

# 1 National Oceanic and Atmospheric 2 Administration Education Strategic Plan 3 2015-2035: Advancing NOAA’s Mission 4 through Education

---

## 5 **Table of Contents**

|    |  |    |
|----|--|----|
| 6  | Table of Contents.....                           | 1  |
| 7  | Introduction.....                                | 2  |
| 8  | Letter from the Director .....                   | 2  |
| 9  | NOAA Education Council .....                     | 4  |
| 10 | Advancing NOAA’s Mission through Education ..... | 5  |
| 11 | NOAA’s Mandate to Educate.....                   | 5  |
| 12 | The Foundation for NOAA Education.....           | 7  |
| 13 | NOAA’s Unique Role in Education .....            | 7  |
| 14 | NOAA’s Education Activities .....                | 8  |
| 15 | Guiding Principles .....                         | 9  |
| 16 | NOAA’s Education Goals .....                     | 9  |
| 17 | Plan Overview .....                              | 10 |
| 18 | Goals, Objectives, and Strategies.....           | 12 |
| 19 | Goal 1: Science-Informed Society.....            | 12 |
| 20 | Goal 2: Conservation and Stewardship.....        | 15 |
| 21 | Goal 3: Safety and Preparedness.....             | 18 |
| 22 | Goal 4: Future Workforce.....                    | 21 |
| 23 | Goal 5: Organizational Excellence.....           | 24 |
| 24 | Implementation.....                              | 27 |
| 25 | Evaluation and Monitoring.....                   | 27 |
| 26 | Glossary .....                                   | 29 |
| 27 | References .....                                 | 34 |

## 28 **Introduction**

### 29 **Letter from the Director**

30 Dear Partners and Friends of NOAA Education,

31 We live on a dynamic planet with environments and ecosystems in transition. Communities around  
32 the world are becoming more vulnerable to natural disasters and long-term adverse environmental  
33 changes. There is growing pressure on our natural resources.

34 As we face these challenges, we should strive to become more resilient to them. NOAA provides  
35 timely, reliable, and actionable information – based on sound science – to help the Nation make  
36 smart decisions that impact the future of society, the economy, and the environment. At NOAA, we  
37 call this “environmental intelligence” and producing it is at the core of our mission.

38 Making use of environmental intelligence requires the foresight to build a foundation of  
39 understanding when the sky is clear and the ocean is calm. For this reason, NOAA invests in  
40 education to expand the public’s understanding and stewardship of Earth systems. These education  
41 efforts take place across the country, supporting NOAA’s mission in creative and innovative ways.

42 Congress recognized the importance of NOAA’s education programs with the passage of the  
43 America COMPETES Act. The Act gives NOAA broad education authority and directs NOAA to  
44 develop an Education Strategic Plan with a 20-year horizon to be updated every 5 years.

45 In this update of our Strategic Plan, we take a fresh look at our programs and priorities to better  
46 reflect the broad scope of NOAA Education. We maintain our focus on a science-informed society  
47 and workforce development, while highlighting our unique role in safety, preparedness,  
48 conservation, and stewardship.

49 The Strategic Plan represents an agency-wide effort with significant input from our external  
50 partners. Such partnerships are critical to our success and we work closely with formal and  
51 informal educational institutions, businesses, non-governmental organizations, and concerned  
52 individuals who dedicate their time to supporting our mission. Through extensive focus and  
53 collaboration, we have crafted a Strategic Plan that guides us and allows us to track our progress.

DRAFT for public comment. Not intended for interim use.

54 We thank you for your support for NOAA Education. We look forward to working with you to  
55 improve our Nation’s ability to protect life and property and build sustainable ecosystems and  
56 resilient communities.

57 Louisa Koch

58 Director, NOAA Education

DRAFT

DRAFT for public comment. Not intended for interim use.

59 **NOAA Education Council**

60 The National Oceanic and Atmospheric Administration (NOAA) Education Council members listed  
61 below represent education programs across the agency. Through their signatures, each member  
62 commits to supporting and enabling the goals and objectives of this Strategic Plan.

63 [Signatures of Education Council members, their names, and the programs they represent.]

