positioned to collaborate and support one another to allow for a significant advance (from USF Dean's Retreat 2007).

Centers of Intellectual Emphasis (Under Construction)

I. Oceans and Atmospheres in the Global System

Understanding interaction of the Earth's two major fluid bodies (the atmosphere and the ocean) is fundamental to predicting changes in our climate. With the atmosphere being omnipresent and the ocean covering ~72% of the Earth's surface, understanding the coupling between these two huge systems is essential so that human civilization can prepare for whatever the next few decades, century and beyond will bring.

Water, at least in large quantities, is unique to Earth as best we can tell and life has evolved as a result. Most of the Earth's hydrological cycle (the movement of water from the ocean to the air to the land and back to the sea) is based largely ocean/atmosphere interactions—so that is why the College of Marine Science views this as a primary area of emphasis.

In addition to this whole-earth, macro-scale approach, we envision a strong presence in meso or smaller scale ocean/atmosphere science. Scientists specializing at this scale examine weather and climate in selected regions of the earth's surface. In this case, we would require specialists in understanding weather and climate in the western Atlantic, Gulf of Mexico, and Caribbean Basin so that we can address problems affecting Florida.

Do Not Distribute
DRAFT

II. Paleoceanography, Paleoclimatology, Biogeochemistry (PPB Group)

Vision Statement

The Earth system is presently undergoing significant climatic and environmental perturbations, the effects of which are manifest in the oceans, atmosphere, land and biosphere. These changes, many of them abrupt, are having significant societal impacts. Planning for the future behavior of the Earth system requires an understanding of its present and past behavior. A better understanding of the inherent complexity of the Earth system requires an approach that integrates observations, data analysis, and modeling efforts, all of which are tied to the development of new technologies. The development of enhanced capabilities for monitoring and observing the modern environment, especially the oceans, which cover the majority of Earth's surface, is acutely needed. New data records of climate and environmental change are also needed to better understand the natural variability of the Earth system so that anthropogenic influences may be placed in context. Modern records of climate and environmental change, which tend be short in duration, must be augmented with geologic records of change from the oceans, land and atmosphere so that trends and patterns of observed change and variability can be evaluated with a historical perspective. Observations and data records of present and past variability in the Earth system must be integrated with modeling efforts to better understand the underlying causal mechanisms of the observed and/or reconstructed climate and environmental variability. Such integration is critical to assessing the robustness of modeling predictions of future behavior in the Earth system

Ongoing global environmental change will continue to be an important challenge for society. Accordingly, interest in global change science at federal and non-federal funding agencies will increase for quite some time. With current faculty in the PPB Group and CMS, we are poised to capitalize on this growth area and become an international leader in quantitative global change science. This effort is linked to the Ocean, Climate, and Environmental Change Institute (OCECI), the revitalization of the Global Change Research Center (GCRC), the US Geological Survey's Center for Coastal and Watershed Studies, and the Dr. Kiran C. Patel Center for Global Solutions.

Themes

The CMS can make an immediate and sustainable impact on Global Change Research by building on present strengths and by focusing its efforts along several overlapping themes. The initial themes are: 1) natural and anthropogenic environmental change, including understanding the historical context of current global change as well as extreme changes in the geologic past, 2) modern and ancient hydrological and ecosystem dynamics, and 3) biogeochemical processes and cycling. These themes are also aligned with projected areas of growth in federal funding (e.g., NSF Geosciences and Atmospheric Sciences, Integrated Ocean Drilling Program, Coral Reef Initiatives). We also envision active engagement between CMS and non-federal funding sources, as expanding the revenue base of CMS is important to its continued vitality

1) Natural and anthropogenic environmental change

Why study past global change? In many respects, current global change is unprecedented in human history. Current rates of temperature change, sea-level change, greenhouse gas increase, hydrologic change, and ecosystem change approach or exceed rates known from the geologic record. In addition, instrumental records are too short to investigate processes that operate on multi-decadal to multi-century time frames. Therefore, proxy records from geologic archives and improved numerical models are needed to learn from the past about possible future changes. Comparison of current environmental change is also needed to evaluate potential impacts and mitigation strategies.

2) Modern and ancient hydrological dynamics

We propose to develop a research group focused on "Global Hydrologic Variability: Past and Future." This group would become a major national and international player in Global Change Research. For example, this group would pursue quantitative understanding of past and future hydrologic/climatic systems such as ENSO and other climate modes, the low-latitude monsoons, the meridional overturning circulation, and ecosystem response. Understanding the global water cycle and regional hydrologic variability (e.g., droughts and floods) is particularly important to society.

3) Biogeochemistry and Geobiology

We seek to develop research strengths in fields of biogeochemistry and geobiology. Biogeochemistry and geobiology, are rapidly growing sub-disciplines within earth and marine science, both of which are inherently multidisciplinary. Biogeochemistry and geobiology focuses on complex processes integrating biology, geology and chemistry and explores the interactions between the biosphere and the lithosphere, hydrosphere and/or the atmosphere. Biogeochemists and geobiologists study processes occurring in settings ranging from lakes, estuaries, oceans, and soils to extreme environments in deserts, deep basins, and hydrothermal vents. These scientists provide assessment of modern biogeochemical processes and cycling and, though the analyses of sediments and via numerical modeling, reconstruct ancient biogeochemical cycles on Earth. In addition, biogeochemists and geobiologists play critical roles in deciphering past climate changes and unraveling linkages between atmosphere, hydrosphere, and biosphere, and the solid Earth. Quantitative understanding these linkages is essential for assessing the rate and extent of current environmental and climate changes. One major subdiscipline of geobiology is geomicrobiology, an area of study that focuses on investigating the interactions between microbes and minerals.

