

**STATEMENT FOR THE RECORD of the
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
for the
U.S. SENATE COMMITTEE ON COMMERCE, SCIENCE, & TRANSPORTATION
“Five Years of the America COMPETES Act: Progress, Challenges, and Next Steps”
September 21, 2012**

The National Oceanic and Atmospheric Administration (NOAA) is proud to support the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act. NOAA thanks Members of the Committee for giving the agency a prominent role in this historic effort to enhance American competitiveness.

As part of America COMPETES, NOAA was charged with implementing programs and activities “to advance ocean, coastal, Great Lakes, and atmospheric research and development, including potentially transformational research.” As a mission-driven, scientific agency NOAA has to balance incremental scientific advancements to operations with transformational research. Transformational research and development is an investment that often carries a level of uncertainty, but has the potential to positively affect society in substantial ways that increase earth system knowledge and produce technological advances that fuel economic opportunity. NOAA’s transformational research inspires students and researchers alike to push the limits of knowledge.

As an example, consider the High Resolution Rapid Refresh (HRRR) weather model. This new experimental model, under development by NOAA's research community in collaboration with our operational weather forecasters, is designed to more accurately predict high impact weather events. This new generation of ultra-high resolution (3 km) weather models predicted the derecho event on June 29, 2012 in excellent detail ten hours in advance of its arrival to Washington, DC. Models such as this have the potential to radically transform our ability to forecast events such as the derecho and therefore greatly enhance NOAA’s ability to conduct its mission to save and protect lives and property. As computing capability continues to improve, HRRR could be transferred from research to operations and applications. NOAA is also active in moving hydrodynamic coastal models from research to operations by developing and implementing coastal nowcast/forecast systems for several major U.S. Ports. These ports systems are taking advantage of NOAA’s High Performance Computing and Communications facility for safe and efficient management and use of our coastal resources.

In addition to model improvements, NOAA has transformed its ability to gather observations over the last decade. In the climate and oceans arena, drifting probes that can be deployed throughout the ocean – called Argo floats – have revolutionized our ability to observe and record the physical conditions of the global ocean. In the past, scientists studying the interplay between ocean and atmosphere used CTD (conductivity/temperature/depth) recorders deployed from research vessels to get temperature and salinity profiles. These profiles formed the basis of much of our basic understanding of the ocean. Limited by our ability to physically sample wide areas

of the ocean and the inherent costs and limitations associated with ship time, there were large data gaps such as the Southern Ocean, and data were mostly limited to the upper 750 meters of the ocean. Argo floats are now routinely used to continuously collect data at depths of up to 2,000 meters and transmit the data to scientists on shore via satellite. The Argo float network and other global array systems have allowed for the collection of temperature and salinity profiles throughout the global ocean. They have vastly improved our ability to estimate and forecast sea level rise, and play a key role in improving seasonal climate forecasts and providing new insight into hurricane activity. The next-generation of Argo, deep-Argo floats, is under development and will extend our ability to comprehensively observe the ocean far beyond the existing 2,000 meter depth to as many as 6,000 meters.

While the development of the HRRR model and the Argo float network are examples of transformational research, use-inspired incremental, or evolutionary, research also has the ability to shift paradigms over longer time scales. An example of this is the shift from traditional species-by-species fisheries management to ecosystem-based management. The traditional management strategy for fisheries and other living resources has been to focus on one species of fish and shellfish in isolation. For example, if there were a decline in the number of a certain type of fish in the Gulf of Mexico, the relevant Council might recommend and NOAA might decide to decrease the number of that species that could be taken. That approach does not take into account other elements such as interactions with other species and the effects of pollution and other stresses on habitat and water quality. To more effectively assess the health of any given fishery and to determine the best way to sustain it requires a holistic understanding of the ecosystem. Ecosystem approaches are transforming our ability to manage fisheries by considering the cumulative effects from various sources, and the balance of conflicting uses.

The power of America COMPETES speaks not only to our Nation's strong scientific expertise but it also furthers NOAA's strong education ethic. The Act complements existing education mandates found in the authorizing legislation of specific NOAA programs, and provided NOAA with a broad, agency-wide authority for education. To provide a clear and coordinated path forward, the NOAA Education Strategic Plan (<http://www.education.noaa.gov/plan>) was developed, which outlines our 20-year education vision, goals, and strategies needed to support the agency's mission. The NOAA Education Strategic Plan, the subsequent Implementation Plan, and most recently, the Monitoring and Evaluation framework have resulted in increased internal collaboration and leveraging of resources, not only among the agency's education programs but also with external partners. We are proud to report a few illustrative examples of the progress NOAA has been able to make in response to the Act this year.

In 2012, NOAA is projected to support 513 students through competitive internships, fellowships, and scholarships who have been awarded NOAA mission-related Science, Technology, Engineering and Mathematics (STEM) post-secondary degrees, out of which 57 are from underrepresented communities. For America to be competitive in the global marketplace, we need bright, creative minds. Our job is to see that we give as many young people as possible many opportunities to learn, stretch in new directions, develop critical thinking, ingenuity, and scientific expertise.

In 2012 alone, we project 49.7 million people will visit informal learning institutions with a NOAA-funded exhibit or program that integrates NOAA's unique science products and services.

NOAA partners with informal learning institutions such as museums, zoos, and aquariums to make NOAA sciences, data, and other information widely available to the American public through interactive STEM exhibits and programs. NOAA's products and services are essential to explaining current, real-world STEM issues such as climate change, oil spills, extreme weather and weather safety, appropriate management of coastal environments, and overfishing.

In 2012, NOAA will serve an estimated 41,000 educators through professional development programs and estimates nearly 7 million visits to NOAA education websites. Such programs and resources aim to enhance understanding and use of ocean, coastal, Great Lakes, weather, and climate environmental information with the goal to promote stewardship and increase informed decision making.

Through scientific rigor, cutting-edge research, and integrated STEM education NOAA is committed to developing and attracting the next generation of scientists who will drive the scientific and technological innovation our country needs to stimulate the economy and create jobs. Through the authority granted by the America COMPETES Act, we offer the American people access to the unique and significant resources of a mission-driven, scientific agency. Coupled with NOAA's investment in education (\$53.8 million in FY 2011), we effectively leverage NOAA's significant scientific expertise, laboratories, data, ships and aircraft, and places of special significance to the nation (such as our National Marine Sanctuaries and National Estuarine Research Reserves) to offer high quality, mission-relevant, formal, and informal education opportunities.

Educating our students in the STEM disciplines will help them understand their world and provide useful scientific advances to society. In turn, that prepares them with the critical thinking skills they need to get better jobs with better pay for a brighter future. We at NOAA will continue our efforts to attract, promote, and engage more talented scientists of all ages – scientists who will help keep America on course to win the future and help us develop the next transformational scientific break-through.

Thank you again for the opportunity to share our enthusiasm for the strong support that you have shown in propelling our Nation's economy and competitiveness forward. NOAA is proud and pleased to play a role in this effort – both in developing the next transformational scientific tools and in preparing the next generation of scientists to make those discoveries for tomorrow.