

Revised Draft October 15, 2008

National Oceanic and Atmospheric Administration



NOAA EDUCATION

Advancing Environmental Literacy

NOAA's Education Strategic Plan

Science, Service, and Stewardship

2008 - 2028

Draft: October 15, 2008

http://www.oesd.noaa.gov/draft_ed_plan.html

1
2
3 Letter from the NOAA Education Community,
4

5 The signing of the America COMPETES Act into law creates an unprecedented mandate for the National
6 Oceanic and Atmospheric Administration (NOAA) to educate the public on the importance of water and
7 air stewardship. The Act calls on NOAA and other Federal science agencies to invigorate our future
8 economy by strengthening interest and access to education and training opportunities in science,
9 technology, engineering and mathematics (STEM) careers. This mandate responds to a crisis in the
10 American education system in which our nation's youth continue to fall further behind their global peers
11 in science and mathematics. The devastating result is that fewer Americans choose STEM careers,
12 motivating U.S. businesses to export STEM jobs overseas where talent is more readily available.
13

14 Global resources face more environmental threats than at any other time in human history. Therefore, one
15 of NOAA's greatest challenges is to refocus and enhance public awareness of the issues threatening these
16 resources. Helping the public to understand the role it must play in protecting the Earth's natural
17 resources is one of NOAA's paramount responsibilities as our planet faces serious ecological threats.
18 Global climate change, coupled with changing weather patterns; acid rain; wildlife extinction and habitat
19 losses; rising sea levels; and planetary temperature increases are dire indications of realistic threats and
20 challenges to the resilience of our global society. Large increases in population that are predicted over the
21 next 25 years only add to the stresses of the environment by increasing water, land, and air pollution.
22 Moreover, larger populations increase demand for production of food and harvests from the land and
23 water, severely increasing the need for energy to run the economic engine. Collapsing fisheries, wide
24 spread bleaching of coral reefs, extinctions, increases in human heat-related deaths, loss of biological
25 diversity, the spread of infectious diseases and invasive species, sea level rise, deforestation, increased
26 droughts, floods and famines. These are only a few of the challenges our global society faces. A large
27 piece to the puzzle of successfully adapting to these changes is a public which is educated, appreciative
28 and involved in the environment in which we are intimately linked.
29

30 NOAA seeks to create solutions to economic and environmental challenges by engaging the public in
31 various aspects of policy development and implementation. NOAA's partnership with the public will
32 enable solutions that are based on the best available information with respect to modern science and data;
33 economic forecasting; and socio-political modeling. Educating the public on the issues and providing
34 them with the tools and skills to make informed decisions on economic, environmental and public safety
35 choices is the task at hand. The NOAA education community is committed to partnering with formal and
36 informal education institutions, businesses, governmental and non-governmental organizations to meet
37 this challenge.
38

39 This strategic plan offers the perspectives of the NOAA Education community on how to best move
40 forward to meet this national mandate and the global challenges our world faces. Success promises a
41 more attuned and engaged society that is better prepared to address its role in transforming negative
42 environmental changes into a more resilient and sustainable economic future. Building bridges between
43 society and ocean, coastal, Great Lakes and atmospheric sciences is NOAA Education's contribution to
44 our future.
45

46 We thank you for your interest in NOAA Education and invite you to join us in partnership on this
47 amazing journey towards understanding and sustaining our planet.
48
49
50
51

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2

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1 **NOAA’s Vision**

2 An informed society that uses a comprehensive understanding of the role of the ocean, coasts, and
 3 atmosphere in the global ecosystem to make the best social and economic decisions

4 **NOAA’s Education Mission**

5 To advance environmental literacy and promote a diverse workforce in ocean, coastal, Great Lakes,
 6 weather, and climate sciences encouraging stewardship and increasing informed decision making for the
 7 Nation.

8 **NOAA’s Mandate to Educate**

9 NOAA’s role in science education is defined in statute. Most recently, the *America COMPETES Act*
 10 (P.L. 110-69) states:

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

19
 20 Passed in 2007, the statute further directs NOAA to develop a 20-year strategic plan in partnership with
 21 ocean and atmospheric science and education experts, and interested members of the public. The Plan is
 22 to be evaluated and updated every five years.

23
 24 The *America COMPETES Act* complements the standing legislation of the National Sea Grant Program,
 25 National Marine Sanctuary Program, National Estuarine Research Reserve System and the Coral Reef
 26 Conservation Program. Together these statutes provide a unifying mandate for education across the
 27 agency. The philosophy and priorities of this strategic plan are guided by these statutes and directly
 28 support the strategic vision of NOAA (2008). Additional guidance was derived from the directives and
 29 recommendations of recent reports (see examples listed below) on the need for science education reform
 30 and the advancement of lifelong learning opportunities in ocean, coastal, Great Lakes, weather, and
 31 climate sciences.
 32

Statutes for NOAA Education	Supporting Directives for Education
<ul style="list-style-type: none"> • National Sea Grant College Program Act (P. L. 107-299) • National Marine Sanctuaries Act (P.L. 106-513, Sections 1431 et seq.) • Coastal Zone Management Act (P. L. 109-58); § 1461, National Estuarine Research Reserve System (Section 315) • Coral Reef Conservation Act (P. L. 106-562) • Magnuson-Stevens Fishery Conservation and Management Act (P.L. 109-479). • America COMPETES Act (P.L. 110-69) 	<ul style="list-style-type: none"> • NOAA’s Strategic Vision (2008) • 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) • <i>Report of the Academic Competitiveness Council</i> (2007)

1 **NOAA's Education Priorities**

2 In preparing this 20-year vision of Education for NOAA the planning committee considered a broad array
3 of perspectives, research findings, and legal statutes. Based on the strengths and mission of the agency
4 and the future needs of our society the agency has established two primary education goals of *building*
5 *environmental literacy* and *developing a future workforce*.

6
7 An environmentally literate public is critical to achieving NOAA's
8 mission goals of managing coastal and marine resources, providing
9 for society's needs for weather and water information, and enhancing
10 society's ability to plan and respond to climate variability. An
11 educated public is needed to serve as stewards of the natural
12 environment, take appropriate action in the case of severe weather
13 and participate in the national debate on complex issues such as
14 climate change. Recent surveys suggest that participation levels in
15 formal and informal education are strong indicators of the ability of
16 citizens to understand science and technology in order to participate
17 in public policy decisions (Miller, 2006). NOAA plays a key role in
18 advancing this understanding through its educational programs,
19 products, outreach efforts, collaborations and leadership supported
20 by the agency's extensive breadth and depth of scientific resources.