Staged Cluster Hiring in the PPB Group

Our goal is to create a critical mass of faculty and researchers in the PPB Group and CMS that would focus on Global Change Research under the above themes. It would have strong linkages to the nascent Climate Dynamics group within Physical Oceanography, to the Ocean/Continental Interactions group within Geological

Oceanography, to the Ocean Acidification group within Chemical Oceanography, to the US Geological Survey, and to the Geology Department in Tampa. This research group will address some of our main societal challenges.

Who should comprise this PPB team? To address complex questions regarding global environmental change on different spatial and temporal scales, we need a diverse group of interdisciplinary scientists. We need experts in proxy data generation and synthesis (e.g., corals, ocean and lake sediments, tree rings, speleothems, the deep biosphere, etc.) and quantitative numerical modelers. We also seek researchers who can attract first-class students to join the highly productive PPB group.

Accordingly, we propose hiring 4-6 new faculty in two stages over the next three years. The following is a hiring plan in two overlapping stages with specific job advertisements.

Stage 1: Natural and anthropogenic environmental change

• Decadal- to Centennial-scale Paleoclimatologist (themes 1 and 2)

We seek a paleoclimatologist who studies regional to global environmental variability on timescales highly relevant to society. The successful candidate will use geochemical analysis of natural archives including (but not limited to) corals, marine sediments, tree-rings, speleothems, etc., and integrate with numerical modeling (e.g., new Ocean-Atmosphere Modeler), to test hypotheses on environmental change. The successful candidate will enhance existing strengths in (1) natural and anthropogenic environmental change, including understanding the historical context of current global change as well as extreme changes in the geologic past, and/or, (2) modern and ancient hydrological and ecosystem dynamics. These themes are aligned with projected areas of growth in federal funding (e.g., NSF Geosciences and Atmospheric Sciences, Integrated Ocean Drilling Program).

• Biogeochemist (themes 1, 2, 3)

We seek an assistant or associate professor in biogeochemistry who utiilizes a state-of-the-art analytical approach and or biogeochemical numerical models to address questions related to the origin, transport, and fate of biologic and geologic materials, particularly those relevant to hydrologic, nutrient, and carbon cycling, in both coastal and open ocean settings . Topic of interest include ocean acidification, biogeochemical processes and cycling associated with anthropogenic and natural climate variability, and ocean-continent interaction.

Stage 2: Integrated Ocean Drilling Program Science

• Millennial- to Tectonic-scale Paleoceanographer (themes 1, 2, 3)

We seek an assistant or associate professor in paleoceanography who studies chemical, biological, and physical oceanographic change on millennial- to tectonic- time frames. The successful applicant should be a major player in the Integrated Ocean

Drilling Program's Dynamics of Earth's Environment initiative to understand the processes and rates of change in Earth's past climate, cryosphere, and ocean chemistry.

• Geobiologist (themes 2, 3)

We seek an assistant or associate professor in geobiology who focuses on geomicrobiology, or life in extreme environments, Researchers focusing on microbe-mineral interactions, unique microbial ecosystems and investigations of biosphere / hydrosphere / geosphere / atmosphere interactions throughout Earth's history, as preserved in the sedimentary rock records are encouraged. The successful applicant will compliment existing strengths in microbiology, biogeochemistry, organic and inorganic geochemistry and Earth system science

What analytical support is currently available? The PPB laboratory has a broad range of analytical capabilities. A dual-inlet, ThermoFinnigan Delta Plus XL stable isotope ratio mass spectrometer (SIRMS) is dedicated to O and C isotope analysis in carbonates (corals, foraminifera, speleothems, mollusks, otoliths, archeological materials, etc.). A continuous-flow ThermoFinnigan Delta Plus XL SIRMS measures H, C, O, and N isotopes from solids, liquids and gases with emphasis on organic materials (filtered POM DOM, bulk sediment, specific compounds). A new Varian 320 triplequad Gas Chromatograph – Mass Spectrometer (GC-MS) measures is used to determine abundance and structural determination of specific organic compounds. This state-of-the-art facility also has fully renovated wet and dry laboratories, including sediment and coral sampling equipment, organic and sedimentary geochemistry laboratories, totaling over 4500 square feet of active laboratory space. In addition, our group has full access to a new Agilent 7500 Inductively Coupled Plasma - Mass Spectrometer (ICP-MS) in Bob Byrne's laboratory, which is used for elemental ratio analysis across the periodic table (e.g., rare earth elements, metal/Ca in carbonates). Thus, new hires in the PPB group would be able to capitalize on analytical capabilities for elemental and isotopic measurements on a full spectrum of materials.

Students of the following researchers might fit the bill:

David Archer, Mike Arthur, Wally Broecker, Chris Charles, Julie Cole, Rob DeConto, Ellen Druffel, Katrina Edwards, Tim Eglinton, Steve Emerson, Rick Fairbanks, Dick Feely, Lee Kump, Fred Mackenzie, Kate Moran, Christina Ravelo, Julian Sachs, Peter Swart, Robbie Toggweiler, Jim Zachos, etc.