DRAFT

## 64 **Advancing NOAA's Mission through Education**

### 65 **NOAA's Vision**

66 Healthy ecosystems, communities, and economies that are resilient in the face of change.

### 67 **NOAA's Mission: Science, Service, and Stewardship**

68 To understand and predict changes in climate, weather, oceans, and coasts,

69 To share that knowledge and information with others, and

70 To conserve and manage coastal and marine ecosystems and resources.

### 71 **NOAA's Education Vision**

72 An informed society that uses ocean, coastal, Great Lakes, weather, and climate science to make the  
73 best social, economic, and environmental decisions.

### 74 **NOAA's Education Mission**

75 To educate and inspire the Nation to use science toward improving ocean and coastal stewardship,  
76 increasing safety and resilience to environmental hazards, and preparing a future workforce to  
77 support NOAA's mission.

78 The National Oceanic and Atmospheric Administration (NOAA) is a science-based agency within the  
79 United States Department of Commerce. NOAA is charged with helping the Nation understand and  
80 predict changes in climate, weather, oceans, and coasts.

81 Education plays a significant role in supporting NOAA's mission. In order for society to become  
82 more resilient, individuals must have the ability to understand scientific processes, consider  
83 uncertainty, and reason about the ways that human and natural systems interact. Therefore, it is  
84 not enough for NOAA to research Earth systems; NOAA must also deliver this information into the  
85 hands of individuals who, in turn, understand the science and know how to respond accordingly.

### 86 **NOAA's Mandate to Educate**

87 NOAA's role in science education is defined in statute. The America COMPETES Act (P.L. 110-69)  
88 provides broad authority for educational activities. The Act states: "The Administrator of the  
89 National Oceanic and Atmospheric Administration shall conduct, develop, support, promote, and  
90 coordinate formal and informal educational activities at all levels to enhance public awareness and  
91 understanding of ocean, coastal, Great Lakes, and atmospheric science and stewardship by the

92 general public and other coastal stakeholders, including underrepresented groups in ocean and  
93 atmospheric science and policy careers. In conducting those activities, the Administrator shall build  
94 upon the educational programs and activities of the agency.”

95 The America COMPETES Act directs NOAA to develop a 20-year strategic plan in partnership with  
96 ocean and atmospheric scientists, experts in education, and interested members of the public. The  
97 NOAA Education community first revised its strategic plan in response to the America COMPETES  
98 Act in 2009. In this document, the NOAA Education community shares an updated course of action  
99 that better reflects the broad scope of NOAA’s education programs and priorities.

100 The America COMPETES Act complements standing mandates that authorize education in programs  
101 such as the National Marine Sanctuaries System, the National Sea Grant College Program, and the  
102 National Estuarine Research Reserve System (see insert for the full list). These statutes  
103 acknowledge the importance of education in fulfilling the distinct laws that NOAA executes, while  
104 the America COMPETES Act provides a unifying mandate for educational activities across NOAA.

105 The philosophy and priorities of this Strategic Plan are guided by these statutes:

- 106 • America COMPETES Act – 2007, 2011
- 107 • National Sea Grant College Program Act – 1966, 1976, 2002
- 108 • National Marine Sanctuaries Act– 1972, 1980, 1984, 1988, 1992, 1996, 2000
- 109 • National Estuarine Research Reserve System, Coastal Zone Management Act – reauthorized or  
110 amended eight times since 1972-1996
- 111 • Magnuson-Stevens Fishery Conservation and Management Act – 1976, 2006
- 112 • Ernest F. Hollings Scholarship Program, Consolidated Appropriations Act – 2005
- 113 • Coral Reef Conservation Act – 2000
- 114 • Tsunami Warning and Education Act – 2006
- 115 • Federal Ocean Acidification Research and Monitoring Act – 2009
- 116 • Ocean Exploration and Research, Omnibus Public Land Management Act – 2009

117 This Strategic Plan is also shaped by the following documents that discuss the need for science  
118 education reform and the advancement of lifelong learning opportunities in ocean, coastal, Great  
119 Lakes, weather, and climate sciences:

- 120 • Discovering Earth’s Final Frontier: A U.S. Strategy for Ocean Exploration ([2000](#))
- 121 • The U.S. Commission on Ocean Policy, An Ocean Blueprint for the 21<sup>st</sup> Century ([2004](#))
- 122 • National Academies Report: Rising Above the Gathering Storm ([2005](#))

