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8 **An Education Plan for NOAA**

9 10 *Engaging Educators, Students and the Public to* 11 *Meet NOAA's Mission Goals*

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15 *Our vision is an environmentally*
16 *literate public and a diverse workforce*
17 *who will use NOAA's products and*
18 *services to make informed decisions*
19 *that enable responsible action.*

2008 - 2028

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NOAA's Education Plan: Preface

A whole world of change...

In 1807, President Thomas Jefferson created America's Coast Survey in order to identify hazards and promote the growth of commerce. In this act were sown the seeds of today's National Oceanic and Atmospheric Administration (NOAA). Now, NOAA scientists study the mysteries of our dynamic planet in order to understand and warn us of nature's hazards and guide our prudent stewardship of our ocean and climate resources.

With the pace of global change increasing, the task has new urgency. Mere information is not enough. We must promote environmental citizenship and enable each person to act on his or her understanding of our ocean's and atmosphere's complex, interwoven systems. NOAA's education efforts now reach well beyond coastal hazards and weather warnings. The nature of scientific inquiry itself, place-based education, and workforce development are all critical components in NOAA's education mission and to our nation's future competitiveness. In this endeavor NOAA does not work alone. Creative partnerships both within and outside of government are necessary, as well as a focus on the whole individual and thriving communities. NOAA's new strategy for education embraces these challenges and mobilizes us to build on our tradition for the benefit of all Americans of the future.

...A whole new generation of environmental citizens.

Throughout its two hundred year history the National Oceanic and Atmospheric Administration (NOAA) has imparted scientific knowledge of Earth's natural systems to the global community. During this time the endeavor to educate was guided by the mandates of legislation for units within NOAA, the vision of leadership, the findings of researchers, and at the request of its constituency. In 2007, Congress officially recognized the role of NOAA in Earth system science education with the passage of the *America COMPETES Act* (P.L. 110-69). This legislation provides a mandate for the entire NOAA community to advance its educational efforts, focus them, coordinate them, and engage a broader community of partners in creating an environmentally literate society and a viable workforce of scientists, managers and administrators in support of a sustainable economic future. This strategic plan, presented by the NOAA Education Council (Education Council), was developed through a collaborative effort of educators and administrators from across NOAA to guide the implementation of this new mandate and to advance the long standing educational mission of the agency.

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1 NOAA's Mandate for Education

2 NOAA's role in science education is defined in statute. Most recently, the America COMPETES Act
3 (P.L. 110-69) states:
4

5 *“The Administrator of the National Oceanic and Atmospheric Administration shall conduct,*
6 *develop, support, promote, and coordinate formal and informal educational activities at all*
7 *levels to enhance public awareness and understanding of ocean, coastal, Great Lakes, and*
8 *atmospheric science and stewardship by the general public and other coastal stakeholders,*
9 *including underrepresented groups in ocean and atmospheric science and policy careers. In*
10 *conducting those activities, the Administrator shall build upon the educational programs and*
11 *activities of the agency.”*
12

13 Passed in 2007, the statute further directs NOAA to develop a 20-year strategic plan in partnership with
14 ocean and atmospheric science and education experts, and interested members of the public to be
15 evaluated and updated every 5 years.
16

17 The America COMPETES Act complements the standing legislation of the NOAA Sea Grant Program,
18 National Marine Sanctuaries, National Estuarine Research Reserve System and the Corals Program.
19 Together these statutes provide a unifying mandate for education across the agency. The philosophy and
20 priorities of this strategic plan are guided by these statutes, directly support the strategic vision of NOAA
21 and respond to the directives and recommendations of recent reports on the need for science education
22 reform and the advancement of lifelong learning opportunities in ocean, coastal, weather and climate
23 sciences.
24

Statutes for NOAA Education	Supporting Directives for Education
<ul style="list-style-type: none">• America COMPETES Act (P.L. 110-69)• National Sea Grant College and Program Act of 1966 (Public Law 89-688)• Coastal Zone Management Act (16 U.S.C. 1451 – 1465); § 1461. National Estuarine Research Reserve System (Section 315)• National Marine Sanctuary Act (16 U.S.C. Chapter 32, Sections 1431 et seq.)• Coral Reef Conservation Act of 2000 (Public Law 106-562)	<ul style="list-style-type: none">• NOAA's Strategic Plan: <i>New Priorities for the 21st Century</i>• The U.S. Commission on Ocean Policy, <i>An Ocean Blueprint for the 21st Century</i> (2004)• The President's <i>U.S. Ocean Action Plan</i> (2005)• National Academies Report: <i>Rising Above the Gathering Storm</i> (2005)• The Intergovernmental Panel on Climate Change Report: <i>Mitigation of Climate Change</i> (2007)

25 NOAA's Education Priorities

26 In preparing this 20-year vision of Education for NOAA, the Education Council considered a broad array
27 of perspectives, research findings and legal statutes. Based on the strengths and mission of the agency
28 and the future needs of our society, the Education Council established two primary education goals of
29 building environmental literacy and developing a future workforce.
30

1 Environmental literacy is an integral component needed to achieve NOAA’s mission goals to conserve
2 marine resources and protect life and property. An educated public is needed to serve as stewards of the
3 natural environment, take appropriate action in the case of severe weather and participate in the national
4 debate on complex issues such as climate change. Recent surveys suggest that participation levels in
5 formal and informal education, particularly higher education, are strong indicators of the ability of
6 citizens to understand science and technology in order to participate in public policy decisions (Miller,
7 2008). NOAA plays a key role in advancing this understanding through its educational programs,
8 products, outreach efforts, collaborations and leadership supported by the agencies extensive breadth and
9 depth of scientific resources.

