

MIT SEA GRANT

STRATEGIC AND IMPLEMENTATION PLAN, 2010 – 2015

Introduction

Our strategic plan is inspired by our vision and governed by our goals and objectives. Our efforts in research, education, and outreach are designed to address critical marine and coastal issues at the state, regional, national and global levels. Our plan describes our mission as a Sea Grant College Program, as well as the geographical and institutional context in which we operate. We also provide some detail on the areas in which MIT Sea Grant has significant expertise and potentially significant impact.

Our goals represent a challenge to the investigators in our research network as well as to our colleagues in education and outreach. These goals mold and govern our annual solicitation for new proposals, and guide us in both the long and short term toward projects whose success can best serve our constituents.

Mission Statement

The mission of the MIT Sea Grant College Program is to develop technology to enable scientific investigation into problems surrounding the human use of the sea. Our education and outreach efforts disseminate the results of our research, encourage the adoption of sustainable and useful technologies, and support public policy and businesses with information that is evidence-based and scientifically sound.

Vision

The Sea Grant College Program at MIT is positioned to bring the substantial intellectual abilities of the Massachusetts Institute of Technology and our institutional collaborators to bear on a number of ocean-related challenges. In meeting these challenges with extraordinary technical contributions, we will expand our knowledge of the ocean, and also establish the collaborative infrastructure to support the initiatives and talent needed to address threats to our critical and fragile marine resources.

THE CONTEXT OF OUR PROGRAM

The National Sea Grant Program



Congress established the National Sea Grant College Program in 1966 to hasten the development, use and conservation of the nation's coastal waters and Great Lakes. The legislation called for a network of Sea Grant Colleges to conduct education, training, and research in all fields of marine study, and directed that grants and contracts would go to "suitable public and private institutions of higher education, institutes, laboratories, and public or private agencies which are engaged in, or concerned with, activities in the various fields related to the development of marine resources." [PL 89-688 Sec. 204(c)]

MIT received its first funding from Sea Grant in 1968 and was designated as a Sea Grant College Program in 1976. Today, there are 30 Sea Grant programs in coastal and Great Lakes states and in Puerto Rico. As part of the National Oceanic and Atmospheric Administration, the National Sea Grant Program supports scientific research in coastal and ocean engineering, fisheries science, and marine-related social sciences and law. To ensure that programs respond to local as well as national concerns, the law requires that one-third of the program funds come from non-federal sources such as industry or state or local governments.

The Local Landscape - The Commonwealth of Massachusetts

The Commonwealth of Massachusetts has a rich and colorful maritime history and a significant part of the Commonwealth's economy remains dependent on the sea. However, unlike during colonial times, the finiteness of the ocean's bounty has been realized.



Massachusetts boasts 1,500 miles of coastline with an estimated 6.4 million people, making it one of the most densely populated states in the USA. Coastal industries such as tourism, shipping, and commercial fishing contribute an estimated \$70.7 billion to the Massachusetts economy. Development in these industries, however, can threaten the state's marine ecosystems upon which their existence depends. Negotiating the wise use of the Commonwealth's maritime resources requires the best and most accurate

scientific information and it is the mission of MIT Sea Grant to make that information available.

The Region - The Gulf of Maine

The Gulf of Maine is a semi-enclosed sea, an ecosystem bounded to the south and east by tall underwater land forms, or "banks," and to the west and north by the coasts of Massachusetts, New Hampshire, Maine, New Brunswick, and Nova Scotia. It includes the Massachusetts and Cape Cod Bays; its watershed extends inland to affect 41% of Massachusetts' land mass. Our strategy is to place our research and outreach efforts in the context of this regional ecosystem. Particularly significant areas in the region are:

- **Georges Bank:** Its relatively shallow waters, large area and great variety of fin and shellfish make it one of the most productive fishing grounds in the world.
- **Boston Harbor:** In the 1980s, Boston Harbor was considered one of the most polluted in the country. Today it is dramatically cleaner, with wastewater treatment facilities on harbor islands and a nine-mile outfall tunnel for effluent discharge out to Massachusetts Bay.
- **Stellwagen Bank:** An area virtually within sight of Boston, Stellwagen is one of 14 designated National Marine Sanctuaries. Stellwagen is an important source of food and a breeding ground for a number of whale species, supporting local whale-watching tours.
- **Watersheds:** A watershed of 65,000 square miles feeds the Gulf of Maine, including land in eastern New England, the "down east" landmass of northern Maine, and the Maritime Provinces of New Brunswick and Nova Scotia. The Massachusetts/Cape Cod Bay watershed consists of 13 rivers and individual watersheds. Of the 351 cities and towns in Massachusetts, 161 fall within this watershed.

