

NATIONAL ASSOCIATION OF MARINE LABORATORIES

FY 2015 PUBLIC POLICY AGENDA

The National Association of Marine Laboratories (NAML) is a nonprofit organization representing the ocean, coastal and Great Lakes interests of member laboratories that employ thousands of scientists, engineers and professionals nationwide. NAML labs conduct high quality research and education in the natural and social sciences and translate that science to improve decision-making on important issues facing our country.

NAML Policy Priorities for Ocean, Coastal and Great Lakes Research, Infrastructure, and Education

- ***Maintain strong support for competitive, merit-based ocean, coastal, and Great Lakes research, infrastructure and education programs at relevant federal agencies.***
- ***Strengthen the infrastructure of marine laboratories to better integrate the environmental data networks into federal information and observing system networks to achieve cost effective science-based decision making to better manage marine, coastal and Great Lakes ecosystems and related resources.***
- ***Implement an innovative and cost-saving national partnership program to co-locate federal scientists and federal research infrastructure initiatives at NAML sites and facilities.***
- ***Preserve a diverse, distributed ocean science education agenda supported by multiple ocean research agencies including mission agencies such as NOAA, NASA and EPA.***

The Role of Marine Laboratories in the Nation's Research and Education Enterprise

Ocean, coastal and Great Lakes marine laboratories are vital, cost-effective, place-based "windows on the sea." They connect communities with cutting edge marine, coastal and social sciences, while also providing students and citizens with meaningful learning experiences. The members of the National Association of Marine Laboratories (NAML) work together to improve the quality and relevance of ocean, coastal and Great Lakes research, education and outreach. In particular, NAML seeks support for the:

- Conduct of basic and applied research of the highest quality making use of the unique capabilities of coastal laboratories;
- Revitalization of research infrastructure through increased cost-effective networking of capabilities;
- Unique role that coastal laboratories play in conducting education, outreach and public service;
- Encouragement of wise use and conservation of marine and coastal habitats and resources using ecosystem-based management approaches;
- Coastal and other observing systems that collect front line data needed to improve predictions of natural and human-caused disasters, the management of marine resources, research, education and for other purposes; and
- Education and training of the future scientific and technical workforce and increased public ocean and Great Lakes literacy to promote greater environmental stewardship.

Oceans, Coasts and Great Lakes are Vital for Economic Growth and the Well-being of the Nation

The ocean, coasts, coastal watersheds, and the Great Lakes play a central role in the well-being of the Nation. Over 8.5 million people reside in the 100 year coastal flood hazard area. More than half of the United States population lives in 673 coastal watershed counties, and these counties generate 58% (\$8.3 trillion) of the Nation's gross domestic product (GDP)—even though they comprise only 25% of the Nation's land area. Every day, the marine environment supplies a multitude of products and services that enhance and support the lives and livelihoods of citizens. In 2011, Americans, on average, ate 15 pounds of fish and shellfish per person – 4.7 billion pounds all together – making the U.S. second in the world in total seafood consumption. Offshore oil production in Federal waters accounts for 24% of total U.S. crude oil production. If American coastal watershed counties were considered an individual country, that country would have a GDP higher than that of China. The United States has jurisdiction over 3.4 million square miles of oceans – an expanse greater than the land area of all 50 states combined. This vast marine area offers many environmental resources and economic opportunities, but also presents threats such as damaging tsunamis and hurricanes, industrial accidents and outbreaks of water borne pathogens. The 2010 Gulf of Mexico *Deepwater Horizon* oil spill, the 2011 Japanese earthquake and tsunami, and the 2012 Superstorm Sandy are vivid reminders that our understanding of our oceans and coastal areas is far from complete. Developing sufficient capabilities to sustain ocean-based economies and protect our coasts and coastal communities from natural and man-made hazards will require a sustained investment in research, infrastructure and education and training.