III. Land/Ocean Interactions—Continental Margins and Coastal Oceans

Given the fact that so many of us live near the sea, it seems incomprehensible that we know so little about the water movement, containing sediments and dissolved material including pollutants, from land through our estuaries, and into the coastal ocean. We need

to quantify processes, rates, and results of sediments, solutes, and organic matter transfer from the water shed to the abyss. How does this source-to-sink system respond to climate and tectonic forcing? What are the areas of accumulation, how, when, under what conditions is mass transferred from one area of accumulation to another? What are the barriers and filters between these areas? What stratigraphy has been developed and what can its examination tell us about past tsunamic events and past extreme climate changes, for example? What have been the morphological/bathymetric changes (seascape) from the estuarine/coastal system to submarine canyons—can we predict them?

We seek to develop a program that quantifies responses of sediments and benthic communities to temporal and spatial changes in the overlying water masses. The goal is to develop interdisciplinary efforts that bring physical and chemical oceanographers together with benthic ecologists, microbiologists and marine geologists to address issues such as dead zone or red tide stresses, changing ocean chemistry (e.g., acidification), coral-reef dynamics under global change, responses to physical stresses such as hurricanes, sediment production and transport, and responses to past and future sea level changes.

Proposed New Faculty Positions:

Sediment transport expert specializing in topics ranging from beach erosion, storm surge, sediment exchanges from the estuary to the continental slope, and sediment gravity flows/mass wasting events.

Biogeochemist specializing in flux of fluid flow containing solutes/nutrients through seafloor—tie into gas hydrates, anoxia zones, chemosynthetic communities

Seascape modeling specialist in how continental margin bathymetry (submarine canyons, prograding shelves, etc) change in time. This would require expertise in geoacoustic seafloor imaging.

Process-oriented stratigrapher specializing in recognizing past extreme events, sea-level fluctuations and overall environmental change record from subsurface using high resolution seismic- reflection imagery.

Geo-oriented benthic ecologist specializing in how sediment transfer affects the ecosystem.

Estuarine, inner shelf circulation physical oceanographer specializing in water motion from head-of tides in estuaries to exchanges with the coastal ocean.

Do Not Distribute
DRAFT

IV. Life in the Sea

The marine biosphere, from microbes to top predators, is modulated by climate (global warming, storms, seasonal heating and cooling), physical circulation (currents, mixing, stratification), the lithosphere (dust transport, sediment characteristics, hydrothermal vents), ocean chemistry (nutrients, ocean acidification), food web interactions (prey, competitors, and predators), and human impacts (coastal erosion, pollution, fishing). In turn, marine organisms influence many of the above processes. Thus, life in the ocean is intimately linked with the themes mentioned above. Marine ecosystems are experiencing dramatic changes globally. These changes reflect natural variability and human activity. New interdisciplinary approaches are needed to develop holistic views of ocean ecosystems. For example, understanding the molecular underpinnings of ocean life (from viruses to whales) is one critical element for interpreting and predicting the interactions of life in the sea with its environment. The College of Marine Science will require a new breed of biological oceanographers that can fully integrate traditionally distinct fields such as genomics, ocean physics, and ocean chemistry to predict the fate of ocean life.

Proposed New Faculty Positions

1. Phytoplankton Ecologist

Primary production drives the ecosystems of this planet and forms the primary mechanism for removal of anthropogenic CO_2 (carbon sequestration). Understanding the mechanisms of CO_2 removal and the diversity of taxa responsible is critical for knowledge of the functioning of primary production in such important processes as the Biological Pump and the Microbial Loop. Ocean acidification will strongly influence changes in phytoplankton taxa and rates. Additionally, several phytoplankton species in the Gulf of Mexico are harmful-bloom forming algae (HAB) that result in millions of dollars lost annually to the Florida economy and irreparable damage and mortality of marine life, including mammals. This position requires a knowledge of phytoplankton species and ecology. The successful candidate will employ modern tools of biology (e.g., molecular genetics and genomics or remote sensing) to understand phytoplankton-mediated processes. Areas of expertise could include autotrophic picoplankton, larger forms (diatoms), and/or harmful algal-bloom forming species. A broadly based investigator with a primary research interest in phytoplankton ecology or physiology, capable of interacting with ongoing programs in red tide initiation, development, and impacts. Ideally, the candidate would be able to fulfill the role of phytoplankton biologist on multi-disciplinary research cruises. The successful candidate would be expected to teach specialty courses in phytoplankton ecology and physiology.

2. Marine Genomics and Bioinformatics of Macrofauna

The modern tools of biology (molecular biology, genomics, proteomics) are just now revolutionizing our understanding of diversity of life in the seas. The growing fields of functional analysis of genomic data will lead to unfortold discoveries in inter-organism interaction, and environmental control of biogeochemical processes. There is a tremendous need for genetic/genomic research of non-microbes (zooplankton, benthic invertebrates, fish and mammals). Genomic research generates tremendous quantitites of data (millions of individual gene sequences and billions of base pairs) that challenge existing computational interpretation. Bioinformatic expertise is required to read and interpret the marine genomic

book of life. To decipher the information encoded in genomes and relate it to biogeochmical processes, tremendous computational expertise is required. The successful candidate will develop novel bioinformatic strategies as well as collaborate with existing faculty. The candidate will also offer a general course in bioinformatics as well as teach an advanced course.