Our Host Institution - The Massachusetts Institute of Technology

MIT was founded in 1861 to establish a new kind of independent educational institution relevant to a newly industrialized America. From its inception the Institute has been guided by the philosophy that professional competence is best fostered by coupling teaching with research and by focusing on real-world problems.

The mission of MIT is to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century. The Institute is committed to generating, disseminating, and preserving knowledge, and to working with others to bring this knowledge to bear on the world's engineering and technological challenges. MIT Sea Grant's work with artificially intelligent underwater vehicles and new kinds of subsea communications is made possible by the intellectual resources and environment of the Institute. MIT promotes broad collaboration among MIT, industry, and government in order to promote education, research, and service to the larger community.

President Susan Hockfield recently announced the creation of an MIT Energy Initiative to address pollution, economic dependence on foreign oil, and other issues related to the nation's energy needs. In the spirit of this initiative and in the interest of preventing climate change, MIT Sea Grant is supporting research in wave and current power generation, algae-based bio-fuels, technology to eliminate oil-spill pollution, and "green" uses of the sea and its resources for energy production.

The MIT Sea Grant College Program

The Massachusetts Institute of Technology was designated as a Sea Grant College in 1976—the first private institution of higher learning to be so appointed. Our innovative marine research is guided by the unique resources of higher educational institutions in Massachusetts and by local and national research needs. We draw on and support the expertise and ingenuity of researchers from MIT, the University of Massachusetts, Boston University, Harvard University, Northeastern University, and other colleges and universities in the region. In addition, we benefit from our partnership with the Woods Hole Oceanographic Institution Sea

Grant Program. Our collaborative approach ensures that we involve a broad spectrum of industrial and governmental groups and government agencies.

Integral to our commitment to basic and applied research are outreach and education. Through outreach we ensure that useful research results reach our constituents, and that we are aware of their needs. Our educational scope ranges from educating school children about marine bio-fuels to nurturing and challenging undergraduate and graduate students who will become the marine researchers and coastal managers of tomorrow.

MIT SEA GRANT STRATEGIC GOALS

Focus Area: HEALTHY COASTAL ECOSYSTEMS

Goal: Provide the scientific information necessary for ecosystem-based management of the coastal environment by developing platforms, sensors, instrumentation, mathematical modeling, underwater communications, manipulators and data collection capabilities

Goal: Ecosystem-based approaches to managing land, water and living resources in coastal areas in widespread use within and outside of NOAA through accurate data collection, useful models and training programs shared with a broad cross-section of stakeholders.

Goal: Coastal communities efficiently using land, energy and water resources with minimal damage to coastal ecosystems and quality of life by using an integrated ocean circulation model for the Gulf of Maine for coastal zone monitoring, fisheries management, and pollution control

Focus Area: SAFE AND SUSTAINABLE SEAFOOD SUPPLY

Goal: Develop and disseminate essential knowledge on threats to the long-term viability of wild fish populations, and on the effective use of ecosystem-based fisheries management to minimize the threats

Goal: Programs, training, technical assistance, and outreach programs on to minimize release of live seafood and curtail the introduction of non-native species into local ecosystems

Focus Area: HAZARD RESILIENCE IN COASTAL COMMUNITIES

Goal: Fuller understanding of historical and current patterns of climate change and use of this information to forecast the effects of global warming on our coastal communities

MIT SEA GRANT IMPLEMENTATION PLAN

To implement its strategy and achieve its objectives, MIT Sea Grant will maintain an active portfolio of research, education and outreach projects and activities. These projects and activities will be selected and judged by how they further our strategic plan, and on their scientific quality, the significance of their contribution, and their competitiveness.

Research projects are solicited yearly from Principal Investigators through a [Request for Proposals process](#). Outreach plans for Marine Advisory Services (MAS), Communications and Education are assembled and reviewed by MIT Sea Grant staff and management team every four years. We also administer other awards and grants through Institute, state and special national funding competitions. Accomplishments under these special awards are folded into our implementation plan in the chart below which depicts the specific, measurable objectives we will achieve in the four focus areas mentioned above.