10
11 In the congressional report *Rising Above the Gathering Storm* (2005) building a workforce literate in
12 science, technology, engineering and mathematics is crucial to maintaining America’s competitiveness in
13 a rapidly changing global economy. These skills are also critical in the continuation of NOAA’s
14 scientific mission. As the population pressures increase on the natural systems of our planet
15 understanding the complexities of these impacts and developing strategies for sustainable solutions
16 requires the brightest minds. An analysis of K-12 curriculum standards from across the U.S found that
17 our educational institutions are poorly positioned to address the preparation of this workforce (TERC,
18 2007). Scientific concepts of interactive Earth systems, integration of 21st century investigative
19 technologies, ocean and environmental literacy principles and concepts, all important foundations to
20 NOAA’s work, were found lacking in the nation’s current educational system. Through continued
21 partnerships with formal and informal education institutions and direct engagement and support of
22 students NOAA strives to bridge this gap to address the future workforce needs of the agency and of the
23 broader scientific community.

24 Educational Settings and Methods

25 In order to achieve NOAA’s environmental literacy and workforce development goals the agency engages
26 governmental partners, non-government institutions, academia, businesses, and the public in a variety of
27 settings utilizing diverse methods. The spectrum of methods employed throughout this strategic plan can
28 be defined in four broad overlapping categories: formal education, informal education, free-choice
29 learning and educational outreach.

30
31 For NOAA, **formal education** means learning within a structured education system in which children or
32 adults are required to demonstrate proficiency. Work in this arena involves policy makers, administrators,
33 academia, teachers, students and professional associations. **Informal education** means learning outside
34 the established formal system that meets clearly defined objectives through organized educational
35 activities. **Free-choice learning** is self-directed, voluntary, and guided by an individual’s needs and
36 interests. Both informal education and free-choice learning are provided by NOAA educational units
37 directly and through myriad partner organizations and grantees. **Educational Outreach** activities are
38 designed to build awareness, develop relationships, promote educational products, and inspire educators,
39 students and the public to pursue further learning opportunities.

40
41 In the recent *NOAA Science Advisory Board Report* (2008) the committee directs the agency to better
42 coordinate across the continuum of activities from education to outreach to systematically and effectively
43 listen to and communicate its vision, mission, services, and products with its partners and the public.
44

1

2 Partnerships and Collaboration

3 NOAA, as the nation’s leading ocean and atmospheric science and service agency and with the passage
4 of the *America COMPETES Act* of 2007, has the responsibility to increase its coordination and
5 collaboration within the ocean, coastal, weather and climate science and education communities both
6 internally and externally. Rich opportunities are available for integrating the relevance of scientific
7 research concerning the world’s weather, climate, ocean, coasts and watersheds into education products
8 for the nation’s citizenry.
9

10 NOAA actively participates in interagency education working groups and committees organized under
11 the U.S. Ocean Action Plan, the Climate Change Science Program and the National Science and
12 Technology Council. Outside of the Federal arena, partnerships are developed through funding
13 agreements, shared educational content or collaborative work on projects of common interest. These
14 arrangements allow NOAA to benefit from the considerable capacity for developing and delivering
15 education content that exists within the broader educational community. NOAA’s numerous
16 partnerships include museums and aquariums, professional societies, education associations, state and
17 local governments, academia, and other education practitioners. The recent publication of the
18 *Essential Principles of Ocean Literacy (National Geographic Society, 2006)* and *Essential Principles of*
19 *Climate Literacy (NOAA, 2008)* are excellent examples of the groundbreaking work that can be
20 accomplished through these types of collaborative efforts.
21

22 NOAA’s Education Standards

23 NOAA is committed to development and support of education programs and products that exhibit
24 standards of high-quality. At NOAA, education activities are:

- 25
- 26 • *aligned with NOAA’s strategic goals and include measurable objectives;*
- 27 • *aligned with appropriate national or state science education standards;*
- 28 • *reflective of current environmental literacy principles and concepts;*
- 29 • *designed to incorporate the needs of the participants;*
- 30 • *replicable, consistent in quality and sustainable; and*
- 31 • *continually evaluated and improved.*

Goal 1: Environmental Literacy

Goal 1: An environmentally literate public developed through a continuum of lifelong formal and informal education and outreach opportunities in ocean, coastal, weather and climate sciences.

Achievement of NOAA’s strategic mission is dependent upon an *environmentally literate* public that is aware of the agency’s services and understands how scientific observations, forecasts, and regulatory activities affect their personal, business, and community decisions. Leaders in Earth system science education echo this need stating that public understanding of Earth’s interconnected systems is crucial to our ability to apply knowledge and problem solving skills to real world issues.¹ NOAA defines an environmentally literate person as someone who has a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment, and is able to understand and utilize scientific evidence to make informed decisions regarding environmental problems. These problems involve uncertainty, as well as economic, aesthetic, and ethical considerations. The outcomes and strategies for this goal provide a six tiered approach of interdependent actions the agency will pursue to meet NOAA’s vision of developing these environmental literacy skills and knowledge in the nation’s citizenry. Provided below are four themes which are integral to these actions.