***Environmental Literacy** – a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment, and the ability to understand and utilize scientific evidence to make informed decisions regarding environmental problems*

21
22 <image – Ocean Exploration and Research graphic showing research vessel, submersible, satellite>

23
24 The Congressional report *Rising Above the Gathering Storm* (National Academy of Sciences, 2005) states
25 that building a workforce literate in science, technology, engineering, and mathematics (STEM) is crucial
26 to maintaining America's competitiveness in a rapidly changing global economy. These skills are also
27 critical in the continuation of NOAA's scientific and resource management mission. As population
28 pressures increase on the natural systems of Earth, understanding the complexities of human impacts and
29 developing strategies for sustainable solutions requires the brightest minds. An analysis of K-12
30 curriculum standards from across the U.S. found that current standards may not adequately address the
31 need for developing this future workforce (Hoffman, Martos and Barstow, 2007). Scientific concepts of
32 interactive Earth systems, integration of 21st century investigative technologies, and ocean and climate
33 literacy principles are all important foundations to NOAA's work. While existing science education
34 standards across the nation incorporate some aspects of these vital concepts, they do not fully embrace
35 them. Through continued partnerships with formal and informal education institutions and direct
36 engagement and support of teachers and students, NOAA strives to bridge this gap to address the future
37 workforce needs of the Agency and of our Nation.

38
39 <image – Fisheries scientist at work examining live shark specimen.>

40 **Partnerships and Collaboration**

41 As the Nation's leading oceanic and atmospheric science and service agency, NOAA has the
42 responsibility to increase its coordination role and collaboration within the ocean, coastal, Great Lakes,
43 weather, and climate science and education communities. The passage of the *America COMPETES Act*
44 further solidifies this role and provides a mandate for the agency to serve as a catalyst to strengthen ocean
45 and atmospheric science education. Central to the success of fulfilling these responsibilities are the
46 agencies, businesses, organizations and individuals with whom NOAA works in pursuit of a common
47 vision. Important NOAA partners include museums and aquariums, non-governmental organizations,
48 educational businesses, professional societies, education associations, state, local, and tribal governments,
49 state and local school systems, academia, and other education practitioners. By participating in planning

1 initiatives, funding agreements, joint research, sharing educational content, and work on other
2 collaborative projects of common interest, NOAA leverages its resources to advance the environmental
3 literacy and scientific knowledge of our Nation and the global community. Through these partnerships
4 and collaborations the course is set to build resilient communities, strengthen stewardship of our natural
5 resources and secure a healthy economic future.

6 **NOAA's Education Standards**

7 NOAA is committed to the development and support of education programs and products that exhibit
8 standards of high quality. At NOAA, education activities are:

- 9
- 10 • *aligned with NOAA's strategic goals and include measurable objectives;*
- 11 • *aligned with appropriate national and/or state education standards;*
- 12 • *reflective of current environmental literacy principles and concepts;*
- 13 • *designed to incorporate the needs of the participants;*
- 14 • *designed to be replicable, consistent in quality, and sustainable; and*
- 15 • *continually evaluated and improved.*
- 16
- 17

18 **Editors Note:**

19
20 In the final version of this document it is envisioned that images and short sidebar examples highlighting
21 longstanding "signature" education programs at NOAA will be included throughout. These examples will
22 be used to reinforce the concepts presented in the text as well as showcase the breadth of highly regarded
23 education programming from across the agency and through NOAA's education partners. In this draft
24 brief references to possible image and graphic composition are denoted by <image>.
25

1 **Goal 1: Environmental Literacy**

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

2 For NOAA to achieve its strategic vision, an *environmentally literate* and engaged public must be
3 fostered. Leaders in Earth system science education echo this urgent need, stating that public
4 understanding of Earth's interconnected systems is crucial to our ability to apply knowledge and problem
5 solving skills to real world issues (Hoffman and Barstow, 2007). These issues involve uncertainty, and
6 require economic, aesthetic, cultural, and ethical considerations. NOAA defines an environmentally
7 literate person as *someone who has a fundamental understanding of the systems of the natural world, the*
8 *relationships and interactions between the living and non-living environment, and has the ability to*
9 *understand and utilize scientific evidence to make informed decisions regarding environmental issues.*

10
11 The outcomes and strategies presented for this goal provide six interdependent actions that NOAA will
12 pursue to achieve this vision of developing environmental literacy in the Nation's diverse citizenry. The
13 environmentally literate public created through these actions will also provide a base for continuous
14 supply of the Nation's future workforce. Four themes are integral to these actions: *promoting*
15 *environmental stewardship, facilitating change in education systems, connecting citizens to nature and*
16 *community, and using emerging technologies.*

17
18 <start text box – Title: Foundations for Education>

19 <image – Divers conducting coral reef survey from Corals Program>

20 The foundation for NOAA's educational content is based on the Agency's scientific work. Often referred
21 to as *NOAA sciences*, the core of this work is the investigation of patterns, features, and interactions of
22 Earth's ocean, coasts, Great Lakes, weather, and climate. The study of these physical systems requires a
23 broad array of scientific disciplines, technology, mathematics, and engineering. Social sciences are also
24 essential in learning how humans interact with these resources and in how to build understanding and
25 stewardship. These Earth systems are complex and no single scientific discipline can capture the cause
26 and effect of changes within them. Observing coral reef health is a lesson in global climate, land use
27 planning, oceanography, biology, chemistry, fisheries management, and marine economics. Likewise,
28 projecting future climate is a product of computer science, statistics, sociology, meteorology, climatology,
29 and other sciences. Infusing the findings and research processes of this work into education, and training
30 new generations of scientists to continue this work are central to the NOAA education mission.

31 <end text box>

32
33 Promoting Environmental Stewardship

34 <image – MERITO program conducting beach cleanup in Monterey Bay National Marine Sanctuary>

35
36 In addition to its scientific mandate, NOAA plays a leading role in the conservation, management, and
37 restoration of ocean, coastal, and Great Lakes resources. The stewardship of these resources for current
38 and future generations is critical to the long-term sustainability of society and the planet. Monitoring the
39 health of these ecosystems and building understanding of the relationships between the ocean and other
40 Earth systems is a core mission of the organization. Over the last 100 years human actions have greatly
41 altered these natural systems and are seriously threatening our world resources. Scientists and economists
42 recognize that the pressure on the environment is currently increasing with the globalization of world
43 markets, population increases, and the race for economic growth. NOAA alone cannot manage these
44 issues. Partnering with the public to share stewardship responsibilities is a necessity; environmental
45 literacy is the first step in that process. NOAA embraces effective educational methods which promote

1 stewardship and associated environmental problem-solving efforts, such as action-research and service
2 learning.

3
4 Building public understanding and appreciation of the interconnectedness of humans and the environment
5 is a critical part of the development of stewardship responsibilities. Education programs and products can
6 provide unique cultural contexts including fostering understanding and practical use of indigenous
7 knowledge and Native science (including Native Hawaiian, Alaska Native, and Pacific Islander) for the
8 development of environmental literacy.