NAML Priority -- Investing in Research

NAML believes America is driven by innovation — advances in ideas, products and processes that create new industries and jobs, contribute to our nation's health and security, and support a high standard of living. In the past half-century, innovation itself has been increasingly driven by educated people and the knowledge they produce. It is essential that the nation reaffirm and revitalize the unique partnership that has existed between the Federal Government, the states and business and industry with the nation's research and education enterprise. In doing so, we encourage the innovation that leads to high-quality jobs, increased incomes, security, health, and prosperity for the nation. Investing in the nation's research enterprise should be seen as a high priority that has contributed significantly to our long-term prosperity and technological preeminence through interdisciplinary research spanning a landscape of disciplines, from physics to geology, chemistry to biology, engineering to social sciences and modeling to observation.

NAML believes that research and education programs at the major federal science agencies with ocean and coastal responsibilities should be viewed as priority investments in the future health and well-being of the Nation. Much attention has been justifiably focused on the need for our Nation to continue its support of premier basic research programs. It is also important to maintain strong support for mission-oriented ocean, coastal and Great Lakes research, observing and monitoring programs. Programs that enhance agency internal research capabilities and support the extramural community in competitive, merit-based research provide highly cost-effective returns on investment and distribute economic and societal benefits over a broad array of communities. Further, NAML believes that developing exchange programs between federal agencies and marine laboratories will further strengthen the communication and capacity of both for the benefit of the ocean science and management enterprise.

NAML Priority -- Investing in Research Infrastructure

NAML believes that a comprehensive range of ocean and coastal research infrastructure will be needed to meet growing demands for scientific information and to enable the safe, efficient, and environmentally sustainable use of the ocean. Institutional barriers have inhibited collaborative efforts to plan for the deployment, operation and maintenance of high-cost critical infrastructure assets such as ships, satellites, observing systems and cyber-infrastructure for data sharing, networking and collaborative use of available facilities. Marine laboratories often play a critical role in supporting studies that extend across decades. Marine laboratories can provide the infrastructure to collect data throughout a lifetime, and even maintain important data streams that extend well beyond any single researcher. Marine laboratories are often a hotbed of sensor development and testing. With technology changing rapidly, marine laboratories provide the expertise to maintain a level of standardization that ensures such data can be interpreted accurately even as protocols change in response to improving technology. Marine laboratories are playing an increasing important role in supporting networks that extend beyond any single lab. Because environmental processes occur on a wide range of spatial and temporal scales, data streams are standardized and networked to varying degrees to facilitate cross-site and long term analyses. Finally, given the complexity and interconnected nature of many environmental processes, marine laboratories provide important opportunities to weave together the work of many researchers in order to see patterns and understand processes that would not be apparent from any single study or data stream.

NAML Priority – Investing in Science, Technology, Engineering and Mathematics (STEM) Education

NAML's education mission is two-fold: to enhance ocean STEM education to ensure that all citizens recognize the role of the oceans, coasts and Great Lakes in their own lives and the impacts they themselves have on these environments; and to provide formal research and training opportunities at K-12, college, and post-graduate levels to ensure a technically-qualified, and ethnically diverse workforce capable of solving problems and answering questions related to the protection, restoration and management of coastal and ocean resources, climate variability and society's needs. An informed and engaged public is essential to understand complex ocean- and coastal-related issues, balance the use and conservation of marine resources, and maximize future benefits from the ocean. The public should be armed not only with the knowledge and skills needed to make informed choices, but also with a sense of excitement about the marine environment. Public understanding of human impacts on the marine environment should be balanced with recognition of the benefits to be derived from well-managed ocean resources. Inland communities need to be just as involved as seaside communities, because of the connection among the ocean, the atmosphere and the land. Ocean-related education also has the potential to help stem the tide of science illiteracy threatening to undermine the nation's health, safety and security. The scientific literacy of U.S. high school graduates is well below the international average. This progressive loss of literacy weakens the nation's ability to maintain its traditionally strong foundation in science and mathematics. NAML laboratories seek to expand the engagement of individuals from groups that have been historically under-represented in ocean research, education and outreach. This is particularly important in fulfilling the goal of achieving a diversified STEM pipeline to meet future science and ocean workforce needs.