Promoting Stewardship

In addition to its scientific mandate NOAA is the leading Federal agency in the conservation, management, and restoration of ocean, coastal and Great Lakes resources. The stewardship of these resources for current and future generations is critical to the long term sustainability of society and the planet. Monitoring the health of these ecosystems and building understanding of the relationships between the ocean and other Earth systems is a core mission of the organization. Over the last 100 years human actions have greatly altered these natural systems contributing to climate change, water contamination, species extinction and a plethora of other impacts that seriously threaten the resources under NOAA’s jurisdiction. With the globalization of world markets, population shifts and the race for economic growth forecasted for the 21st century scientists and economists recognize that the pressure on the environment will increase. NOAA alone cannot avert these problems. Partnering with the public to share in its stewardship responsibilities is a necessity; environmental literacy is the first step in that process.

Facilitating Systemic Change of the Education System

Environmental literacy is an ongoing lifelong process. Developing the skills of locating, evaluating and integrating current science in the context of prior knowledge is a process that involves formal and informal education. Our Nation’s K-12 formal education system has not established a strong framework to support this development particularly in the ocean and atmospheric sciences relevant to NOAA’s mission. NOAA is committed to support and facilitate systemic change of this educational system to build the future capacity for developing environmentally literate citizens. This systemic change requires participation across the spectrum of the education community including policy makers, academic training institutions, professional associations, teachers and students. Partnerships and collaboration are integral to establishing these changes.

The programs and products of the informal education sector are better developed in the areas of ocean, coastal, weather and climate sciences but more must be done to infuse this community with current resources and methodologies. Evaluation of the effectiveness of these settings in enhancing

1 environmental literacy is developing and NOAA is committed to facilitating advancement of this
2 important component of the process. As informal education settings are instrumental both in the
3 development of literate citizens and the long term maintenance of their literacy skills and knowledge, it is
4 prudent for NOAA to be engaged in the improvement of this system in the pursuit of its own
5 environmental literacy goals.

6 Connecting Citizens to Nature and the Community

9 Making a connection between human actions, scientific information, policy and Earth’s systems is
10 important to the process of environmental literacy. Framing this process in a local context within the
11 social framework of one’s community and the associated regional resources makes these lessons even
12 more powerful and longer lasting. NOAA has embraced two educational methodologies which have been
13 shown to greatly enhance these connections: experiential education and place-based education.

15 Experiential education programs engage learners in constructing meaning by immersing them in direct
16 and meaningful hands-on experiences. There is a considerable body of cognitive research which has
17 provided evidence that learners are not passive recipients of codified knowledge but rather active
18 participants (*reference*). This experiential approach incorporates learning using real world problems and
19 interaction with natural phenomena. The experiential learning process is a tool in NOAA's toolbox to
20 ensure that the learner is actively and purposefully engaged in posing questions, investigating,
21 experimenting, being curious, solving problems, assuming responsibility, being creative and constructing
22 meaning.

24 Place-based education immerses the learner in local heritage, culture, landscapes, opportunities, and
25 experiences as a foundation for the study of language arts, mathematics, social studies, science, and other
26 subjects. This method of instruction encourages participants to use the schoolyard, community, public
27 lands, and other special places as resources, turning communities into classrooms. NOAA National
28 Marine Sanctuaries and National Estuarine Research Reserves provide excellent venues for applying this
29 methodology, offering a real-world context for learning and stimulating “hands-on/minds-on”
30 opportunities for education. NOAA offices throughout the nation play an important role in imparting the
31 relevance of ocean and atmospheric science to their community through these educational experiences.

33 Using Emerging Technologies

35 Advances in technology change the way we interact as a society and impact our view of the world around
36 us. Maintaining a presence in this new information age and keeping educational approaches relevant to
37 new learning modalities are important to the continued success of NOAA’s environmental literacy goal.
38 Many of the advances in NOAA science rely on these technological developments and there is a
39 commitment and directive to build collaborative networks and monitoring systems to enhance the
40 delivery of comprehensive Earth system, ocean and atmospheric data to the public. While NOAA
41 considers all sophistication levels in communicating environmental literacy concepts to the public use of
42 innovative and engaging technologies to increase the efficiency and utility of this information holds a
43 high priority for the agency.

Outcome 1.1 Evaluation and Research for Effective Programs

Outcome 1.1: NOAA education programs are based on a body of knowledge about effective environmental and science education.

Strategies

- a) Support and facilitate the use of current educational research to inform the development and implementation of education programs and products.
- b) Develop and implement a framework of evaluation strategies based on educational research findings.
- c) Contribute to educational research about effective science and environmental education.

Potential Performance Indicators

- Percentage of NOAA education programs using research based education practices.
- Percentage of NOAA education programs that use the NOAA framework of evaluation strategies.
- The number of publications and presentation at forums contributed by NOAA education.