9
10 Facilitating Change in Education Systems

11 <image – Sea Grant teacher development field class>

12
13
14 Developing environmental literacy is a lifelong process involving diverse education systems. The ocean,
15 weather and climate systems that are the foci of NOAA’s scientific endeavors, are central to
16 environmental literacy and are inherently of interest to people of all ages, backgrounds and education
17 levels. The development of a society that is environmentally responsible and utilizes effective science-
18 based problem-solving skills and stewardship behavior will require significant attention and increased
19 action by formal and informal education systems. Our Nation’s K-12 formal education system has not
20 established a strong and comprehensive structure to support this development particularly in the oceanic
21 and atmospheric sciences relevant to NOAA’s mission. NOAA is committed to support and facilitate
22 system-wide change of the formal education system to build future capacity for developing
23 environmentally literate citizens. Such change requires participation across the spectrum of the education
24 community including policy makers, academic institutions, professional associations, teachers and
25 students.

26
27 NOAA is committed to facilitating the improvement of education programs at all stages of development
28 and implementation. Informal education plays a critical role in developing environmentally literate
29 citizens. Therefore more must be done to equip these programs and products with contemporary
30 instructional resources and interdisciplinary methods. NOAA must be engaged in the improvement of
31 both formal and informal education systems because these venues are important to the development of
32 literate citizens and to the long-term maintenance of their skills, knowledge and attitudes. Partnerships
33 and collaboration are integral to establishing these changes.

34
35 <start text box – title: Definitions of Education and Outreach>

36
37 **Formal education** - learning within a structured education system in which children or adults are required
38 to demonstrate proficiency

39
40 **Informal education** - learning outside the established formal system that meets clearly defined objectives
41 through organized educational activities

42
43 **Free-choice learning** - self-directed, voluntary education guided by an individual’s needs and interests

44
45 **Educational Outreach** - activities that are designed to build awareness, develop relationships, promote
46 educational products, and inspire educators, students, and the public to pursue further learning
47 opportunities

48
49 <end text box>

1 Connecting Citizens to Nature and the Community

2
3 <image – B-WET group in National Estuarine Research Reserve planting aquatic plants>

4
5 Connecting human actions to scientific information, policy, and Earth’s systems is critical to the process
6 of environmental literacy. Framing this process in a local context within the social framework of one’s
7 community and the associated regional resources makes these lessons more powerful and longer lasting.
8 NOAA embraces two educational methodologies that have been shown to greatly enhance these
9 connections: *experiential education and place-based education*.

10
11 Experiential education programs engage learners in constructing meaning by using real world problems
12 and hands-on interaction with natural phenomena. A considerable body of cognitive research provides
13 evidence that these learners become active participants rather than passive recipients of knowledge (Huitt
14 and Hummel, 2003). The experiential learning process is one component of NOAA’s repertoire that helps
15 to ensure learners are actively and purposefully engaged in creatively posing questions, investigating,
16 experimenting, developing curiosity, solving problems, assuming responsibility, and constructing
17 meaning.

18
19 Place-based education immerses the learner in local heritage, culture, landscapes, opportunities, and
20 experiences as a foundation for the study of language arts, mathematics, social studies, science, history,
21 and other subjects. This interdisciplinary approach encourages participants to use the schoolyard,
22 community, public lands, and other special places as resources, turning communities into classrooms.
23 The NOAA National Marine Sanctuaries and National Estuarine Research Reserves provide excellent
24 place-based locations that serve as “living classrooms”, applying real world contexts for learning and
25 stimulating “hands-on/minds-on” educational opportunities. NOAA facilities throughout the Nation play
26 an important role, as well, in imparting the relevance of ocean and atmospheric science to their local
27 communities through these place-based educational experiences. Additionally, NOAA’s grants and
28 educational partnerships extend the agency’s ability to positively impact communities with this approach.

29
30 Using Emerging Technologies

31 <image – satellite image of El Niño as viewed in Second Life Virtual world>

32
33 Advances in technology change the way we interact as a society and impact our view of the world around
34 us. Maintaining a presence in this new information age and keeping educational approaches relevant to
35 new learning modalities are important to the continued success of NOAA’s environmental literacy goal.
36 NOAA science relies on these technological developments, and NOAA is committed to building
37 collaborative networks and monitoring systems to enhance the delivery of comprehensive Earth system
38 data. To ensure the usefulness of these data, problem-solving, interactive and multimedia resources for
39 students, educators and the public are being developed. While NOAA adopts a broad array of
40 methodologies in communicating environmental concepts to the public, the use of new, innovative, and
41 engaging technologies to efficiently and effectively deliver this information is a high priority for the
42 agency.

1 **Outcome 1.1 Evaluation and Research for Effective Programs**

2 Recent years have seen many advances in our understanding of how the mind works and the process of
3 learning. Incorporating this research into the design and implementation of educational programs in both
4 formal and informal settings has begun. The infusion of this knowledge proves beneficial in creating new
5 programs and revising existing educational efforts targeting increased environmental literacy. A product
6 that is able to bridge the gap between sound scientific principles and practical application in the learning
7 environment is one that is likely to be proven effective (Ritter and Lemke, 2000). Improving
8 effectiveness of programs and products by using the best practices and the latest knowledge is an
9 important part of NOAA’s approach to environmental literacy.

10
11 In the report “*BEST: What it Takes*,” (BEST, 2004) a Blue Ribbon Panel reviewing best practices in K-12
12 education notes: “Evidence matters because outcomes matter and resources are limited. It is important to
13 ensure that the investments in money, time, and human capital have a high probability of paying off.
14 Good intentions and passionate commitment are not enough to fill the science and technology pipeline”
15 (Partnership for 21st Century Skills, 2004). Developing methods that accurately and efficiently evaluate
16 the effectiveness of projects is an ongoing challenge in the educational community. Much work has been
17 done by Federal agencies and their education partners to advance the evaluation process and much work
18 remains. As part of the quality standards for NOAA Education, the agency is committed to advancing
19 evaluation practices to improve the results of its efforts and to contribute to the body of knowledge
20 regarding effective environmental and science education. Building evaluation capacity of NOAA
21 educators and developing a coordinated system to capture and share these findings are key elements in
22 achieving this outcome.
23
24
25

26 **Outcome 1.1: NOAA education programs are based using the best available research on the** 27 **effectiveness of environmental and science education.**

28 *Strategies*

- 29
30
- 31 a) Support and use research-based practices when developing and implementing education programs
32 and products.
 - 33 b) Develop and implement a framework of assessment and evaluation strategies that add to and are
34 based on educational research findings, and are consistent with interagency assessment and
35 evaluation efforts.
 - 36 c) Contribute and share research on effective science and environmental education.
- 37
38

39 **Outcome 1.2 Educators Understand and Use Literacy Principles**

40 An environmentally literate and involved citizenry is essential to protect fragile ecosystems and to build
41 sustainable communities which are resilient in the face of a changing Earth. NOAA, together with partner
42 agencies, organizations, and individuals in the science community, has developed several environmental
43 literacy frameworks that identify the essential principles and fundamental concepts individuals need to
44 understand in order to make appropriate decisions about human activities that affect our planet. These
45 frameworks are designed to support efforts to improve development of state and national standards,
46 curricula, assessments, teacher certification and the informal education landscape.
47
48

1 <start text box – Title: **Developing Literacy Frameworks** >

2 < image – *Ocean and Climate Literacy Brochure Covers*>

3 The development of science literacy frameworks has gained the attention of the scientific, education, and
4 research communities. NOAA played a leading role in the collaborative process to develop principles and
5 conceptual frameworks for ocean and climate literacy. These documents, *Oceans for Life, Essential*
6 *Principles for Ocean Literacy* and *Essential Principles for Climate Literacy*, are aligned with national
7 education standards to facilitate use of the concepts in both formal and informal education settings. As
8 these two areas of study are critical to NOAA’s mission, they form the central focus of the Agency’s
9 efforts in developing an environmentally literate society.