National Science Foundation

NSF funds vital basic research that enhances the public understanding of the Nation's oceans, coasts and Great Lakes. NSF also supports science, engineering and education to inform the societal actions needed for environmental and economic sustainability and sustainable human well-being. A sustainable world is one in which human needs are met equitably and without sacrificing the ability of future generations to meet their needs. Meeting this challenge requires a substantial increase in our understanding of the integrated system of society, the natural world and the alterations humans bring to Earth. Research in this area as well as in other ocean and coastal areas is supported via a highly competitive, merit-based process through a variety of modes of support at NAML laboratories involving individual investigators, small interdisciplinary teams of researchers and students.

Research, education and infrastructure funded by NSF address the central role of the oceans in a changing Earth and as a national strategic resource. NSF supports interdisciplinary research to better understand changing ocean circulation, other physical parameters, biodiversity and the dynamics of marine organisms and ecosystems, and changing ocean chemistry such as ocean acidification. NSF also supports research on the geology of the ocean margins and sub-seafloor to investigate past ocean and climate conditions, stability of methane hydrates, natural hazards associated with earthquakes and volcanic eruptions, and microbial life deep below the seafloor. Ocean education emphasizes undergraduate programs and the interdisciplinary nature of ocean sciences. Since ocean science requires access to the sea, NSF supports research vessels, deep submergence capability including submersibles and autonomous vehicles, and technologically advanced sensors and instrumentation.

Research emphases in NSF are guided by national research priorities in key areas of interaction between society and the ocean. These priorities include improved understanding of marine ecosystems, marine biodiversity, the impact of increased atmospheric carbon dioxide on ocean acidification, the ocean's role in climate change, ocean observing, changing conditions in the Arctic, hazards and extreme events, and the enhancement of infrastructure to support ocean and coastal research. In general, 30 percent of NSF's ocean sciences portfolio is available for new research grants with the remaining 70% used to support continuing grants. Approximately 52 percent of the overall budget supports facilities and infrastructure. This is a substantial change from the historical percentage of 40%. Within the highly constrained budgets, a shift of this magnitude could have adverse effects on the ability of individual investigators – particularly young investigators – to compete successfully for the resources needed for high quality research activities.

NAML is particularly supportive of the creation of new research networks that connect NAML laboratories and terrestrial field stations in ways that would enhance other ecosystem networks supported by NSF. NAML believes that research infrastructure and related networking support is needed to move the research enterprise forward and therefore we continue to support growth in NSF's Field Stations and Marine Laboratories (FSML) program.

NAML maintains a strong interest in the forthcoming National Research Council report on the value and sustainability of Biological Field Stations and Marine Laboratories.

National Oceanic and Atmospheric Administration

The complex interdependence of ecosystems and economies will grow with increasing uses of land, marine and coastal resources, resulting in particularly heavy economic and environmental pressures on the Nation's coastal communities. Continued growth in coastal populations, economic expansion, and global trade will further increase the need for safe and efficient maritime transportation. Similarly, the Nation's need for conventional and alternative energy presents many economic opportunities, but will also result in greater competition for ocean space, challenging our ability to make informed decisions that balance conflicting demands as well as economic and environmental considerations. At the same time, the interdependence of ecosystems and economies makes coastal and Great Lakes communities increasingly vulnerable to chronic— and potentially catastrophic—impacts of natural and human-induced hazards, including climate change, oil spills, harmful algal blooms and pathogen outbreaks, and severe weather hazards.

NAML envisions invigorated coastal communities and economies, with increased resiliency and productivity. Comprehensive planning will help protect coastal communities and resources from the impacts of hazards and land-based pollution to vulnerable ecosystems by addressing competing uses, improving water quality and fostering integrated management for sustainable uses. Geospatial services will support communities, navigation and economic efficiency with accurate, useful characterizations, charts and maps, and assessment tools and methods. Coastal decision makers will have the capacity to adaptively manage coastal communities and ecosystems with the best natural and social science available. Resilient coastal communities and economies cannot be achieved without strong partnerships. NOAA plans to build on existing strategic partnerships in coastal communities with other Federal agencies (such as the U.S. Coast Guard) to help provide services to adapt to coastal hazards and provide safe conditions in the Arctic, the DOI to conserve and manage special marine and coastal places, and the EPA and USDA to improve coastal water quality and encourage smart growth). Comprehensive ocean and coastal planning will require an unprecedented level of engagement and collaboration with state, local and tribal partners, as well as a wide range of stakeholders in the private and academic sectors. NOAA should increase its outreach to and make more extensive use of NAML laboratories – through the National Sea Grant College Program, its observing programs, its research programs, and other activities to help it achieve the various goals in its strategic plan.