MIT Sea Grant Implementation Plan

Outcomes	Measurable Objectives	Target Metrics
Healthy Coastal Ecosystems		
<p>Managers contribute to the development of scientific underpinnings for an ecosystem-based approach to resource management through baseline data, standards, and indicators and work with NMFS to analyze human dimensions.</p>	<p>Over the next two to six years MITSG will develop field-tested instruments to assess biota and plankton; a microprocessor to facilitate AUV response; an underwater communications capability for collecting data in a reliable and cost-effective manner; biomonitors to track pollution; smart sensors for bacterial water quality prediction; field tests for "biobullets" for use in control or eradication of <i>Didemnum</i>; press releases, media notices, and articles to communicate research findings to colleagues and the public</p>	<ol style="list-style-type: none"> 1. Two instruments to assess biota and plankton a 3-D plankton sampler and optical sensor for detection of <i>Didemnum</i> 2. Microprocessor to increase responsiveness of AUV platform 3. Deep sea acoustic and video monitoring capability 4. Five AUVs capable of underwater acoustic communication for data collection network 5. Mussel gene assay biomonitor for pollution detection 6. Smart sensor for monitoring hot spots of DNA bacteria 7. One biobullets field test, minimum 8. 24 press releases and notices, six articles
<p>Resource managers will use existing, and develop new, methodologies to evaluate ecosystem-based management approaches, including their social impacts on the fisheries population and their usefulness as a guide to future management efforts</p>	<p>By 2014, develop methodologies to evaluate ecosystem-based management approaches, assess their effectiveness and guide future management efforts. In collaboration with the National Marine Fisheries Service and other federal, state and local partners, will help identify human impact indicators.</p>	<ol style="list-style-type: none"> 1. Information on <i>Didemnum</i> patchiness and distribution on Georges Bank, by season, sediment type, etc. available to end users 2. Ten partners and resources managers recruited to i.d. human impact indicators 3. One social impact assessments for herring fisheries
<p>Managers have access to data, models and training that support ecosystem-based planning and management approaches.</p>	<p>By 2012-16, develop models and training activities that support ecosystem-based planning and management approaches, developed with partners within and outside of NOAA and shared with a broad cross-section of stakeholders</p>	<ol style="list-style-type: none"> 1. Mathematical model to evaluate spread of <i>Didemnum</i> 2. Infestation tracking visualization tool for managers 3. A single continuous model for Mass Bay 4. Online forecasting model for Mass Bay 5. Online forecasting model for bacterial water quality 6. Three workshops to train managers to access and use these models

<p>People of all ages understand coastal and ocean environments and the need for stewardship of healthy ecosystems</p>	<p>By 2014, learning programs for people of all ages to enhance understanding of coastal and ocean environments and promote stewardship of healthy ecosystems through our Advisory and Education section; includes marine bioinvasions, create community contact database, develop campaign to alert coastal stakeholders</p>	<ol style="list-style-type: none"> 1. Twenty new citizen scientists and one new resource manager per year reporting marine invasions through MITSG/MITIS database 2. A community database for marine bioinvasions 3. 25 MA and/or Northeast communities using invasive species database (MITIS) in active campaign to minimize introductions 4. Two joint newsletters per year with WH SG 5. Six electronic/print publications per year communicating scientific and outreach findings to public 6. 120 students, 18 volunteers, 12 schools per year involved in Blue Lobster Bowl (BLB) 7. Ten students per year mentored through BLB, MIT Undergraduate Research Opportunity Program (UROP), and other programs
<p>Coastal residents, resource managers, businesses, and industries have access to sound scientific information to support ecosystem-based approaches to managing the coastal environment and to ameliorating degraded ecosystems. The ecosystem degradation issue addressed is non-native, invasive species in near-shore areas and Georges Bank.</p>	<p>By 2014 develop and implement a working regional communications and participation network to obtain input on ecosystem degradation by non-native species, both near-shore and on Georges Bank, specifically eelgrass beds and fisheries habitat.</p>	<ol style="list-style-type: none"> 1. Two complementary databases per year created on marine invasions and environmental variables 2. Two additional organizations/communities per year accessing and using these databases
<p>Fisheries managers, scientists, and individuals associated with the fishing industry have access to communication networks</p>	<p>By 2012, increased discussion of ecosystem-based management approaches on Fishfolk and through other electronic media tools of communication</p>	<ol style="list-style-type: none"> 1. 10% increase in number of people participating in online discussion of ecosystem-based management (EBM) on boards and lists such as Fishfolk 2. Three focus group meetings on EBM
<p>Managers have the know-how to undertake restoration projects, do so, and evaluate and adapt as needed.</p>	<p>By 2014 MITSG will sponsor three workshops/seminars and develop a working regional communication network of managers and stakeholders involved in the implementation of ecosystem management system.</p>	<ol style="list-style-type: none"> 1. One workshop/conference on ecosystem management sponsored per year 2. 25 participants per workshop/conference 3. One coalition taskforce formed to reduce marine invasions
Sustainable Coastal Development		
<p>Develop technical and related know-how to foster the development of marine commercial activities.</p>	<p>By 2014, at least one of the MITSG-fostered research activities yields results that are commercially viable</p>	<ol style="list-style-type: none"> 1. AUV sensors, manipulators and upgrades that are of commercial value to stakeholders