3. Coral Reef Ecology and Dynamics
Perhaps the most greatly threatened biome in the state of Florida is that of the coral reef. Ocean acidification, increased UV irradiation, increasing temperature, and anthropogenic nutrient input all threaten this unique, diverse, and productive environment. A coral reef biologist studying the ecology of modern reefs and the potential effects of global climate change on reef ecology is needed. This faculty member will study questions of coral response to environmental changes, such as the effects of rising carbon dioxide or increasing frequency of bleaching events. Other important questions include the effectiveness of marine protected areas on preserving coral reefs, and the ecological impacts of shifts from coral cover to algal cover. A knowledge of the threats facing reefs and a strategy for ameliorating at least some of these may protect this dwindling Florida resource.

V. Cluster Hires for the Center of Ecosystem-Based Research and Modeling: West Florida Shelf Regional Cooperative Initiative. Initiative partners: USF-CMS, NOAA/NMFS, FWC-FWRI

Fisheries Oceanography

The research themes identified below represent collections of CMS faculty skills that could be coordinated to address fisheries-related issues. There is increasing demand for combining the previously distinct disciplines of fisheries management and ecosystem management, and the CMS is in a good position to make meaningful contributions to this effort.

Ecosystem Analysis and Modeling.

There are several programs within CMS that could contribute to this research theme; the biological, chemical, geological and physical oceanography disciplines are all represented CMS scientists have the skills that would allow the migrations of schooling coastal pelagics to be compared with spatio-temporal trends in zooplankton abundance; the fish migrations are likely lag-synchronized with local, seasonal zooplankton blooms.

As Florida becomes increasingly developed, concerns are being raised that changing land use and reduced water supply/quality will affect Florida's fisheries. Detection of the disproportionate contributions of different land uses to the nitrogen found in coastal fish biomass is needed. Coastal nutrient linkages are dependent on hydrologic connectivity within Florida's diverse watersheds, and this connectivity is, in turn, dependent on future trends in climate, land use, and surface-water consumption. Worldwide and in Florida, a large number of correlations have been found between river discharge and marine or estuarine fisheries yields.

Physical-Biological Interactions

Upwellings and convergences affect fish prey availability, fish reproductive potentials, and the retention of planktonic early stages. These physical-biological interactions can be studied using hydrodynamic models, remote sensing, and ocean observing systems (GCOOS, IOOS). Physical features can be expected to influence the distributions and abundances of pelagic fishes such as mackerels and tunas. The locations of important physical features can be expected to shift as climate changes, and if such shifts can be predicted, then the predictions could be used to remediate negative effects on dependent fisheries before they become severe. The discipline of Physical Oceanography can also be applied to the problem of understanding interannual variation in recruitment. Passive and active particle trajectory models may explain variations in survival during early life, such as those associated with cross-shelf ichthyoplankton transport or the spatial match-mismatch between settling larvae and microhabitat types that improve survival. This approach is applicable to reef fishes and to estuarine-dependent species that are spawned at seaward locations, but later move to landward nursery grounds.

Geological-Biological Interactions

Existing collaborations allow the CMS to produce high-resolution maps of deep, offshore reefs that are important spawning sites for groupers, snappers and other reef fishes. The discovery and exploration of these reefs, which was aided by CMS Geological Oceanographers, has led to recent proposals that these areas be protected as MPAs. In the northern and western Gulf of Mexico, there has been a great deal of interest in the interaction between settling reef-fish larvae (primarily red snapper) and the limited
distribution of limestone outcroppings that serve as essential habitat for later life stages. Parallel processes may be in operation on the various types of hard-bottom habitat on the West-Florida Shelf. In shallower waters in Florida and elsewhere, the impacts of coral bleaching on reef-based fisheries and reef ecology are important issues. Developing a predictive capability that could be used to avoid irreversible regime shifts – e.g., from coral to macroalgae –would be particularly useful. In estuarine and coastal waters, geomorphology and hydraulics determine the residence times of various biologically relevant materials (nutrients, CDOM, plankton) that have profound effects on the distribution of productivity in these ecosystems. CMS is currently involved in an investigation of accumulations of fine sediments that are suspected of inhibiting secondary production in Florida's estuaries.

Proposed New Faculty Positions

1. Ecosystem Analysis and Modeling. Specialist in Applied Fish Population Dynamics. This position requires application of fish population dynamics models and field studies to contemporary resource-management issues in tropical and subtropical marine ecosystems. The successful candidate will be capable of applying mathematical models to issues involving fisheries production, fisheries conservation, stock enhancement, and aquaculture within the context of ecosystem-based fisheries management. The ability to include economic evaluations in these assessments is desirable. Persons with research interests that create working partnerships with other USFCMS faculty are preferred.

2. Physical-Biological Interactions. Specialist in the Ecology of Coastal Pelagic Fishes. This position requires expertise in identifying quantitative interactions between biomass-dominant schooling coastal pelagics (anchovies, sardines, herrings, scads, and mackerels), areas of high productivity, and physical features such as upwelling, convergence and estuarine plumes. These interactions include trophic interactions, reproductive responses, adult migration, and the effects of climate change on these linkages. Persons with research interests that create working partnerships with other USFCMS faculty are preferred.

3. Geological-Biological Interactions. Specialist in the Ecology of Reef Fishes. This position requires evaluation of the population structure and habitat requirements of commercially and recreationally exploited marine reef fishes. Specifically, applicants should be able to evaluate processes that limit reef-fish production and contribute to variation in habitat-specific population structure. The successful candidate will be capable of applying age and growth techniques, advanced tagging techniques, and otolith chemistry to the identification of habitat connectivities, particularly as these apply to the effectiveness of MPAs. Persons with research interests that create working partnerships with other USFCMS faculty are preferred.