10 NOAA is also actively involved in several efforts to create new science literacy frameworks related to the
11 conceptual understanding of other aspects of the Earth system (e.g. Earth Science, Atmospheric Science).
12 As these products are completed they will be integrated into future educational work supported by
13 NOAA. The Agency recognizes that these conceptual frameworks are a starting point for building true
14 environmental literacy that encompasses not only the acquisition of essential knowledge, but also includes
15 the development of skills and attitudes that enable the application of that knowledge to inform society’s
16 decisions.

17 <end text box>

18 Additionally, a gap exists between the scientific knowledge and skills most students learn in school and
19 what they will need in 21st Century communities and workplaces. Several national reports recommend
20 significant increases in the number of science teachers and improvement in the quality of their ongoing
21 preparation to address this need (National Academies of Science, 2005; National Commission on
22 Mathematics and Science Teaching for the 21st Century, 2000). NOAA believes integration of
23 environmental literacy frameworks into formal and informal education is an important contribution
24 toward addressing this gap in science literacy and developing a robust scientific and engineering
25 workforce.

26 Further, the agency’s support and promotion of experiential and place-based education programs
27 encourages interdisciplinary approaches to learning through the active engagement of students in real
28 scientific inquiry, resulting in improved understanding of important environmental concepts and
29 improved environmental stewardship behavior (Penuel et al., 2005). Expanding the awareness of these
30 approaches and literacy frameworks, building confidence in the application of the teaching methods, and
31 providing support services in their application are all part of NOAA’s strategy in addressing the need for
32 an environmentally literate citizenry. NOAA cannot undertake these efforts on its own and, thus,
33 partnerships with other organizations, agencies and institutions will be essential to ensuring this outcome
34 is achieved. NOAA cannot undertake these efforts on its own and, thus, partnerships with other
35 organizations, agencies and institutions will be essential to ensure this outcome is achieved.

36

37 **Outcome 1.2: Educators understand and use environmental literacy principles.**

38 *Strategies*

- 39 a) Support the development and dissemination of environmental literacy principles.
- 40 b) Partner with external groups to adopt and integrate environmental literacy principles into state
41 and national standards, curricula, assessments, professional development programs, pre-service
42 education, educator certification, and the informal education field of informal education.
- 43 c) Expand and strengthen experiential and place-based education using environmental literacy
44 principles.

45

46

1 **Outcome 1.3 Evidence-based Earth System Science Education**

2 Technological improvements over the last decade have advanced the ability of NOAA and other agencies
3 to monitor, assess, and make predictions about Earth's changing environmental systems. Using satellites,
4 aircraft, ships, remote sensing systems, and direct scientific monitoring by a global scientific network,
5 NOAA and other Federal agencies collect data on climate, weather, the ocean, and other natural
6 phenomena through projects such as the U.S. Integrated Ocean Observing System (IOOS®). NOAA has
7 a long-standing commitment to share this information with scientists, industry, government, and the
8 public through a variety of media and interactive data portals. These data are critical to NOAA products
9 and services that help our society make better decisions concerning how to conduct business, monitor
10 public health, and protect life and property.

11
12 *<image - students collecting data as part of a Sea Grant program rocky intertidal study to demonstrate
13 conduct of scientific investigation>*

14
15 Developing the ability of learners to formulate and conduct independent scientific investigations to
16 explore relationships within Earth's natural systems is a central goal of environmental science education
17 and supports the advancement of environmental literacy. Ocean, coastal, Great Lakes, weather, and
18 climate sciences provide rich subject matter for learning these skills. By extending existing public portals
19 for accessing imagery, real time data, and archival data, NOAA has begun the process of creating
20 specialized products designed to facilitate the integration of this material into educational experiences.
21 Programs such as the Science on a Sphere®, NOAA Ocean Data Education (NODE) Project, *MERITO*,
22 Estuaries 101, Signals of Spring-ACES, Project Atmosphere, and Chesapeake Bay Interpretive Buoys
23 (CBIB) curriculum modules utilize NOAA data and visualizations to help learners recognize patterns and
24 processes, and improve understanding of research discoveries or natural phenomena. Additionally,
25 NOAA is committed to creating and supporting virtual and hands-on experiential opportunities in ocean,
26 coastal, Great Lakes, weather, and climate science disciplines that focus on user collected data. Programs
27 such as Long-term Monitoring Program and Experiential Training for Students (LiMPETS), EarthLabs,
28 The JASON Project, and Teacher-at-Sea are current examples of this work. Continued efforts in this area
29 will strengthen the skills and abilities of the learners and help them make informed decisions regarding
30 the environment and its resources.

31 **Outcome 1.3: Educators, students and/or the public collect and use ocean, coastal, Great Lakes, 32 weather, and climate data in inquiry and evidence-based activities**

33 *Strategies*

- 34
35
- 36 a) Support and implement professional development to strengthen scientific knowledge, and build
37 inquiry and decision-making skills
 - 38 b) Create and disseminate audience-appropriate products and services that facilitate access to, and
39 use of ocean, coastal, Great Lakes, weather, and climate science and data through multiple
40 platforms and emerging technologies.
 - 41 c) Partner with external groups to maximize the dissemination, integration and use of these
42 products.
- 43

1 **Outcome 1.4 Informal Science for Lifelong Learners**

2 “Lifelong learning” is an important component of an environmentally literate citizenry. Conceptually this
3 process allows each individual to incorporate current scientific, economic, and social data and
4 information into their personal knowledge base and use it in their daily decision making. High quality
5 learning opportunities beyond the K-12 education system and academia must be made available to
6 continue this process. The science attentive public, those citizens that actively display an interest in
7 learning about the scientific process, provide an ideal target audience for introducing environmental
8 literacy concepts. By expanding this audience through educational outreach and then offering engaging
9 learning opportunities that result in the gain of sufficient information to move knowledge beyond basic
10 awareness, NOAA serves as a catalyst and a valued information source in a lifelong-learning partnership.

11
12 Building public understanding of how our Nation’s natural resources are managed and the importance of
13 these resources is a key element in the agency’s stewardship mission. To achieve this outcome, NOAA
14 engages in informal science education activities at local, state, regional, multi-state, and national levels,
15 with particular emphasis on reaching communities that are underrepresented in STEM sciences. NOAA’s
16 vast experience and infrastructure for monitoring Earth’s systems and modeling future trends uniquely
17 positions the agency to provide citizens with the most current information available on the ocean and
18 climate. To provide for the lifelong learner, NOAA’s comprehensive education programs provide a
19 critical connection between the agency and the learning public.