[Insert Science on a Sphere Image]

Recent years have seen many advances in our understanding of how the mind works and the process of learning. Incorporating this research into the design and implementation of educational programs in both formal and informal settings has slowly begun. Creating new programs and revising existing educational efforts which target increased environmental literacy are also benefiting from this infusion of knowledge. A product that is able to bridge the gap between sound scientific principles and practical application in the learning environment is one that is likely to be proven effective.³ Improving effectiveness of programs and products by using the best practices and latest knowledge is an important part of NOAA's education vision.

A Blue Ribbon Panel reviewing best practices in K-12 Education reports: "Evidence matters because outcomes matter and resources are limited. It is important to ensure that the investments in money, time, and human capital have a high probability of paying off. Good intentions and passionate commitment are not enough to fill the science and technology pipeline."² Developing methods that accurately and efficiently evaluate these outcomes is an ongoing challenge in the educational community. Much work has been done by Federal agencies and their education partners to advance this evaluation process and much work remains. As part of the quality standards for NOAA Education the agency is committed to pursuing this line of investigation to improve the results of its efforts and to contribute to the body of knowledge regarding effective environmental and science education. Building evaluation capacity of NOAA educators and developing a coordinated system to capture and share these findings are key elements in achieving this outcome.

Outcome 1.2 Educators Understand and Use Literacy Principles

Outcome 1.2: Educators understand and use environmental literacy principles

Strategies

- a) Support the development, dissemination, and adoption of these principles.
- b) Integrate the environmental literacy principles into professional development programs.
- c) Improve the quality and reach of these professional development programs.
- d) Strengthen place-based experiences based on literacy principles.
- e) Partner with external groups to infuse literacy principles into state and national standards, curricula, assessments, educator certification, and the informal education landscape.

Potential Performance Indicators

- Percentage of Educators that implement environmental literacy principles, place-based experiences, or NOAA related educational and scientific products and information.
- The number of professional development programs that incorporate the environmental literacy principles.
- Percentage of integrated literacy principles in state and national standards, curricula, assessments, educator certification, and the informal education landscape.
- Percentage of materials disseminated that align with environmental literacy principles.

An environmentally literate citizenry is essential to protect fragile ecosystems and build sustainable communities that are resilient in the face of a changing Earth. NOAA together with partner agencies and organizations in the science community have developed ocean and climate environmental literacy frameworks that identify the essential principles and fundamental concepts that individuals need to understand in order to make appropriate decisions about human activities that affect our planet. It is essential that these frameworks become integrated into state standards, curricula, assessments, teacher certification and the informal education landscape.

Additionally there is a gap between the scientific knowledge and skills most students learn in school and that which they will need in 21st century communities and workplaces. Several national reports recommend significant increases in the number of science teachers and improvement in the quality of their ongoing preparation to address this need.^{1,2} NOAA feels that integrating environmental literacy frameworks into formal and informal education is an important contribution towards addressing this gap in science literacy. The agency's support and promotion of experiential and place-based education programs also helps by extending the classroom to teach concepts through interdisciplinary methods that improve the active engagement of students in real scientific inquiry, increase the incorporation of important environmental concepts and improve environmental stewardship behavior.^{3,4} Expanding the awareness of these approaches and literacy frameworks, building confidence in the application of the teaching methods and providing support services in their application are part of NOAA's strategy in addressing this need.

Outcome 1.3 Evidence-based Earth System Science

Outcome 1.3: Educators and students collect and use ocean, coastal, weather and climate science data in inquiry and evidence-based activities to understand the Earth's systems and make informed decisions regarding the environment and its resources.

Strategies

- a) Support and implement professional development to strengthen science understanding and build fundamental informed decision making skills.
- b) Create and disseminate audience appropriate products that facilitate access to and use of current ocean, coastal, weather and climate science and data through multiple platforms and emerging technologies.
- c) Partner with external groups to expand the integration and use of these products to maximize use.

Potential Performance Indicators

- Percentage of educators participating in NOAA-supported professional development programs reporting the intent to apply NOAA science-based information in their education programs.
- Percentage of students taught by educators trained in NOAA-led professional development programs who demonstrate improved ability to make informed decisions.
- Percentage of external groups reporting the ability to incorporate NOAA educational products into their programs and the intention to use them.

Technological improvements over the last decade have enabled NOAA to further its mission to monitor, assess and make predictions in Earth's changing environmental systems. Through satellites, aircraft, ships, remote sensing systems and direct scientific monitoring by its global scientific network NOAA collects data on climate, weather, the ocean and other natural phenomena. NOAA has a long standing commitment to share this information with scientists, industry government and the general public through a variety of media and interactive data portals. These data products help our society make better decisions about how to conduct business, monitor public health, and protect life and property.

Developing the ability of students and educators to formulate and conduct scientific investigations independently to explore relationships within Earth systems is a central goal of environmental science education and supports the advancement of environmental literacy. Ocean, coastal, weather and climate sciences provide rich subject matter for learning these skills. Extending existing public portals for downloading imagery, real time and archival data, NOAA has begun the process of creating specialized products designed to facilitate the integration of this material into educational experiences. Programs such as the Science on a Sphere, NODE, Estuaries 101, and CBIBS utilize NOAA data and visualizations to help learners recognize patterns and process and translate research-discoveries or natural phenomenon. Additionally, NOAA is committed to creating and supporting virtual and hands-on experiential opportunities in ocean, coastal, weather and climate science disciplines which focus on user collected data. Programs such as BWET, LiMPETS, EarthLabs, JASON and Teacher-at-Sea are current examples of this work. Continued efforts in this area will strengthen the skills of the abilities of the learners and help build long term relationships with NOAA.