Technology Development—A Critical Component

A great program in the marine, oceanographic, and atmospheric sciences requires an outstanding engineering and technology staff to provide advanced sensors and data assimilation techniques. This is critically important in the marine environment, where expertise in designing sensors and instrumentation exposed long-term to a hostile environment is essential to success.

The Center for Ocean Technology (COT) was created as a single engineering and technology development center providing technological support to faculty, other research staff and students. To effectively meet the support and services required COT personnel must be engaged in multiple efforts of varied function; engineering development, technology deployment and academic and technology research.

Engineering development support consists of sensor and platform development, sensor and platform integration, data and information analysis assistance, and fundamental technology research. Engineering support is provided to the CMS marine science community at no cost.

Field support of highly-sophisticated oceanographic instrumentation and equipment is the central role of the applied technology services. The infrastructure required by this effort, e.g. operation and maintenance of CMS vessels, requires recurring college resources and funds.

COT academic and technology research staff are capable of establishing funded research and development programs and participating in the licensing and patenting of intellectual property. These programs would cover both marine science investigation as well as developing technologies. COT will be strongly committed to conducting research and development which can transition to wide use in the field. Graduate students will be benefit from these research programs both in financial support and in meeting the research requirements intrinsic in obtaining a graduate degree.

Graduate Student Issues

Recruiting and educating the best graduate students is essential to the vision and mission of the CMS. Providing financially competitive, multi-year, tuition-free assistantships is vital. The CMS is committed to improving the quality of student life including work in the field, laboratory, and classroom.

The College of Marine Science should provide funds so faculty members can take students on extensive trips to appropriate sites for in-field experiences both in the US and other countries. This would include week-long excursions to remote labs to examine modern marine science phenomena or field sites displaying the sedimentary record of ancient marine environments.

The CMS graduate students should partner with journalism faculty and the Poynter Institute to bridge the communication gap between science and the public. A Center of Intellectual Emphasis--Center for Ocean Science Communication, Media, and Policy could be established. This center could establish more formal relationship with the local and national news media. The Marine Science Advisory Committee (MSAC) is an integral part of graduate student life. Resources should be provided so that this graduate student group could address quality-of-student life issues as well as assisting the CMS in fund raising. Graduate students should work more closely with faculty in grant writing as part of the educational experience. Graduate students should play a more active role in engaging the CMS partners, the private sector, and local environmental clubs and organizations. The MSAC should provide leadership in reducing the CMS carbon footprint and to make CMS activities more “green”.

The MSAC should work closely with the CMS Curriculum Committee to have more quantitatively-oriented generic courses taught. The opportunity to present one’s research to a scientific audience is an important part of a graduate student’s development. The Graduate Student Symposium, as well as smaller presentation events, should be emphasized and supported by faculty. The CMS should have a separate travel fund so that graduate students can present their work at national and international meetings.

Do Not Distribute
DRAFT

Partnerships

A unique aspect and strength of CMS is its link to government and private sector partners as well as other units within the USF system. We plan to aggressively develop stronger linkages with all of these groups as an essential component of this strategic plan.

CMS faculty will continue to enhance our working relationships with academic units on the main **USF campus in Tampa**. Most of our faculty members have worked with individuals in various academic colleges. However, CMS will develop more formal relationships with the College of Arts and Sciences, the College of Engineering, and USF Health. The physical separation between St. Petersburg and Tampa can be closed by providing multiple telecommunications nodes so that individuals and groups can participate in virtual meetings that closely resemble in-the-flesh exchanges. The College of Marine Science seeks a much more visible presence on the Tampa campus.

We look to our **USF-St. Petersburg** neighbors as strong partners in marine environmental science and policy issues as well as a source of graduate students from their undergraduate population. The planned, shared technology center buildings on the USF-St. Petersburg campus will provide a day-to-day interaction needed to forge strong collaborative relationships. We extend our hand to **Eckerd College** and **St. Petersburg College** undergraduate students to work part-time in our laboratories and to participate on research cruises as well as an additional pool from which to recruit outstanding graduate students. We look to USF-St. Petersburg, St. Petersburg College, and Eckerd College for advice concerning our proposed new hires. We anticipate that these programs would reciprocate so collectively we avoid duplication and enhance intellectual synergy. Overall, we anticipate enhanced direct contact between individual CMS faculty, staff, and students with our counterparts at these three institutions.

CMS is highly dependent upon the vessel and shore-based operations of the **Florida Institute of Oceanography (FIO).** We plan to work as partners with FIO to obtain new research vessels to replace their aging fleet and to enhance shore-based operations include the Florida Keys Laboratory.

The government labs of the **National Ocean and Atmospheric Administration (NOAA),** the **US Geological Survey (USGS)** and the **Florida Wildlife Research Institute (FWRI)** have been and will continue to be critical to our future success. The resources within these organizations are enormously valuable and the CMS will continue to strengthen the bonds that we all have developed over the years. Our groups should participate as research teams to respond to major initiatives being formulated in Washington or Tallahassee. Even better, appropriate multi-agency teams, locally

constructed, should create new initiatives and play a more active role in defining the lines of research for the future.