20
21 <image - public viewing an exhibit featuring Science On a Sphere® at Free Choice learning center funded
22 by NOAA’s Environmental Literacy Grants Program>

23
24 Connecting citizens directly to natural resources through hands-on experiences is a key element of the
25 NOAA educational approach. Place-based and experiential education opportunities provide direct
26 application of the multi-disciplinary science NOAA conducts and promotes stewardship. Working in
27 partnership with informal science centers to infuse Earth system science topics into free-choice learning
28 allows NOAA to extend its ability to reach the public. Application of emerging technologies allows
29 NOAA to increase the impact of the content presented by engaging this community in their preferred
30 methods of learning.

31
32 Citizen science networks, comprised of volunteers who often have limited scientific training, assist
33 NOAA in a variety of settings. These groups monitor coral reef health, collect local weather information,
34 assist with maritime archeology and conduct estuarine habitat studies to cite a few examples. Partnering
35 with these groups to increase their knowledge of the scientific process and to support their volunteer
36 efforts that help advance NOAA’s mission is another important strategy in achieving this outcome.

37 38 39 **Outcome 1.4: Lifelong learners are provided with informal science education opportunities** 40 **focusing on ocean, coastal, Great Lakes, weather, and climate topics.**

41 *Strategies*

- 42 a) Partner with free-choice learning programs to integrate ocean, coastal, Great Lakes, weather, and
43 climate science content into their programs through multiple platforms and emerging
44 technologies.
- 45 b) Establish and collaborate with networks of informal science education institutions to develop
46 effective practices for science content delivery.
- 47 c) Collaborate with citizen-science networks to support their participation in the scientific process.
- 48 d) Provide place-based experiences that facilitate hands-on exploration of natural environments.

1 **Outcome 1.5 Interagency and Intergovernmental Collaboration**

2 Many science and resource management agencies contribute to the goal of enhancing environmental
3 literacy. NOAA's ocean and climate education efforts, for example, are complemented by the
4 interpretive education programs of the National Park Service, the Earth science programs of NASA and
5 the U.S. Geologic Survey, and the Science, Technology, Education, and Mathematics (STEM) education
6 programs of the National Science Foundation, to name a few. NOAA contributes unique assets of
7 laboratories, field sites, monitoring systems, extension, and education networks that provide real-world
8 applications and are specific expressions of Earth system and environmental sciences. Collectively, the
9 science and resource management agencies collaborate in many ways to promote Earth system science
10 and environmental education. The National Ocean Science Bowl, Centers for Ocean Science Education
11 Excellence, Partners in Resource Education, the Smithsonian Sant Ocean Hall, and the Coastal Ecosystem
12 Learning Centers are a few examples of this work. In addition, NOAA provides leadership or is
13 represented in several formal interagency partnerships such as the Interagency Working Group on Ocean
14 Education, established under the *U.S. Ocean Action Plan*, and the Interagency Working Group on Climate
15 Education, established under the Climate Change Science Program.

16
17 <image – group photo showing interagency management partnership at Channel Islands National
18 Marine Sanctuary>

19
20 The issues surrounding ocean, coastal, Great Lakes, weather and climate resources are not confined
21 within the borders of any single country. Raising global awareness of the threats to these resources
22 requires educational efforts around the world. NOAA actively pursues opportunities to work with natural
23 resource and education agencies internationally to increase environmental literacy and stewardship. As
24 global concerns increase and relationships mature, this area of the education portfolio promises to move
25 beyond current training opportunities and coordination to incorporate shared global education initiatives.
26 Within the United States NOAA collaborates with tribal, state and local governments to improve the
27 support for environmental literacy education and to work on educational projects of common interest.
28
29

30 **Outcome 1.5: NOAA works cooperatively to maximize the impact of federal investment in ocean, 31 coastal, Great Lakes, weather, and climate education.**

32 *Strategies*

- 33 a) Leverage NOAA's interagency capabilities and resources to serve as a catalyst for coordinated
34 environmental literacy education.
- 35 b) Provide leadership on interagency and intergovernmental working groups to develop and
36 disseminate consistent literacy frameworks for Earth system sciences.
- 37 c) Lead and participate in interagency and intergovernmental projects and programs that promote
38 ocean, coastal, Great Lakes, weather, and climate science.
- 39 d) Work across agencies to develop consistent performance metrics for formal and informal
40 education in STEM and environmental science disciplines.
41
42

1 **Outcome 1.6: Intra-agency Coordination**

2 Education is pivotal in attaining NOAA’s vision and in enabling members of society to incorporate ocean
3 and atmospheric sciences in their daily lives and to effectively utilize NOAA products and services.
4 Ensuring that education activities are well coordinated and efficiently leveraged, informed by NOAA
5 sciences, and supportive of a broader spectrum of activities focused on providing effective service to our
6 constituents is paramount to the success of our Agency. The NOAA education community strives to build
7 effective systems of internal coordination across all its efforts and to support the broader constituent
8 “engagement” processes.

9 *Coordination of Education*

10 Educational efforts at NOAA are managed and delivered through a structure of programs and projects
11 distributed throughout the agency. Additionally several programs, such as the NMSP, NERRS, Sea Grant
12 College Program, NMFS and Coral Reef Conservation Program, have their own separate, long-standing
13 mandates for education. To assist in the coordination of these diverse entities the agency established the
14 NOAA Education Council. The Council serves as a forum for the NOAA education community and
15 works to leverage existing capabilities within the corporate infrastructure to provide a basis for a
16 comprehensive and targeted education program.

17 *Support of NOAA Engagement Efforts*

18 Because people make informed decisions at the policy,
19 community, and individual level, NOAA strives to engage
20 audiences from Congress to the public to develop knowledge,
21 skills, and strategies to protect ocean, coastal, and Great Lakes
22 resources and prepare for severe weather events and changing
23 climate. Engagement efforts to reach these audiences
24 incorporate several approaches within NOAA and include
25 extension, training, outreach, communication and education
26 activities. The 2008 NOAA Science Advisory Board report
27 “*Engaging NOAA’s Constituents*,” recommended the agency
28 expand its efforts to collaborate across approaches to fully
29 engage audiences to address the problems and opportunities
30 facing society. Through this process, NOAA can better
31 mobilize internal and partnership networks to achieve mission
32 goals.

Engagement

NOAA defines engagement as an open and ongoing dialogue between the agency and the public. This dialogue leads to partnerships to address jointly the problems and opportunities facing society particularly in the areas of ocean, coastal, Great Lakes, weather, and climatic sciences. This concept strongly supports the concept of NOAA as a service agency where its goals, objectives, and resources are shared with society. Implicit to engagement is a respect between partners that involves listening, dialogue, understanding, and mutual support (NOAA Science Advisory Board, 2008).