NOAA's support for research and education at marine laboratories and universities greatly assists NOAA in the execution of its missions and expands its access to world-class expertise and unique facilities, complementing and expanding the work carried out within NOAA laboratories. NOAA's extramural partnerships contribute invaluable information to our coastal resource managers. These include: the National Sea Grant College Program, navigation programs, the Coastal Services programs; aquaculture initiatives; the Highly Migratory Shark Fishery Research Program; NOAA Cooperative and Joint Institutes; the Integrated Ocean Observing Systems program; NOAA's Center for Sponsored Coastal Ocean Research on harmful algal blooms, hypoxia, and ecological forecasting initiatives; the National Estuarine Research Reserve System (NERRS); the National Marine Sanctuary Program; the research and partnership programs administered by the National Marine Fisheries Service, and NOAA's Office of Education.

NAML strongly supports recommendations made to the NOAA Science Advisory Board (SAB) that calls for priority support for NOAA extramural programs. This recommendation comes on the heels of a significant decline in NOAA extramural research expenditures. For example, according to data provided by NOAA to the SAB's R&D Portfolio Review Task Force, extramural support has declined since 2005 by over \$60M. As a percent of the total NOAA Research budget, extramural support has dropped significantly since 2005. At that time extramural support represented 50.2% of the OAR portfolio. In 2011 the percentage had declined to 34%.

Extramural research enables NOAA to leverage its R&D and operational investments with the resources of the nation's leading university scientists resulting in greater and faster scientific advances at lower costs. A predictable and reliable partnership with the extramural research community is critical to NOAA's long-term success. As available resources become scarcer and major program reorganizations may be considered, NOAA should enhance its partnership with the extramural research community in creative and innovative ways. For example, NOAA should expand its efforts to co-locate agency research staff and infrastructure at non-Federal marine laboratories. Such actions will not only result in significant cost savings, achieve a greater return for its investment, and increase scientific collaborations and productivity. A robust NOAA budget directly coupled with solid support for extramural partnerships is essential for NOAA to serve national needs.

National Aeronautics and Space Administration

Part of NASA's mission is to develop an understanding of the total Earth system and the effects of natural and human-induced changes on the global environment. Oceans play a major role in influencing changes in the world's climate and weather. Long-term ocean data from satellites make it possible to employ modeling techniques for global mapping of seasonal changes in ocean surface topography, currents, waves, winds, phytoplankton content, sea-ice extent, rainfall, sunlight reaching the sea, and sea surface temperature. Studying these patterns at a global scale can help forecast and mitigate the effects of floods and drought. Ocean observing satellite images tell us about the most fundamental climate changes. Satellite data have improved forecasting model capabilities to predict events such as El Niño and other global and regional climate cycles. Expanding NASA extramural support will further develop the ability to better predict ocean phenomena.

Environmental Protection Agency

EPA is an important source of support for marine laboratories, and EPA's own laboratories are a critical part of the marine science community. EPA's Office of Research and Development and Office of Water provide essential resources to marine laboratories nationwide, fund research grants in various environmental science and engineering disciplines, and engage the Nation's best scientists and engineers in targeted research complementary to EPA and other federal research activities. Unfortunately, support for research has declined dramatically over the past several years within EPA, and the EPA's Science Advisory Board has called for renewed investments. Enhanced support for extramural research programs at EPA, such as BEACHES, Science to Achieve Results and the National Estuary Program, are essential in helping to mitigate and adapt to environmental change.

Department of Interior

DOI is an important federal player with respect to the ocean and coastal community through the research and other activities supported and conducted by the Bureau of Ocean Energy Management (BOEM), the U.S. Geological Survey (USGS) via the Coastal and Marine Geology program and the National Biological Service, and the U.S. Fish and Wildlife Service (FWS). Greater partnership with NAML laboratories would provide BOEM, USGS, and FWS with improved access to sound marine science information to support their role in the management of ocean and coastal resources.