We anticipate significantly enhanced interaction with the **Mote Marine Laboratory** particularly in view of our proposed hires stated in the section above. Mote Marine Laboratory scientists should provide an important role in our ability to recruit the next generation of biological oceanographers that we seek. We anticipate that our engineering and technology talent will assist in elevating the quality of shared, collaborative research projects.

The CMS looks to the newly formed **SRI-ST. Petersburg** as our major private sector partner to create new marine technologies, to bring these ideas to maturity and to ultimately spin up new private sector companies to produce and market such technologies. Both CMS and SRI will have shared goals in the next ten years and beyond to work as technological incubators. We propose a joint working group consisting of members of CMS and SRI to maintain communication.

The CMS plans to enhance its relationship with the **Pinellas County Schools**, private schools, home-schooled children and educational programs such as the **Pier Aquarium**, the **Florida Aquarium**, the **Pinellas County Science Center**, and the **Museum of Science and Industry (MOSI).** We will require at least two full time marine educators housed in the CMS to nurture these relationships.

We plan to develop a coordinated linkage leading to a consortium of all marine-oriented programs in the west-central Florida area to foster greater communication and awareness of our collective activity.

Information Technology

The College of Marine Science will have to make the appropriate investments from frequently upgrading desktop and laptop computers but also servers and mid-size computational centers. IT enhancements should also be made in the classrooms and teaching laboratories. Being located 40 miles from the main campus, the CMS should always have the most up-to-date telecommunications system to more effectively and efficiently communicate with our faculty counterparts and members of the upper administration. CMS will also require a significantly enhanced capability to archive and retrieve large data sets.

Final Thought

So, to position the College of Marine Science to successfully address these themes, we need the best talent possible. Financial resources to attract the best minds are essential.

Oceanographic research is amongst the most expensive form of scientific research that exists due to the nature of working in a hostile environment, the sheer size of the environment, and the fact that it is simply expensive to access the ocean through research vessels, satellites, submersibles, and ocean observing platforms.

But, a great program starts with great people, and we require resources to attract and continue to attract the best minds to elevate us to world premier status.

Funding the Plan

The College of Marine Science leadership realizes that the resources to convert these strategic needs into reality will require significant entrepreneurial activity on a broad front. This includes aggressive responses to major state (programs of centers of excellence, world class scholars, special legislative budget initiatives, etc) and federal initiatives. We also realize that the CMS will rely heavily upon our own efforts to seek support from the private sector. To address that point, we provide the following section as part of our strategic plan.

Seeking Private Support

FACILITIES

MARINE SCIENCE RESEARCH AND TEACHING FACILITY

The progression of the College of Marine Science toward being one of the world's foremost teaching and research institutions of its type requires construction of a new Marine Science Laboratory building. The College (which is currently housed in a 66 year old facility that was originally designed to be a WWII Merchant Marine Training Barracks) is challenged to increase faculty, staff and student numbers due to a lack of classroom and administrative space and up-to-date laboratories. Adequate lab space is particularly at a premium for both faculty and the College's engineering group, The Center for Ocean Technology. Current plans call for a new building of over 200,000 square feet to be built on the present site of the current Marine Science Laboratory at an estimated cost of $95 million. Such a facility would allow the College to increase its faculty, staff and student population by more than 50% and provide these individuals with world-class classrooms and research/learning laboratories.

MAINTENANCE ENDOWMENT

Among the most critical issues in contemporary science education is the timely acquisition, maintenance and regular upgrading of research and design equipment, instrumentation and computer hardware and software. As these items become increasingly complex and costly, and as the industry expects graduates to be conversant with their use, universities find themselves in a constant race with obsolescence and exhaustion of equipment. Responding to this challenge, the College of Marine Science seeks to establish and endow a Laboratory Renovation Fund to renovate its new research and teaching facility and ensure that its technological systems and programs receive regular enhancements and upgrades to remain working at peak efficiency.

.

Do Not Distribute
DRAFT

FINANCIAL AID

GRADUATE FELLOWSHIPS

The College of Marine Science seeks to attract and retain the best and brightest graduate students, while also ensuring that its educational programs are available to all without regard to financial circumstances. The market for top students is extremely competitive with many top scholars making decisions based not simply upon the merits of the school, but upon a school's ability to provide financial assistance. The College of Marine Science seeks to establish a financial assistance fund to make the College more competitive among the nation's top colleges of its type and "the school of choice" for the best students-leaders seeking a graduate degree in Marine Science. An endowment of $30 million will provide the College the ability to offer full fellowship support (tuition, room, board and books) to over 50 graduate students pursuing advanced degrees in Marine Science.

POSTDOCTORAL FELLOWSHIP PROGRAM

The program should consist of four (8) postdoctoral positions, each having a 24-month duration. The principal objective of the postdoctoral program is to expand the scientific expertise within the College while promoting interactions between CMS and other pre-eminent oceanographic institutions. The College will seek postdoctoral fellows as a balance between synergy with existing programs and expansion into new areas.

