

Research Priority Descriptions for the Sea Grant 2011 Call of Proposals

Background

The following research priority descriptions (RPD) are intended to guide the upcoming OPC-funded 2011 Sea Grant call for proposals. The RPDs were organized under the priority issue areas currently proposed to be the focus of OPC efforts over the next five years. These areas encompass critical ocean threats and potential solutions where the OPC's particular role in coordinating agencies, recommending policies, and funding projects is essential and will have high impact:

- Climate Change Adaptation to Address Sea-Level Rise and Other Climate Impacts to Ocean and Coastal Ecosystems
- Coastal and Marine Spatial Planning to Inform Decisions about Ocean Uses Off the California Coast
- Land-Based Management to Reduce Impacts on Ocean and Coastal Resources
- Preparing for Emerging Industrial Uses of the Ocean
- Sustainable Fisheries Management to Ensure Healthy and Thriving Marine Ecosystems and Fishing Communities

In order to ensure that the call for proposals addresses the most relevant and timely research needs, the Ocean Science Trust (OST) led a collaborative effort to write the RPDs that involved OPC staff, regulating agencies with ocean and coastal jurisdictions, and the OPC Science Advisory Team (OPC-SAT). First, the OST canvassed the OPC and regulating agencies for the most pressing management questions they are facing under each priority issue area. The OST then held a series of conference calls with OPC-SAT working groups to generate corresponding research questions that would most effectively advance scientific knowledge on each matter. Finally, the OST, with extensive comment and input from the OPC-SAT, formulated the corresponding research questions into the final RPDs.



Climate Change Adaptation to Address Sea-Level Rise and Other Climate Impacts to California's Ocean and Coastal Ecosystems

Compelling evidence exists that the impacts to our ocean and coastal resources from climate change will be substantial. However, we have less information on how climate change will alter specific ocean and coastal habitats, including habitats represented in newly implemented MPAs, and have not yet harnessed existing tools and data to predict the relative vulnerabilities of habitats, local economies and coastal infrastructure. Research priorities include:

- Understand how habitats at the margins (i.e. marshes, estuaries, wetlands, beaches, dunes and coastal bluffs) may change, namely those facing increasing pressure from sea-level rise, yet cannot migrate inland due to existing built infrastructure.
- Harness existing tools and data (e.g. LiDAR data) to:
 - Make predictions about the future of coastal habitats
 - Map habitats most immediately vulnerable to inundation
 - Develop early warning signs of climate change impacts
 - Evaluate risks facing coastal economies (e.g. ports, infrastructure, and recreation)
- Identify potential shifts in ecosystem resilience and diversity in habitats represented in the newly implemented MPAs in the face of climate-mediated changes in habitat distributions.
- Harness modeling efforts generated under the Marine Life Protection Act Initiative to assess predicted impacts of changes in coastal and marine habitat distributions (including ocean productivity), potential shifts in species ranges, and larval dispersal.
- Understand how surface water warming may alter key elements of ocean productivity (i.e. surface pycnocline stratification, nutrient transport, and phytoplankton) in areas along the California coast.

Coastal and Marine Spatial Planning to Inform Decisions about Ocean Uses Off the California Coast

To evaluate the tradeoffs of potentially conflicting uses in an ecosystem-based context, managers must set accurate ecological, economic, and social objectives that reflect key attributes of coastal and marine ecosystems and the communities that depend on them. A key research component for California will be balancing existing data with the collection of new data in the appropriate format to inform state management decisions. A distinct emphasis should be placed on collaboration between biophysical and social scientists to conduct spatially based research projects that connect the supply of valuable ecosystem services (e.g. fisheries, recreation, shoreline protection etc) with the delivery of those services. Research priorities include:

- Determine key ecological attributes that must be preserved to sustain ecosystem structure and function while allowing multiple uses, specifically:
 - Obtain explicit, observed data on the distribution of marine habitats, or gather existing data on bathymetry, substrate, temperature, and other physical conditions to use as habitat proxies that can be combined and modeled to better understand ecosystem function and the supply of services
 - Collect socioeconomic data in conjunction with mapping of biophysical data to both better connect ecosystem service supply with service delivery and ensure that data sets across disciplines can be meaningfully evaluated