Outcome 1.4 Informal Science for Lifelong Learners

Outcome 1.4: Lifelong learners are provided with informal science education opportunities focusing on ocean, coastal, weather, and climate topics.

Strategies

- a) Partner with free-choice learning programs to integrate current ocean, coastal, weather and climate science content into their programs.
- b) Establish and collaborate with networks of informal science education institutions to identify best practices for science content delivery.
- c) Use innovative technology to reach and impact citizens.
- d) Collaborate with citizen-science networks to support their participation in the scientific process.
- e) Provide place-based experiences that facilitate hands-on exploration of natural environments.

Potential Performance Indicators

- Percent of participants in place-based experiences who demonstrate an improved understanding of natural environments.
- Number of people exposed to ocean, coastal, weather, and climate sciences through citizen-science networks.
- Number of citizens impacted through free-choice learning programs incorporating ocean, coastal, weather, and climate sciences.

“Lifelong learning” is an important component of an environmentally literate citizenry. Conceptually this process allows each individual to incorporate current scientific, economic and social data into daily decision making adding to their personal knowledge base throughout their lives. Beyond the K-12 education system and academia quality learning opportunities must be made available to continue this process. The science attentive public, those citizens that actively display an interest in learning about the scientific process, provide an ideal audience for NOAA to focus on. By providing this audience with sufficient information that can move their knowledge beyond basic awareness NOAA will be able to serve as a catalyst and a valued information source in a lifelong learning partnership.

In order to achieve these goals, NOAA engages in informal science education activities at local, state, multi-state and national levels. NOAA’s vast experience and infrastructure for monitoring Earth’s systems and modeling future trends uniquely positions the agency to provide citizens with the most current information available on these resources. This information is also essential in managing the ocean and coastal resources in which NOAA is entrusted. Building public understanding of how a federal science agency manages our nation’s natural resources and the importance of those resources is a key element in the agency’s stewardship mission. To provide for the lifelong learner NOAA offers comprehensive education programs that touch on all of these areas and provide NOAA with a critical connection to the needs of the communities.

Connecting citizens directly to natural resources that need protection through hands-on experiences is a key element of the NOAA educational approach. Place-based and experiential educational experiences provide direct application of the multi-disciplinary science NOAA conducts and promote stewardship.

1 Working in partnership with informal science centers to infuse Earth system science topics into free-
2 choice learning allows NOAA to extend its ability to reach the science interested public. Application of
3 emerging technologies allows NOAA to increase the impact of the content presented by engaging this
4 public in their preferred methods of learning. Partnering with citizen scientists to increase their
5 knowledge of the scientific process and to support their volunteer efforts to advance NOAA’s mission is
6 another important strategy in achieving this outcome.

7 **Outcome 1.5 Coordinated Educational Efforts**

8 **Outcome 1.5: Education is coordinated with extension, training, outreach and** 9 **communications programs to fully engage NOAA audiences to promote** 10 **environmental literacy that ultimately leads to informed decision making**

11 *Strategies*

- 12 a) Develop and deliver a suite of coordinated activities that reach multiple audiences and
13 promote informed decision making.
- 14 b) Integrate engagement into new program activities at national, regional and community
15 levels.
- 16 c) Develop a framework to assess NOAA’s ability to engage constituents.

17 *Potential Performance Indicator*

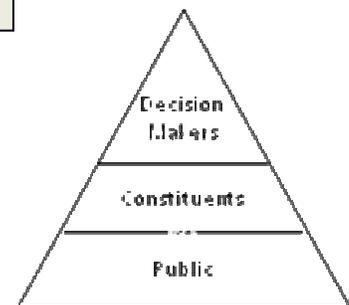
- 18 • Integrated communications, education, training and extension products.

19 NOAA’s role in society is one of ongoing support to local, regional, and national decision makers,
20 constituent groups and the public that contribute to sustaining ocean and atmospheric resources. Because
21 people make informed decisions at the policy, community and individual level, NOAA strives to engage
22 audiences from Congress to the public to develop knowledge, skills and strategies to protect ocean and
23 coastal resources and prepare for changing weather and climate.

24 NOAA promotes environmental literacy that leads to informed decision making through a continuum of
25 activities, from education to outreach, extension, training and communications. Collectively, these
26 activities reach across the entirety of NOAA audiences. Acting on the recommendations of the 2008
27 NOAA Science Advisory Board Report the agency is committed to expanding its efforts to collaborate
28 across disciplines at NOAA to fully engage audiences to address the problems and opportunities facing
29 society. In this way, NOAA can better mobilize internal and partnership networks to achieve mission
30 goals.

