

***Case Study: The Development of U.S. Ocean Acidification Policy***

President Obama's National Ocean Policy highlights the need to improve the resilience of ocean, coastal, and Great Lakes ecosystems, communities, and economies. To that end, the United States is committed to understanding and responding to the effects of ocean acidification. The Federal Ocean Acidification Research and Monitoring Act of 2009 (FOARAM) directed the National Science and Technology Committee's (NSTC) Subcommittee on Science and Technology (SOST) to create an Interagency Working Group on Ocean Acidification (IWG-OA).

Since FOARAM was enacted, the IWG-OA and individual U.S. government agencies have taken steps to implement FOARAM. The National Oceanic and Atmospheric Administration (NOAA) established an Ocean Acidification Program, the National Science Foundation (NSF) supported research and monitoring of ocean acidification, and the National Aeronautics and Space Administration (NASA) collected relevant data and also supported research. NOAA, with vice-chairs from NSF and NASA, chairs the IWG-OA. Each of the nine U.S. agencies represented on the IWG-OA has a mandate for research and/or management of resources likely to be impacted by ocean acidification.

In the 2010 National Research Council report, *Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean*, the U.S. government acknowledged the necessity of improved instrumentation, sensors, and methods to support long-term observations, systematic ocean surveys, and the development of experimental systems to investigate organism and ecosystem responses to ocean acidification. Approximately \$795K was spent on activities directly related to technology development for ocean acidification in 2010, and \$526K in 2011. The ten agencies that are part of the IWG-OA estimate that between fiscal years 2010 and 2013 they collectively spent approximately \$88 million on activities directly related to ocean acidification. The United States helped found the IMBER (Integrated Marine Biogeochemistry and Ecosystem Research) and SOLAS (Surface Ocean - Atmosphere Study) Ocean Acidification Working Group and the International Coordination Centre (ICC) on Ocean Acidification. Scientists from NOAA serve on the Advisory Boards for both of these important international bodies and the United States is leading the coordination of global open ocean and coastal ocean acidification observing.

The United States supports the Integrated Ocean Observing System (IOOS), a national-based ocean acidification observing network infrastructure to increase the mooring-based time series global baseline network to advance the understanding of the impacts on, and predict changes in, the Earth's environment as a consequence of continued ocean and U.S. Great Lakes acidification.

NOAA's Carbon Program at the Pacific Marine Environmental Laboratory (PMEL) advances global scientific understanding of the ocean carbon cycle and how it is changing over time in support of NOAA's commitment to improve the U.S. ability to anticipate and respond to climate impacts and to conserve and manage healthy oceans, coastal ecosystems, and marine resources. PMEL's research includes documenting the evolving state of the ocean carbon chemistry with high quality measurements on ships and autonomous platforms, studying the processes controlling the role of the ocean in the global carbon cycle, and investigating how rising atmospheric CO<sub>2</sub> and climate change affect the chemistry of the ocean and its ecosystems.

The United States (NOAA) also published the *National Coral Reef Monitoring Plan*, a multi-agency effort focusing on monitoring benthic and fish community structure, climate impacts (including indicators of ecological responses of coral reef ecosystems to ocean acidification, such as changes to coral reef carbonate budgets, coral growth rates, bioerosion, and framework integrity), and socioeconomic conditions throughout the U.S. Pacific, Atlantic, and Caribbean coral reef areas. The overarching goal of this effort is to collect the information needed to gauge changing conditions of U.S. coral reef ecosystems, which are among the most biologically diverse and economically valuable ecosystems on Earth, providing billions of dollars in food, jobs, recreational opportunities, coastal protection, and other important services.