33 **Outcome 1.6: NOAA’s Education Community functions in a unified manner and is coordinated
34 with agency extension, training, outreach, and communications programs to fully
35 engage NOAA audiences.**

36 *Strategies*

- 37 a) Coordinate internally to improve the efficiency and effectiveness of NOAA’s collective education
38 efforts.
- 39 b) Build collaborative information frameworks that facilitate efficient access to NOAA education
40 resources.
- 41 c) Lead and participate in intra-agency projects and programs to develop, direct, and evaluate
42 NOAA-wide education and engagement initiatives.
- 43 d) Integrate NOAA-wide engagement themes into educational program activities at national,
44 regional, and community levels.

1 **Goal 2: Workforce Development**

Goal 2: A future workforce, reflecting the diversity of the Nation, skilled in science, technology, engineering and mathematics and other disciplines critical to NOAA's mission

2 NOAA's employees are its most important asset. With this in mind, the agency requires a skilled
3 workforce that is well-educated in science, technology, education, policy, management and
4 communication working to fulfill its mandates and mission. Similar to other Federal agencies, NOAA
5 has an aging workforce where nearly forty percent of its employees are eligible to retire by 2014. To
6 ensure a vigorous pipeline of qualified candidates, NOAA must undertake education and recruitment
7 activities for strategic workforce development. This goal and supporting outcomes outline a strategy that
8 the agency will employ to extend the current education and recruitment pipeline to meet tomorrow's
9 workforce needs at NOAA, and in organizations supporting NOAA's mission. The following concepts
10 and terms are central to this strategy.

11 <image – Picture of Knauss student(s) at work>

14 Workforce Development for Students, Educators, Researchers, and Managers

15
16 In broad terms workforce development is defined as: “*education, employment, and job training systems*
17 *designed to provide the skilled workers employers need to succeed and the education and training*
18 *individuals need to succeed in today's labor market*” (National Governors Association, 2008). At NOAA
19 these systems are provided through various agency offices and through partnerships with the education
20 and research community. The focus of workforce development in this Education Strategic Plan is to
21 provide grants, internships, fellowships, and other experiential activities to students, educators,
22 researchers, and managers in support of professional development in NOAA mission-critical careers.
23 Scientific literacy and stewardship skills are introduced through the programs developed through Goal 1
24 of this plan. Goal 2 programs build students' professional competency and helps them transition into the
25 working community. These activities are coordinated with the NOAA Workforce Management Office
26 which handles recruitment, hiring, and employee training.

28 NOAA Mission-Critical Disciplines

29
30 Although NOAA is known for its scientific work, to fully enable the agency to fulfill its mission requires
31 a workforce with a variety of backgrounds. Different skill sets support one another and are considered
32 “Mission-Critical.” Provided here are several examples of the interdependency of these disciplines:

- 33 • By nature NOAA's oceanic investigations require traveling on, under, and above the water
34 employing ocean going vessels, submersible craft, airplanes, and satellites. These craft require
35 operators, technicians, and engineers with specialized knowledge without which missions to chart
36 the ocean floor, monitor ocean currents, investigate fish populations, or explore new habitats
37 would not be possible;
- 38 • Computers and information technology have become integral to gathering, processing,
39 interpreting, and publishing data on the ocean and atmosphere. Computer programmers and
40 operators, web developers, geographic information systems specialists, and statistical modelers
41 work closely with NOAA scientists to understand and predict changes in Earth's systems;
- 42 • Public safety, a primary responsibility of NOAA, employs concepts of risk management,
43 economic modeling, emergency management, and media relations. These disciplines allow for the

1 science of weather trends, climate projection, tsunami monitoring, and El Niño forecasting to be
2 integrated into actions that save lives and support commerce;

- 3 • Protecting, restoring, and managing the use of coastal and ocean resources requires scientific
4 investigations to understand these environmental systems and their processes at work. In addition
5 the science will help the development of management plans that consider stakeholder interest,
6 which includes the business community, and drafting of policy to support these efforts. A strong
7 science background, that includes social sciences, is needed to conduct the type of research
8 necessary to yield better tools for ecosystem assessments and monitoring, better understanding of
9 the coastal and ocean processes and ecosystem dynamics, and better understanding of the
10 linkages of these ecosystems to human impacts;
- 11
- 12 • A workforce skilled in political processes, education, communication and public involvement,
13 that is also familiar with administrative procedures and adept in strategic planning methods, U.S.
14 and international laws and treaties, is necessary to support implementation and management plans
15 and policy development; and,
- 16
- 17 • Responding to the specific demands of air, sea, and surface transportation with consistent, timely,
18 and accurate science information aids in safe, efficient, and environmentally sound transportation
19 systems that are crucial to the nation’s commerce, and thus to the nation’s economy.

20

21 Underrepresented Populations in NOAA Sciences

22

23 *<image – Educational Partnership Program Center of Excellence with students and NOAA*
24 *representative>*

25 As the demographics of the Nation shift, maintaining an interest in the careers critical to NOAA’s mission
26 becomes increasingly challenging. Population growth in the U.S. is increasing most rapidly in
27 communities that have not traditionally selected STEM disciplines as college majors or career tracks
28 (National Science Board, 2008). One reason for this trend is that these groups currently have limited
29 representation in STEM careers. The NOAA workforce reflects these findings, with only 10% of the
30 STEM-related occupations in 2006 filled by underrepresented groups (Robinson et al., 2007). Given the
31 forecasted need for replacing NOAA retirees in the near future, maximizing the candidate pool is
32 important. Having a workforce that reflects the diversity of the Nation is also important to maintain the
33 relevance of the agency to the citizenry. Additionally, diversity brings a wider variety of perspectives and
34 approaches to bear on policy development and implementation, strategic planning, problem solving, and
35 decision making. For these reasons this workforce development goal emphasizes efforts to raise
36 awareness of NOAA mission-critical careers and to provide educational support in communities
37 underrepresented in these careers. Building workforce development education programs in these
38 communities and partnering with Minority Serving Institutions (MSIs), national organizations, industrial
39 partners and the non-governmental community that have programs to serve underrepresented groups will
40 be key mechanisms used to inspire students to consider this career pathway in pursuing this goal.

Outcome 2.1 Engaged Community of Scientists and Educators

Educators and researchers are influential in guiding students in their education and towards their career choices. In order to build the future workforce at NOAA, it is essential that this community be aware of the agency and be familiar with the academic disciplines needed to support the agency's mission. This knowledge allows educators and researchers to produce students who are interested in STEM-related subjects and other NOAA mission-critical disciplines with a broadened insight on future education and career options.

Awareness of NOAA's mission must also be supplemented by awareness of existing opportunities for education and experience including scholarships, internships, research, and fellowships. These opportunities expose promising students to the 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, K-12 students, undergraduates, and graduate students through NOAA and partner organizations.