31 **NOAA Engages Audiences across a Continuum of Activities**

- 32 • Extension and training provide science-based information to bring
33 about positive economic or environmental change to targeted
34 constituents and decision makers.
- 35 • Education provides science-based information to specific constituencies
36 (educators and students) and to the public to promote environmental
37 literacy and attract a future workforce.
- 38 • Outreach and communication develops and delivers common messages
39 on priority topics for all audiences.



Outcome 1.6 Interagency Partnerships

Outcome 1.6: Federal agencies work cooperatively to maximize the impact of federal investment in ocean, coastal, weather and climate education.

Strategies

- a) Leverage NOAA's interagency capabilities and resources to serve as a catalyst for coordinated environmental literacy education. .
- b) Provide leadership on interagency working groups to develop and disseminate consistent literacy frameworks for Earth system sciences.
- c) Lead and participate in interagency projects and programs that promote ocean, coastal, weather and climate science.
- d) Work across agencies to develop consistent performance metrics for informal environmental education.

Potential Performance Indicators

- Coordinated activities leveraging resources across agencies.
- Comprehensiveness of environmental literacy frameworks.

Many science and resource management agencies contribute to the goal of enhancing environmental literacy. NOAA's ocean and climate education efforts, for example, are complemented by the interpretive education programs of the National Park Service, the Earth science programs of NASA and the U.S. Geologic Survey, and the STEM education programs of the National Science Foundation, to name a few. NOAA contributes unique assets of laboratories, field sites, monitoring systems and extension and education networks that provide real-world applications and are specific expressions of Earth system and environmental sciences.

Collectively, the science and resource management agencies collaborate in many ways to promote Earth system science and environmental education. Standing examples of these interagency collaborations are:

- The *National Ocean Sciences Bowl*, which is jointly funded by eight Federal agencies and supports annual regional and national competitions for high school students.
- The *Centers for Ocean Science Education Excellence* that promote partnerships between scientists and educators to create a more scientifically literate workforce and citizenry.
- *Partners in Resource Education*, a network of environmental education programs in National Parks, National Wildlife Refuges, National Marine Sanctuaries, National Forests and other field classrooms.
- The Smithsonian Ocean Hall, an exciting new venue to promote understanding of *Ocean Literacy* concepts.
- National and international education activities, such as the International Polar Year and International Year of the Reef.

In addition to informal relationships across agencies, NOAA is represented or provides leadership in several formal interagency partnerships including:

- The Interagency Working Group on Ocean Education, established under the U.S. Ocean Action Plan. This body develops implementation plans to: coordinate activities, develop common

1 messages, develop ocean data products for classrooms and focus on a future workforce. The
2 Ocean Research and Resources Advisory Panel provides guidance for this group.

- 3 • The Interagency Working Group on Climate Education, established under the Climate Change
4 Science Program, coordinates climate education activities across agencies.
- 5 • The Education and Workforce Development Subcommittee under the National Science and
6 Technology Council focuses on STEM education activities, particularly evaluation.

8 **Goal 2: Workforce Development**

9
10 ***Goal 2: A future workforce, particularly from underrepresented***
11 ***groups, skilled in science, technology, engineering,***
12 ***mathematics and other disciplines critical to NOAA's***
13 ***mission.***
14

15 NOAA has identified people as its most valuable asset. With this in mind, the agency requires a
16 workforce well educated in science, technology, engineering, mathematics and other supporting
17 disciplines to meet its mission and workforce needs in the future. Like other Federal agencies NOAA is
18 faced with an aging workforce where approximately 37% of its employees are eligible to retire by 2014.
19 To ensure a qualified pool of candidates is in place to fill this void requires the creation of a pipeline of
20 students trained in NOAA mission critical sciences, education, policy and management.

21
22 Preparing a well educated future workforce first requires an increased awareness of the agency and its
23 mission. It requires a coordinated education, outreach and recruitment strategy and the engagement of
24 academia, the research community and the private sector. In partnership all entities must be actively
25 involved in supporting NOAA student education and research opportunities to build a pipeline of
26 candidates eligible to maintain the NOAA workforce.

27
28 NOAA will maintain and enhance its current partnerships with education and research communities and
29 leverage the use of scholarship, intern and research education opportunities available to students and
30 teachers to expand and target well qualified individuals to join the NOAA workforce. These education
31 and internship opportunities will serve as a primary pipeline to create a pool of potential employees with
32 diverse backgrounds from which the agency may select its future workforce. NOAA is aware of the
33 nation's changing demographics and the demographics of the existing workforce and will ensure that its
34 education and outreach programs include individuals from underrepresented groups who have not
35 traditionally selected NOAA as their employer of choice.

36
37 NOAA will focus its education, outreach and recruitment activities using electronic and print media to
38 attract students and create a future workforce that reflects the diversity of America. A well qualified and
39 diverse pool of students with degrees in NOAA mission sciences and willing to join the NOAA
40 workforce is the ultimate goal of this workforce development effort.

41
42 Ultimately, every NOAA employee is a potential recruiter and educator and can independently increase
43 opportunities for students to learn about NOAA sciences, management and its community. NOAA
44 employees serve on the frontline every day to ensure that students get high quality opportunities as they
45 intern at facilities nationwide. These opportunities will hopefully result in a strong future workforce,
46 particularly from underrepresented groups trained in disciplines critical to NOAA's mission.