FWS' Landscape Conservation Cooperatives (LCCs) are applied conservation science partnerships with two main functions. The first is to provide the science and technical expertise needed to support conservation planning at landscape scales – beyond the reach or resources of any one organization. Through the efforts of in-house staff and science-oriented partners – such as NAML laboratories, LCCs generate the tools, methods and data managers need to design and deliver conservation using the Strategic Habitat Conservation approach. The second function of LCCs is to promote collaboration among their members in defining shared conservation goals. With these goals in mind, partners can identify where and how they will take action, within their own authorities and organizational priorities, to best contribute to the larger conservation effort. LCCs assist partners to see how their activities can merge with those of other partners to achieve a bigger and more lasting impact. NAML encourages the continued engagement of the LCCs with NAML laboratories to help achieve mutual interests.

National Institutes of Health – National Institute of Environmental Health Sciences (NIEHS)

NIEHS Centers for Oceans and Human Health fund research on marine-related health issues, such as developing techniques for more accurate and earlier detection of harmful algal blooms with the goal of preventing or reducing exposure, and studying the health effects of eating seafood that harbors toxins produced by harmful algae. NIEHS grantees examine the health effects of consuming seafood containing pollutants such as PCBs and mercury; identify indicators of recreational water contamination and illness, and exploring compounds from marine organisms that hold promise as therapies for neurodegenerative disorders, cardiovascular and infectious diseases, certain cancers and other conditions. NIEHS is conducting research on the effects of the *Deepwater Horizon* oil spill on coastal communities—social and human health effects. NAML encourages NIH to reinvigorate its support for the Oceans and Human Health research program.

Department of Energy

DOE's Energy Efficiency and Renewable Energy division has initiated significant efforts to understand and develop sources of renewable marine energy from tidal, wave and current sources. Environmental effects and conflicts with existing ocean uses must be evaluated as U.S. coastal energy sources are developed. The Nation's marine laboratories are uniquely distributed and serve as ideal locations for much of the research needed to rationally develop this energy source. Opportunities to partner with DOE in these areas should be strongly encouraged.

Education, Diversity and an Ocean Literate America

The U.S. continues to be at risk with respect to student achievement in science, technology, engineering and math among industrialized nations, as well as, emerging industrializing nations. As reported in the National Science Board's Science and Engineering Indicators 2014, released in February 2014:

- In mathematics, the percentage of U.S. students reaching the proficient level remained well below half in 2011: 40% of fourth graders and 35% of eighth graders performed at or above this level.
- In science, 32% of eighth graders performed at or above the proficient level for their grade in 2011.

In comparison with other nations, the U.S. average score on the 2011 Trends in International Mathematics and Science Study (TIMSS) mathematics assessment was substantially lower than those of seven other countries/jurisdictions at grade 4 and those of six countries/jurisdictions at grade 8. The top performing nations each scored at least 50 points higher than the U.S. at grade 4 and at least 77 points higher than the U.S. at grade 8.

NAML continues to believe it is critically important that we improve ocean literacy and workforce development among all sectors of our nation. Marine laboratories play an important role in formal and informal education and workforce development by providing students with a place to learn. Marine laboratories serve as primary training grounds for experiential ocean education and are committed to enhancing diversity within the field of ocean, coastal and Great Lakes research and education. By fostering relationships with community colleges and minority-serving institutions, marine laboratories provide distinctive learning opportunities for underrepresented groups, allowing students to achieve a greater understanding of oceans and coastal ecosystems and providing them with a sense of stewardship.

NAML laboratories continue to strongly support partnerships with Federal agencies to address the ocean education needs of the Nation. These include the NSF's Louis Stokes Alliance for Minority Participation, Centers for Ocean Science Education Excellence, Research Experiences for Undergraduates and Research on Learning in Formal and Informal Settings programs; NOAA's Expanding Partnerships Program in the NOAA Education Office and Sea Grant's fellowships and K-12 STEM education programs; and EPA's Science to Achieve Results (STAR) Fellowship Program. The importance of marine laboratories in support of coastal states' Environmental Literacy Plans is essential in developing a literate public. Investment is needed today in coastal, ocean and Great Lakes education programs at NAML laboratories that support formal and informal learning at all age levels, by all disciplines and for all Americans.

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