Provide community leaders with tools needed to pursue sustainable social and economic development policies and programs.	By 2012 - social and economic benefits from alternative energy generation (algae biodiesel demo project) and sustainable coastal policies and practices as a result of Sea Grant activities	<ol style="list-style-type: none"> 1. One alternative energy project, biodiesel from cultivated marine algae 2. Twelve tours of the biodiesel project per year 3. One school per year participating in biodiesel technology transfer
Managers will understand benefits of maintaining working waterfronts	By 2014, raise awareness of value of working waterfronts through outreach efforts	<ol style="list-style-type: none"> 1. One symposium per year held on working waterfronts 2. Fifteen resource managers attend symposium
Managers benefit from information on fisheries habitats and working water fronts	By 2014, coastal communities derive economic benefits from sustainable use policies and practices as a result of Sea Grant activities	<ol style="list-style-type: none"> 1. Two communities per year benefit from activities on fisheries habitats and working waterfronts
Contribute to the development of an integrated ocean circulation model for the Gulf of Maine for use by the scientific community in coastal zone monitoring, fisheries management, pollution control and similar applications.	By 2014 coastal communities have access to tools and methodologies to determine the spatio-temporal distribution of observation points for initialization and data collection to support ocean forecasting.	<ol style="list-style-type: none"> 1. One training program related to climate change adaptation 2. One community, two schools benefitting from program 3. Two schools collecting data with Sea Perch for use by local communities
Safe and Sustainable Seafood Supply		
State and federal managers minimize natural and human threats to the long-term viability of wild fish populations	By 2012 - expand Community Sponsored Seafood (CSF) programs locally and transfer to other regions, ensuring safety and sustainability of the seafood supply.	<ol style="list-style-type: none"> 1. One new community recruited per year to participate in CSF program 2. One hundred new subscribers recruited per year 3. One new state per year to receive CSF information
Managers benefit from a viable domestic aquaculture industry with acceptable environmental impacts .	By 2012 conduct integrated research, education, and outreach activities to support a viable domestic aquaculture industry with acceptable environmental impacts, in ways that are consistent with national objectives, building on the leadership role Sea Grant plays in this area	<ol style="list-style-type: none"> 1. Two focus groups per year to meet on best management practices to reduce NIS 2. Twelve tours per year of Gloucester Marine Education Center and Hatchery
Local seafood consumers have an increased knowledge of the nutritional benefits of seafood products, know how to judge seafood safety and quality, and can apply this knowledge to make better choices when they purchase seafood.	Develop a regional network of managers and stakeholders to implement measures to ensure the safety and sustainability of the seafood supply.	Covered above
Information portals are available on seafood safety, nutrition, and sustainability.	Develop a regional communications and participation network to obtain input on the safety and sustainability of the seafood supply.	Covered above

<p>The local seafood industry harvests and produces seafood responsibly and efficiently.</p>	<p>Develop a regional network of managers and stakeholders to implement measures to ensure the safety and sustainability of the seafood supply; use social science to support appropriate fish management options</p>	<p>1. One Social Impact Assessment on the northern shrimp fishery</p>
<p>The seafood supply is sustainable and safe.</p>	<p>Develop a regional network of managers and stakeholders to implement measures to ensure the safety and sustainability of the seafood supply.</p>	<p>Covered above</p>
<p>Consumers make choices in seafood purchases that support safe, valuable and sustainable seafood industries</p>	<p>Support Cape Ann Fresh Catch Program to strengthen our local food community, economy, and the sustainability of the ecosystem and to teach consumers to make choices in seafood purchases that support safe, valuable and sustainable seafood industries.</p>	<p>Covered above</p>
<p>Hazard Resiliency in Coastal communities</p>		
<p>Managers have access to instruments needed to collect baseline data/indicators to support predictions of global warming impacts on humans and ecosystems</p>	<p>By 2014, use data from research on deep-water corals to understand patterns of past climate change and use this information to forecast the effects of global warming</p>	<p>1. One manipulator created to sample deep sea corals 2. Information (web and print) for the public on past climate change, based on coral analyses</p>
<p>Decision-makers are aware of existing and available data and resources to predict consequences of global warming.</p>	<p>1. National symposium (with WH SG) to share findings, particularly those related to global warming and climate change 2. Number of reports generated for meeting</p>	<p>1. One MITSG-sponsored national symposium to share findings of climate change research for the Northeast region 2. One white paper on predictions for Northeast region</p>
<p>Residents and decision-makers are aware of and understand processes that produce coastal hazards and of the implications of these risks</p>	<p>By 2012, comprehensive education/literacy programs on the immediate and long-term effects of climate change developed in collaboration with the NOAA Climate Change Program and other public and private sector partners. Develop program: test, redesign, implement</p>	<p>1. One training program per year on climate change 2. Fifteen managers per year attend training programs.</p>