Outcome 2.1 Awareness of Educational Opportunities

Outcome 2.1: An increased awareness by education and research communities, particularly in under-represented communities, of NOAA's mission, student opportunities and potential career opportunities.

Strategies

- a) Increase awareness in the education and research communities, particularly targeting underrepresented communities, about environmental stewardship and NOAA's mission.
- b) Improve collaboration and expand partnerships with education and research communities to increase awareness of NOAA's student opportunities.
- c) Increase education and research community awareness of NOAA careers.

Potential Performance Indicators

- The number and diversity of career fairs at which NOAA has representation.
- The number of campus visits made by NOAA representatives to minority serving institutions.
- Content on NOAA mission-related student opportunities included in NOAA informational brochures distributed at career fairs and campus visits.
- The number of partnerships with minority serving institutions.
- The number of NOAA representatives will give seminars on NOAA mission-related work at minority serving institutions annually.

Educators and researchers are influential in guiding students in their education and career choices. In order to build the future workforce in disciplines critical to NOAA's mission, it is essential that the education and research communities be aware of the agency and the academic disciplines that support the agency's mission. This knowledge allows educators and researchers to provide students interested in STEM-related subjects and other supporting disciplines with a broadened insight on future student opportunities and career paths.

Awareness of NOAA's mission must also be supplemented by awareness of existing opportunities for education and experience in NOAA mission-critical fields. These opportunities expose the future workforce to the type and breadth of fields available to them as future careers, and help prepare them as qualified candidates for positions in these fields. A wide range of such opportunities are currently available for educators, high school students, undergraduates, and graduate students through NOAA and partner organizations.

By highlighting these available opportunities, NOAA will increase recruitment to the programs, attract and retain students and professionals into the pipeline for NOAA mission-critical disciplines, and further broaden the knowledge and understanding of NOAA's mission and needs. NOAA is particularly interested in bringing awareness of its mission and opportunities to underrepresented communities in an effort to bolster the number of future workforce members from these demographics.

Examples of NOAA Educational Support Programs:

- Ernest F. Hollings Undergraduate Scholarships
- NOAA Graduate Sciences Program
- Dr. Nancy Foster Scholarship Program
- Faculty and Student Intern Research Program (FSIRP)
- NOAA Workforce Recruitment Program (WRP)
- National Climatic Data Center (NCDC) Internships
- John A. Knauss Marine Policy Fellowship Program
- Teacher at Sea Program
- Sally Ride Science
- The Maury Project

Outcome 2.2 Engaged Community of Educators

Outcome 2.2: A community of educators and researchers actively involved in supporting student opportunities in disciplines critical to NOAA's mission.

Strategies

- a) Engage and expand partnerships with educators and researchers, particularly from underrepresented groups, to augment the number of qualified students who apply to NOAA's student opportunities.
- b) Maintain and enhance resources for students and teachers to access information about NOAA's student opportunities.
- c) Expand partnerships with Minority Serving Institutions to increase the pool of underrepresented students that are educated in disciplines critical to NOAA's mission.

Potential Performance Indicators

- Levels of collaboration and partnerships in supporting NOAA related student opportunities.
- Student awareness NOAA related opportunities such as Knauss Fellowships, Nancy Foster and other student programs at Minority Serving Institutions.

A community of educators and researchers willing to support NOAA students is essential to the success in developing a future, particularly from underrepresented groups, skilled in science, technology, engineering, mathematics and other disciplines critical to NOAA's mission.

To achieve this goal engaging the support and creating partnerships with private industry, academia, and other Federal, state local and tribal government entities is needed for NOAA to stay relevant with products and services that drive NOAA's science, educational programs and management. New products and services provide students with the knowledge and ability to effectively compete in the workforce.

There are numerous student opportunities available at NOAA to provide to the education and research communities. NOAA currently makes information on scholarships, internships, fellowship available throughout its offices and facilities available on the NOAA website. Information on NOAA student opportunities includes a brief description of each program; application deadline; award amount; dates of opportunity; contact name, telephone number and e-mail address.

NOAA will enhance and expand the existing partnerships with Minority Serving Institutions (MSI) primarily through grant funding opportunities. In addition, the MSI community should be invited to

1 participate in all major NOAA events, including stakeholder meetings, to increase collaboration and
2 expand research and education partnerships with the MSI community.

3 Outcome 2.3 NOAA Employees Support Workforce Education

5 **Outcome 2.3: NOAA’s employees support opportunities for students and teachers to learn about 6 and explore NOAA science and stewardship.**

8 *Strategies*

- 9 a) Increase NOAA employees’ awareness of student and teacher scholarship opportunities within the
10 agency.
- 11 b) Target student recruitment to underrepresented communities and promote NOAA’s career track
12 positions to students.
- 13 c) Encourage NOAA employees to create high-quality internship opportunities for NOAA supported
14 students and teachers.
- 15 d) Ensure student opportunities are responsive to NOAA’s future workforce needs.
- 16 e) Monitor and evaluate NOAA student and teacher opportunities to ensure high quality experiences.

18 *Potential Performance Indicators*

- 19 • The number of employees knowledgeable of NOAA student opportunities.
- 20 • Participation by underrepresented groups in NOAA student opportunities.
- 21 • Internship opportunities within NOAA for students, particularly from underrepresented
22 communities.
- 23 • Student satisfaction levels with all student opportunities.