- Determine or develop the relevant geospatial datasets at a resolution that can be used for analytical purposes, as well as those that can be meaningfully visualized and shared in a readily accessible format.
- Stronger understanding of the nature of cumulative impacts, including:
 - Map cumulative impacts on marine ecosystems at finer, more localized scales
 - Understand how various existing and emerging uses interact and how their combined effects impact the marine ecosystem

Land-based Management to Reduce Impacts on Ocean and Coastal Resources

Compelling evidence exists that land-based runoff is the largest source of pollutants and contaminants to the coastal ocean. While a significant amount of water quality research has been conducted on the level and toxicity of various runoff components, finer-scale understanding is necessary to determine their distinct sources and pathways in the coastal ocean, their effects on particular marine habitats, and what solutions will most effectively mitigate their impact. There is a need for synthetic, interdisciplinary research among scientists with expertise in terrestrial watersheds, water quality, marine biology, land use and low impact development.

Communication and collaboration between coastal scientists and resource managers, decision-makers, and land-based scientists is essential where upstream decisions may impact coastal habitats. Research priorities include:

- Identify the most important sources and associated land-based activities for pollutants and contaminants that discharge into the ocean, as well as their pathways in the coastal ocean.
- Determine the impacts of point source and non-point source runoff on near-shore habitats, including those in and adjacent to the newly implemented Marine Protected Areas.
- Identify and prioritize potential mitigation of polluted run-off, on coastal habitats including evaluation of the efficacy of different approaches to low-impact, terrestrial development.

Preparing for Emerging and Industrial Uses of the Ocean

Serious attention is being given to the development of wind, wave, and tidal energy technologies, desalination plants, and aquaculture (including polyculture offshore fish ‘ranching’). These emerging uses of California’s coast and ocean, present potential risks and benefits to coastal ecosystems and economies, many of which are poorly understood. Data from across disciplines are needed, and fit under these general themes: 1) potential impacts on coastal and marine habitats of proposed installations, 2) economic and social impacts on existing stakeholders, (i.e. fishers, recreational users, etc.), and 3) engineering solutions to known challenges, or ways to improve operations. Research priorities include:

- Desalination:
 - Develop potential engineering solutions to known challenges, including diffusing brine at discharge pipes to meet Ocean Plan standards, and reducing entrainment at intake pipes
 - Conduct cost/benefit analysis of the capture, treatment, storage and re-use of freshwater vs. desalinating seawater
- Aquaculture & Polyculture:
 - Identify local species that are most suitable for aquaculture and polyculture from both an economic and ecological point of view

- Evaluate and develop methods to mitigate potential damage from intensive husbandry of species (i.e. degradation of water quality, depletion of species used as feed, diseases etc)
- Evaluate the risks associated with offshore aquaculture.
- Offshore alternative energy:
 - Greater understanding of the direct, indirect and cumulative impacts of offshore wave energy arrays on ecosystems and marine species, including downstream physical effects of lower wave energy from offshore arrays, potential impacts of acoustic noise and electromagnetic radiation, and changes in water quality

Sustainable Fisheries Management to Ensure Healthy and Thriving Marine Ecosystems and Fishing Communities

Sustainable fisheries research should address natural and social science questions under four over-arching topics: adapting fisheries management to newly implemented MPAs, harnessing market-based forces to promote more sustainable fisheries, studying the ecosystem effects of fishing, and researching data-poor and/or emerging fisheries. A focus should be placed on research that promotes multi-disciplinary collaboration between natural and social scientists, and/or involves various fishing stakeholders, including linking traditional ecological knowledge of tribal fishing communities to scientific knowledge. Research priorities include:

- Understand how the spatial distribution of fisheries may be impacted by newly implemented MPAs, and develop methods to sustainably integrate fisheries management with MPAs
- Understand the ecosystem effects of fishing, including:
 - Develop ecosystem models to understand the potential impacts of MPAs
 - Understand how fishing is affecting non-target species
- Conduct a preliminary assessment to determine which California fisheries might currently qualify for certification under the Marine Stewardship Council (MSC), and what is necessary for those that don't
- Initiate cooperative research projects with fishing stakeholders to explore methods to co-manage fisheries, including the potential for community-based management of fisheries (e.g. territorial use rights sustainability)
- Conduct research regarding data-poor and/or emerging fisheries, including exploring cooperative research (e.g. enlisting fishing participants to contribute data from vessels)