FACULTY SUPPORT

ENDOWED CHAIRS AND PROFESSORSHIPS IN MARINE SCIENCE

The primary mission of the College of Marine Science is to conduct basic and applied research in fields related to the marine environment. This research furnishes the knowledge base that develops the academic programs. It accomplishes this mission through a unifying theme of climate change, adding faculty as required to facilitate a more cohesive, interdisciplinary group of scientists operating on the frontiers of their respective fields. The College's plan is to fill new faculty positions with the best scientists, seeking parity among disciplines in ways that will promote its ability to compete on the frontiers of evolving national and international science programs. The added benefit of this approach will be expanded expertise and resources for application to environmental issues of local and statewide importance. To accomplish this, the college must have the resources available to make competitive salary offers to qualified applicants as well as to retain those individuals with opportunities elsewhere. One method for doing this is through the use of endowed chairs and professorships. The long term plan calls for the College to expand its tenured faculty from 27 to 40 and non-tenured track from 40 to 60 with an equal number in each of four academic disciplines: Biological, Geological, Chemical, and Physical. A total of five endowed Chairs and ten endowed professorships are considered essential to accomplishing this long term goal.

RESEARCH

MOTE/USF CENTER OF EXCELLENCE IN MARINE SCIENCE

In August 2006, the College of Marine Science and Mote Marine Laboratory established a joint program in the form of a Center of Excellence in Marine Science. The goal of the Center is to unite and enhance the

institutions' existing programs of coastal and ocean physics, chemistry and biology. The Center will provide a structure for collaboration between the institutions in a wide range of future programs but will begin with a focus on coastal ocean observation. The Center's flagship endeavor, BIOSENSE, will coordinate existing observation systems, and others already in planning, into the nation's model for integrated ocean observing systems capable of supporting basic and applied research and ecosystem-based resource management.

RESEARCH INNOVATION FUND

Scientific advances are solely dependent upon the fertile imaginations of research scientists, engineers, and their students and technicians. New ideas and new approaches can come from anywhere at anytime. However, a climate of creative thinking, interaction, and the ability to translate an idea into a well-defined research program requires both human capital and appropriate infrastructure. We require funds to import the brightest minds to work with our faculty, students and staff to keep the innovative cauldron of ideas boiling over. Then, we need the ability to design, build, and deploy the instrumentation needed to address the ideas spawned from the cauldron. Without this process science stagnates. Only though a vibrant, stimulating, innovative process can we make the advances in marine science required by our global society. Attracting great people working as energized teams and developing breakthrough technology is our vision for the future in the College of Marine Science.

COMMUNITY OUTREACH

EDUCATIONAL OUTREACH FUND

The College of Marine Science Office of Education and Outreach provides the community with nationally recognized marine education programs through hands-on, inquiry experiences in both laboratory and field environments. The goal of these programs is to successfully integrate scientific research and K-20 education to enhance science learning. Students and teachers are enriched in their discovery of the relevancy, excitement and knowledge encompassing ocean-related research. Programs are interactive and interdisciplinary providing experiential learning via research cruises, field trips, research projects, science teaching and communication courses, and minority-focused outreach activities. Programs are available to all learners inclusive of cultural, ethic, social, economic, geographic, and learning diversities. Our vision is to advance ocean literacy and environmental stewardship through positive, community-based engagement with our oceans. The Office of Education and Outreach seeks to establish an endowed fund to support the long-term continuation of community-based programs including the Oceanography Camp for Girls; In-Service Teacher Oceanography Workshops; GK-12 OCEANS Teaching Fellowships; Spoonbill Ocean Science Bowl; and K-12 Partnership Schools incorporating ocean education.

UNRESTRICTED SUPPORT

Unrestricted funds help address current needs, while also allowing College of Marine Science leadership flexibility in initiating programs and opportunities that benefit the entire campus community. During this period of intensified fund raising, it is the College's goal to establish an **Unrestricted Endowment.**

Do Not Distribute
DRAFT

CMS Meeting USF's Academic Affairs' Metrics (Under construction)

Key metrics have been established by the USF Academic Affairs Office that are being and will be widely used to evaluate programs within the university. We find it appropriate to address these "meter sticks" in this strategic plan to demonstrate our participation and commitment to: (1) centrality, (2) quality, (3) demand, and (4) viability/sustainability

Centrality

By virtue of being nearly surrounded by water, every aspect of Florida's economy is impacted by the ocean. Indeed, the State's geologic origin and natural resources are entirely dominated by the history of past oceanographic events. Correspondingly, Florida's human history and the workings of its modern society have intimate ties to the State's enormous coastline, the robust character of the local marine environment, and the relationship between this environment and both regional and global climate. As a result, Florida requires a first-rate marine science program to educate its citizens about the marine environment, to create new oceanographic knowledge through research, and to provide the critical information necessary for the sound management of Florida's marine resources. The University of South Florida is *uniquely positioned* to house a world premier marine science program.

The following are some key statistics that demonstrate the importance of the ocean to Florida's economy:

1. Florida ranks number one among the nation's destinations for Americans that swim, fish, dive, and otherwise enjoy the state's many beaches, coastal wetlands, and shores.
2. In 2003, Florida's shoreline counties contributed an estimated $402 billion to the Florida economy, 77% of the state's total economy.
3. In 2003, Florida's direct Ocean Economy (GSP) ranked second in the nation behind California with an estimated $13.1 billion.
4. In 2003, Florida's total (with multipliers) Ocean Economy was an estimated $23.2 billion.
5. Florida's shoreline county population ranked third in the nation.
6. 77% of Florida's population lives in coastal counties, with 46% living on the Atlantic and 31% on the Gulf coast. The remaining population lives inland.
7. In 2003, shoreline counties contributed more than 70% of all employment, population, and housing in the state with only 56% of the land area.
8. Employment forecasts for the Ocean Economy project a 73% growth with more than 268,000 new jobs by 2015.