<image - Former Senator Ernest F. Hollings in front of NOAA's Hollings Marine Laboratory, Charleston, SC.>

By highlighting NOAA's student opportunities, the agency seeks to increase recruitment to these programs. Attracting students and professionals into this workforce pipeline and retaining them through completion of the programs further broadens participants' knowledge and understanding of NOAA's mission and supports development of a future employee pool for mission-critical disciplines. In facilitating the preparation of STEM professionals and science educators, NOAA will focus on the full spectrum of education and instruction from kindergarten through post secondary levels. The agency 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 demographic backgrounds. For example, NOAA will enhance and expand existing partnerships with Minority Serving Institutions (MSI) primarily through competitive grant funding opportunities. In addition, the agency will seek to collaborate with national technical organizations, the business community, non-governmental organizations and the MSI community to provide information on opportunities available within the agency to their constituents. Tapping on these formerly underutilized entities to participate in major NOAA events, including stakeholder meetings will increase collaboration and expand research and education partnerships with the MSI community.

Outcome 2.1: A diverse and qualified pool of applicants, particularly from underrepresented groups, considers NOAA's student and professional opportunities for career development.

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 and choose careers that support NOAA's mission.
- b) Maintain and enhance resources for students and teachers to access information about NOAA's careers and student sponsored programs.
- c) Expand partnerships with Minority Serving Institutions to increase the pool of underrepresented students that are educated and graduate in disciplines critical to NOAA's mission.
- d) Expand the number of visits by NOAA representatives to campuses, career fairs, and national science and education conferences to increase the public's knowledge of the agency's education resources.

1 **Outcome 2.2 NOAA Employees Support Workforce Development**

2 One of NOAA's strongest recruitment tools is the ability to engage the public through internships,
3 scholarships, fellowships, sabbaticals, and student opportunities. These opportunities provide a
4 mechanism for the public to engage with NOAA to learn about and explore NOAA sciences, education
5 resources, management, and stewardship.

6
7 Ultimately, every NOAA employee is a potential recruiter and can independently increase education
8 opportunities for students to learn about NOAA sciences and the agency's management of, and impact on,
9 the environment. NOAA employees serve on the frontline every day to ensure that students get high
10 quality opportunities as they intern at facilities nationwide. These opportunities will potentially result in a
11 strong future workforce, particularly from underrepresented groups, trained in disciplines critical to
12 NOAA's mission.

13
14 *<image – NOAA Teacher at Sea participant working beside NOAA staff on vessel>*

15
16 To continue to meet the workforce needs of the agency and to attract a more diverse applicant pool,
17 NOAA plans to work with its employees to augment and diversify educational opportunities for students
18 and teachers. The agency will train its workforce to design successful student opportunities and to
19 enhance current teacher fellowships as ways to further connect with this diverse community.

20
21 Increased participation by NOAA's workforce in support of these student and teacher activities will
22 increase the number of available topics and themes in which students and teachers can get involved. A
23 more knowledgeable NOAA workforce will translate into a better learning experience for both students
24 and teachers. As a result, NOAA will be in a position to increase its environmental stewardship and
25 provide better services to the public.

26 27 28 **Outcome 2.2: NOAA's employees support programs and activities for students and teachers to** 29 **learn about and explore NOAA science and stewardship.**

30 *Strategies*

- 31 a) Increase NOAA employees' awareness of student scholarship and internships, and teacher
32 fellowship opportunities within the agency.
 - 33 b) NOAA employees will take an active role in developing career resources and participate in career
34 outreach for K-12 students.
 - 35 c) Ensure student opportunities are responsive to NOAA's future workforce needs.
 - 36 d) Monitor and evaluate NOAA student, teacher, and research faculty experiences to ensure they are
37 of high quality.
- 38
39

1 **Outcome 2.3 Connecting Graduates to Careers**

2 NOAA is committed to a workforce that is reflective of the diversity of America and, as such, the agency
3 has put in place education and outreach programs, such as the Educational Partnership Program (EPP) and
4 the District of Columbia Metropolitan Consortium for Students in Science, Mathematics, and Engineering
5 (METCON) program to create education and hands-on research opportunities targeted at recruiting
6 students and teachers, particularly from underrepresented groups, to participate in programs at NOAA
7 facilities.

8
9 *<image – picture of NERRS Fellowship graduate employed at NOAA >*

10
11 Succession planning activities at NOAA reveal that approximately 40% of its workforce is eligible to
12 retire within the next five years (2008–2014). NOAA needs a multi-faceted approach, including
13 education, outreach, and recruitment to create a pipeline of well-educated students with workforce skills
14 to fill mission-critical occupations. This effort will leverage the environmental literacy efforts of Goal 1
15 and will also partner with public and private sector organizations that support NOAA’s mission.

16
17 The overarching goal of NOAA’s workforce development program is to increase the number of students
18 who take coursework and graduate with degrees in STEM and other fields that directly support NOAA
19 and the nation’s workforce. Building a strong, competitive pool of potential new NOAA employees
20 requires the involvement of NOAA staff with a primary goal to increase individuals trained in these fields
21 from which NOAA may select its future workforce. NOAA will use the current and future student
22 scholarship and internship programs to support students in NOAA mission training programs. The
23 agency will also use the Student Career Experience Program to increase opportunities that can transition
24 participants to NOAA careers and track the graduation and career choices of participants to determine the
25 effectiveness of its programs.

26
27
28 **Outcome 2.3: A diverse pool of students with degrees in science, technology, engineering,
29 mathematics and other fields critical to NOAA’s mission connect to career paths at
30 NOAA and in related organizations.**

31 *Strategies*

- 32 a) Provide scholarship support to students in NOAA mission sciences, management, education and
33 policy to increase the number of students obtaining degrees in those disciplines.
- 34 b) Connect students to professional opportunities that enhance their ability to pursue careers in oceans,
35 coastal, Great Lakes, weather and climate sciences, science education, engineering and maritime
36 technology.
- 37 c) Work with other agencies, academia, national organizations, private sector and non-governmental
38 organizations to increase opportunities for students to transition to careers at NOAA in
39 mission-critical fields, and that increase the nation’s STEM graduates.
- 40 d) Monitor NOAA supported students to track graduation and career choices and assess these impacts
41 on NOAA recruitment and retention efforts.
- 42
43
44

1 **Strategy for Implementation**

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

9 NOAA will develop a five-year Education Implementation Plan as a second step in the planning process
10 that developed this Education Strategic Plan. The implementation plan will set forth the programmatic
11 actions that NOAA and its education community will take to implement the goals and strategies
12 established under this strategic plan. Specific performance measures aligned with each outcome will be
13 developed to provide the metrics needed for evaluating the success of the agency in meeting the strategic
14 vision. Suggested metrics for formal and informal education under consideration by the Academic
15 Competitiveness Council (U.S. Department of Education, 2007) will be integrated where appropriate.
16 Implementation plans will be reviewed on an ongoing basis and revised with the five-year review of the
17 broader NOAA Education Strategic Plan.
18

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

27 **Alignment to NOAA Strategic Plan and 20-Year Research Vision**

28 Education is a tool used throughout NOAA to connect constituents with the science and management
29 philosophies of the agency. Outlined below is a brief statement of how this Education Strategic Plan
30 aligns with the NOAA 2008 Strategic Plan and the NOAA Research Council's 20-year Research Vision.
31

32 **NOAA's Strategic Plan**

33 Vision

34
35
36 ***An informed society that uses a comprehensive understanding of the role of the oceans, coasts, and***
37 ***atmosphere in the global ecosystem to make the best social and economic decisions:*** The NOAA
38 Education Strategic Plan, in its entirety, directly supports NOAA's vision.
39

40 Mission Goals

- 41
42
43 • ***Protect, restore, and manage the use of coastal and ocean resources through an ecosystem***
44 ***approach to management:*** The NOAA Education Strategic Plan directly supports the second
45 outcome of this Goal (A well-informed public that acts as a steward of coastal and marine
46 ecosystems) through its Goal 1: Environmental Literacy and associated outcomes and strategies.
- 47
48 • ***Understand climate variability and change to enhance society's ability to plan and respond:***
The NOAA Education Strategic Plan directly supports the second outcome of this Goal (Use of

1 NOAA's climate products by climate-sensitive sectors and the climate literate public to support
2 their plans and decisions) through its Goal 1: Environmental Literacy and associated outcomes
3 and strategies.