25 One of NOAA’s strongest assets is the ability to engage the public through internships, fellowships,
26 sabbaticals, and other student opportunities. These student opportunities provide a mechanism for the
27 general public to come to NOAA and learn about and explore NOAA sciences management and culture.

29 There is a need for increasing the awareness about the educational opportunities that NOAA has to offer
30 to underrepresented communities. In addition, NOAA recognizes an opportunity to expand work with
31 these communities to increase the amount of students that participate in these learning activities. NOAA
32 hopes through these efforts there will be an increase in demand by underrepresented communities to
33 participate on these student opportunities. To address this influx of new applicants and students NOAA
34 plans to work with its employees to augment and diversify the educational opportunities offered. The
35 agency will increase the knowledge of its workforce on the way they can increase the student
36 opportunities NOAA can offer.

38 NOAA anticipates that increased support by its workforce for these student opportunities will increase the
39 number of available topics and themes that students can get involved with in. A more knowledgeable
40 NOAA workforce will translate into a better learning experience by the students. As a result, NOAA will
41 be in a position to increase its stewardship and provide a better service to the public.

Outcome 2.4 Connecting Graduates to Careers

Outcome 2.4: A diverse pool of students with degrees in science, technology, engineering, mathematics and other fields critical to NOAA’s mission connected to career opportunities at NOAA and related organizations.

Strategies

- a) Support students in NOAA mission sciences, education and policy to increase the number of students obtaining degrees in those disciplines.
- b) Ensure students get professional opportunities that enhance their ability to pursue careers in ocean, coastal, weather and climate sciences.
- c) Increase the number of science and engineering professionals, particularly from underrepresented groups, who come to NOAA via sabbaticals, faculty staff exchanges and Intergovernmental Personnel Act assignments.
- d) Increase opportunities for students to transition to careers in NOAA mission critical fields.
- e) Monitor NOAA supported students to track graduation and career choices and assess these impacts on NOAA recruitment and retention efforts.

Potential Performance Indicators

- Number of NOAA research opportunities online from which students and teachers may select assignments.
- Number of NOAA scholarships offered annually to meet the need of undergraduate students.
- Opportunities created in each NOAA Line Office annually for faculty from Minority Serving Institutions to compete for collaborative research activities at NOAA facilities.
- Career positions at NOAA Line Office which are available annually for participants in the NOAA Graduate Sciences Program.

NOAA is committed to a workforce that is reflective of the diversity of America and, as such, the agency has put in place education and outreach programs, including the Educational Partnership Program and the METCON program to create education and hands on research opportunities targeted at recruiting students and teachers, particularly from underrepresented groups to participate in programs at NOAA facilities.

Succession planning activities at NOAA show that nearly forty percent (36.8%) of its workforce is eligible to retire within the next five years (2008–2014). NOAA needs a multi-faceted approach, including education, outreach and recruitment to create a pipeline of well-educated students with workforce skills to fill mission critical occupations.

The overarching goal of NOAA’s workforce development programs is to increase the number of students who take coursework and graduate with degrees in STEM and other fields that directly support NOAA’s mission. Building a strong, competitive pool of potential new NOAA employees requires the involvement of NOAA staff with a primary goal to increase individuals trained in these fields from which NOAA may select its future workforce.

NOAA will use the current and future student scholarship and internship programs to support students in NOAA mission training programs. The agency will also use the Student Career Experience Programs to increase opportunities that can transition participants to NOAA careers and track the graduation and career choices of participants to determine the effectiveness of its programs.

1 Strategy for Implementation

2
3 The purpose of the NOAA Education Plan is to provide high-level guidance for the
4 implementation of the America COMPETES Act mandate and the realization of NOAA’s
5 education vision. To encompass a 20-year time-frame, the goals, outcomes and strategies of this
6 plan provide a framework to focus and coordinate the educational efforts of the agency.
7 Operationalization of this guidance requires the development of shorter term implementation
8 plans that considers the more immediate needs, opportunities and resources of the agency in
9 support of its long term strategic goals.

10
11 The implementation plan will set forth the specific programmatic actions the agency will take to
12 carry out the goals and strategies established under this strategic plan. Specific performance
13 measures aligned with each outcome will be developed for these actions to provide the metrics
14 needed for evaluating the success of the agency in meeting the strategic vision. The “Potential
15 Performance Indicators” listed under each outcome in this document provide a limited sampling
16 of topics from which fully developed performance measures may be established. Implementation
17 plans will be reviewed on an ongoing basis and revised with the 5-year review of the broader
18 NOAA Education Plan.

19
20 This Education Plan will be fully integrated with NOAA’s planning and budgeting system. To
21 ensure consistency with NOAA’s mission and priorities, the Education Council will work to
22 integrate the goals of this education plan into the agency’s annual priorities. Through these
23 established processes NOAA Line and Staff Offices will enable this strategic plan and
24 subsequent implementation plans. The active participation by members of the NOAA Education
25 Council in developing this plan assures alignment of this framework with the educational
26 mandates of each office providing better integration with the NOAA planning and budgeting
27 processes.

1 **References**

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