Do Not Distribute
DRAFT

Kildrow, J., 2006, Phase 1 Facts and figures Florida's Ocean and Coastal Economies: National Ocean Economics Program, 20p. (www.OceanEconomics.org).

Mention 1200 people in the St. Petersburg area who are working in the marine/ocean science

Dr. Ashanti Pyrtle, and a colleague from Engineering, Dr. Bhansali, have been awarded three, consecutive, two-year NSF grants to support minority graduate students in the Colleges of Marine Science and Engineering under the aegis of NSF's Bridge to the Doctorate. She has also been awarded substantial funding from NASA through their MS/PhD program and was a pivotal part of our college becoming one of only 42 groups that are part of the A.P. Sloan Foundations Minority Scholarship Program

Quality

1. Four USF Distinguished University Professors (Drs. Byrne, Paul, Weisberg, Walsh; highest proportion of any academic unit at USF)
2. Member of the National Academy of Science (Robert Garrels--now deceased)
3. Sloan Fellowship winner (Mya Brietbart; only 2 selected in entire SE US; she was also selected as one of only 30 most outstanding US genomics researchers)
4. Highest percent of federal overhead return on grant/contract expenditures of any USF academic unit (31%)
5. Student award winners
6. publications/citations
7. 2 facutly are AAAS Fellows (Walsh and Torres)
8. David Mann, using NSF funds is building the largest, non-military passive acoustic array in the world, providing unique data sets that will, for the first time, actually reveal the behavior of marine mammals and game fish near thermal and optical fronts.
9. Associate professor Daly just returned from a year's leave with JOI where she led the first at-sea international research effort, ORION, to instrument the hydrothermal system on the Juan de Fuca Ridge in the Pacific Ocean. When expanded, this multi-year research program will cost hundreds of millions from NSF, Canada, and other sources
10. associate professor Luther was elected by his peers to **lead** the Alliance for Coastal Technology, a multi-university consortium on new coastal-ocean sensing technologies, and also to **lead** the Steering Committee of the US Integrated Ocean Observing System (IOOS), the group that will design the first real-time observing network for the entire US Coastal Zone under future joint Federal-state support.

Do Not Distribute
DRAFT

Demand

Request for COT services

Education/outreach demand
Diversity—Bridge to the doctorate
Partners

Available data demonstrate a strong demand and success for our educational program. Informart shows the following facts. Between 2000-1 and 2006-7, graduate applications to CMS were 97-to-132 per yr, maintaining a steady pattern around an average of 113. We accepted 29-70% each year, and then 46-to-69% of acceptees actually enrolled. In those years, the applicants were 66-to-84% domestic US and 16-to-34% international. The total number of MS and PhD students enrolled in the fall and spring semesters ranged from 102-to-123, nearly all of which received support. Summer enrollments were 61-to-94. On average, our 26-to-28 ranked faculty over those years, have directed ~4 graduate students each.

Current student/faculty ratios from peer marine institutions (FSU, U of RI, U of Hawaii, Texas A&M, Rutgers, U of Texas, and U of Delaware) ranged from 0.8-7.4 with an average of 3.1; so CMS has carried a better-than-average graduate-student load. Between 2001-2 and 2006-7, CMS graduated 14-35 students per year, for an annual average of 22. In 2003, a self-study identified 92 PhD graduates (We now have 580 alumni, with 130 being PhDs), 36% of whom became faculty members or researchers at Penn State, Cal Tech, U. Mississippi, Eckerd College, St. Petersburg College, U. Calif. @ Irvine, U. Georgia, U. West Florida, Skidaway Institute, Florida Gulfcoast U., East Carolina U., U. Maine, U. Maryland, U. North Carolina (Wilmington), SUNY, etc. Four were in foreign countries (Korea, Brazil). Eleven graduates had post-doctoral positions (5 at USF, and 6 external). Seven graduates were research associates (6 at USF, 1 external). Three worked at private research institutions. Twenty (22%) worked in research-oriented agencies such as NOAA, EPA, USGS, and FWRI (state marine environmental agency); 15 of the 20 worked in Federal agencies, and 5 in state agencies (in Florida and elsewhere). Eleven worked in private businesses, most oriented toward environmental research. Forty (or 43%) resided in Florida; thus the majority moved out of state to achieve their professional goals.

The Physical Oceanographic Real-Time System (PORTS, http://ompl.marine.usf.edu/PORTS/), a Bay data-dissemination system within CMS and is available to all Tampa Bay shipping

CMS has a very large monitoring system on the West Florida Shelf called COMPS (http://comps.marine.usf.edu/). Like PORTS it has monitoring stations and sends data back on ocean processes. Environmental managers are interested in using both COMPS

and PORTS to decide about evacuations during hurricanes, which cost roughly $1million per mile of coastline.

Viability/sustainability

For FY years 2004-2006, CMS research expenditures ranged from $20-$23 million per year, or $700,000-$800,000 per ranked faculty member per year. These normalized values compare very favorably with funding at peer marine institutions (FSU, U of RI, U of Hawaii, Texas A&M, Rutgers, U of Texas, and U of Delaware): $100,000 - $1.1 million (average: $630,000). Further, while providing 9-10% of USF Academic Affairs' research expenditures in 2004-6, CMS provided 15-20% of its F&A expenditures in 2004-2006, thus showing a strong success rate in Federal competitions, where full F&A is charged.