- 4 • ***Serve society's needs for weather and water information:*** The NOAA Education Strategic Plan
5 directly supports the seventh objective of this Goal (Enhance environmental literacy and improve
6 understanding, value, and use of weather and water information and services) through its Goal 1:
7 Environmental Literacy and associated outcomes and strategies.
- 8 • ***Support the nation's commerce with information for safe, efficient, and environmentally sound***
9 ***transportation:*** The NOAA Education Strategic Plan directly supports the fifth objective of this
10 Goal (Build public understanding of the scientific, technological, and environmental factors of
11 commerce and transportation) through its Goal 1: Environmental Literacy and associated
12 outcomes and strategies.

13 NOAA's Cross-Agency Priorities

- 14 • ***A World-Class Workforce:*** The NOAA Education Strategic Plan directly supports this
15 crosscutting priority through its Goal 2: Workforce Development and associated outcomes and
16 strategies.
- 17 • ***An Environmentally Literate Public:*** The NOAA Education Strategic Plan, in its entirety,
18 directly supports this crosscutting priority.

19
20
21 **NOAA Research Council's 20-Year Research Vision**

22 The NOAA Education Strategic Plan also directly supports the Agency's 20-Year Research Vision by:
23

- 24 • Providing an implementable framework that enables the recommendations for educational
25 partners
- 26 • Disseminating the latest NOAA research to the public through audience-appropriate means
27

1 Glossary of Terms

Citizen Science– proposed “Citizen Science is the collection of scientific data by individuals who are not professional scientists, participating as part of their professional scientists.” (modified from source: Forest Service’s Monarch Butterfly in North America, <http://www.fs.fed.us/monarchbutterfly/index.shtml>)

Earth System Science - an integrated approach to the study of the Earth that stresses investigations of the interactions among the Earth's components in order to explain Earth dynamics, evolution, and global change. (source: NASA’s Earth Observatory Glossary, <http://earthobservatory.nasa.gov/Library/glossary.php3?mode=alpha&seg=e>)

Educational Outreach - activities that are designed to build awareness, develop relationships, promote educational products, and inspire educators, students, and the public to pursue further learning opportunities.

Engagement - an open and ongoing dialogue between NOAA and the public which often leads to partnerships to address jointly the problems and opportunities facing society particularly in the areas of ocean, coastal, Great Lakes, weather, and climatic sciences.

Environmental Literacy – a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment, and the ability to understand and utilize scientific evidence to make informed decisions regarding environmental problems.

Environmental Stewardship –an ethic whereby citizens value and participate in the careful and responsible management of air, land, water and biodiversity to ensure healthy ecosystems for present and future generations of all life on Earth. Stewardship of the environment can include conservation, protection, regeneration, and restoration of natural ecosystems and incorporates the use of sustainable practices for human actions which impact these resources.

Experiential Learning – “Experiential education programs engage learners in constructing meaning by immersing them in direct and meaningful hands-on experiences. This experiential approach incorporates learning using real world problems and interaction with natural phenomena” (source: Association for Experiential Education (AEE)).

Formal education - learning within a structured education system in which children or adults are required to demonstrate proficiency.

Free-choice learning - self-directed, voluntary education guided by an individual’s needs and interests.

Indigenous Knowledge - the traditions, culture and belief systems of people whose ancestors inhabited a place or country when persons from another culture or ethnic background arrived on the scene. (source: <http://traditionalknowledge.info/glossary.php>)

Informal education - learning outside the established formal system that meets clearly defined objectives through organized educational activities.

Lifelong Learning - All learning activity, formal and informal, undertaken throughout life, with the aim of enhancing knowledge, skills and competencies from a personal, civic, social and/or employment-related perspective.

Minority Serving Institutions (MSIs) - colleges and universities, including state colleges, private schools, religiously affiliated colleges, liberal arts colleges, and community colleges, that have a special focus on serving the needs of a minority audience. These universities have a historical tradition or mandate to serve a specific demographic of student, but often serve non-minority students as well.

Mission Critical Disciplines - occupations, technical skill sets and academic studies which fully enable the agency to fulfill its mission to understand and predict changes in Earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social, and environmental needs. These include but are not limited to earth sciences, technology, engineering, mathematics, social science, education, marine trades, marine archeology and natural resource management.

Native Science – a Native American scientific approach with the intent of maintaining balance and harmony. A relationship with the interconnected web of life sits at the heart of learning and knowledge has a moral and ethical dimension. Knowledge is conveyed by traditional oral history. (source: <http://silverbuffalo.org/NativeScienceAcademy.html>)

Place-Based Education – immerses the learner in local heritage, culture, landscapes, opportunities, and experiences as a foundation for the study of language arts, mathematics, social studies, science, and other subjects. This method of instruction encourages participants to use the schoolyard, community, public lands, and other special places as resources, turning communities into classrooms. (modified from source: Place-based Education Evaluation Collaborative definition, http://www.peecworks.org/PEEC/Benefits_of_PBE-PEEC_2008_web.pdf)

Service Learning - "a method under which students or participants learn and develop through active participation in thoughtfully organized service that is conducted in and meets the needs of a community; is coordinated with an elementary school, secondary school, institution of higher education, or community service program, and with the community; and helps foster civic responsibility; and that is integrated into and enhances the academic curriculum of the students, or the educational components of the community service program in which the participants are enrolled; and provides structured time for the students or participants to reflect on the service experience." (source: The National and Community Service Act of 1990 (42 U.S. Code 12511)).

Student Opportunities - internships, grants, scholarships, fellowships and educational programs provided to students on a competitive basis for introducing them to careers and/or to support their pursuit of higher education in mission critical disciplines.

Underrepresented Populations - demographic groups which have disproportionately less representation in specific workforce occupations than in the populace.

Workforce Development - "education, employment, and job training systems designed to provide the skilled workers employers need to succeed and the education and training individuals need to succeed in today's labor market" (National Governors Association, 2008).

Workforce Development Pipeline - creation of systematic pathways for facilitating movement of future employees from career exploration through training and education to placement in jobs providing a sustainable candidate pool of diverse, highly skilled workers to support the needs of industry, government and academia.

References

Legislation

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