- 123 • National Academies Report: Rising Above the Gathering Storm, Revisited ([2010](#))
- 124 • NOAA's Next Generation Strategic Plan ([2010](#))
- 125 • National Research Council of the National Academies: NOAA's Education Program, Review  
126 and Critique ([2010](#))
- 127 • National Research Council of the National Academies: A Framework for K-12 Science  
128 Education – Practices, Crosscutting Concepts, and Core Ideas ([2011](#))
- 129 • U.S. Global Climate Research Plan ([2012](#))
- 130 • Committee on STEM Education, National Science and Technology Council: Federal Education  
131 5-Year Strategic Plan ([2013](#))
- 132 • The Ocean Research Advisory Panel: Leveraging Ocean Education Opportunities ([2013](#))
- 133 • The Intergovernmental Panel on Climate Change: 5th Assessment Report ([2013](#))
- 134 • U.S. Global Change Research Program: National Climate Assessment Report ([2014](#))

### 135 **The Foundation for NOAA Education**

136 NOAA's scientific work is the foundation for the agency's educational content. NOAA-related  
137 sciences include the collection of disciplines that NOAA employs in its investigations. Studying  
138 Earth's physical and biological systems requires expertise in science, technology, engineering, and  
139 mathematics (STEM). NOAA's work also relies heavily on input from social science, management,  
140 policy, and other disciplines. These fields are essential to effective communication, managing  
141 shared resources, and making decisions that involve the environment.

142 NOAA's work is inherently interdisciplinary. Earth systems are complex and no single scientific  
143 discipline can capture the causes and effects of changes within them. Observing coral reef health,  
144 for example, involves global climate, hydrology, land use planning, oceanography, fisheries  
145 management, and marine resource economics. Likewise, projecting the future climate is a product  
146 of computer science, statistics, sociology, meteorology, climatology, and other sciences. NOAA  
147 strives to incorporate authentic research practices into education and inspire the next generation of  
148 experts in the entire suite of disciplines that support the agency's mission.

### 149 **NOAA's Unique Role in Education**

150 NOAA's contributions to science education are unique among federal agencies.

- 151 • **NOAA's topics:** NOAA's mission can be summed up as science, service, and stewardship.  
152 NOAA is an international leader in ocean, coastal, Great Lakes, weather, and climate science  
153 and topics within NOAA's purview span from the surface of the sun to the depths of the ocean

154 floor. NOAA's service and stewardship functions connect research to applications that benefit  
155 society. The agency's mission unites our intellectual drive to understand and explore with our  
156 civic duty to serve and protect communities and the environment. NOAA Education can reach  
157 and inspire audiences through many points along the spectrum of science, service, and  
158 stewardship.

- 159 • **NOAA's assets:** NOAA tackles real-world issues in labs, on ships, and using equipment such as  
160 buoys and satellites that gather environmental data. NOAA manages special places such as  
161 National Marine Sanctuaries and National Estuarine Research Reserves that connect the  
162 public with natural and cultural resources. NOAA's resources also include its people – experts  
163 in science, engineering, policy, management, communications, and other disciplines. These  
164 diverse assets provide excellent platforms for engaging the public in education.
- 165 • **The geographic diversity of NOAA's educators, field operations, and facilities:** NOAA  
166 maintains a presence in every U.S. state, as well as Guam, Puerto Rico, and the Pacific Islands.  
167 This broad reach allows the agency to connect with constituents in different regions,  
168 understand their needs from a local perspective, and deliver regionally relevant products and  
169 services. NOAA's geographic spread also creates many opportunities for the public to interact  
170 directly with NOAA experts and resources.

## 171 **NOAA's Education Activities**

172 NOAA conducts a wide variety of education activities. Each program has distinct goals but all strive  
173 to put scientific information in the hands of the public. Below are some examples of the types of  
174 educational work that NOAA undertakes:

- 175 • Supporting formal education by educating students, creating classroom materials, providing  
176 professional development opportunities for educators, and supporting educator networks.
- 177 • Funding scholarships and internships for students, primarily in higher education.
- 178 • Partnering with universities, including Minority Serving Institutions.
- 179 • Infusing NOAA science content, expertise, and data visualization technology into zoos,  
180 aquariums, museums, science centers, and other informal education institutions.
- 181 • Funding education that supports NOAA's mission through competitive grants.
- 182 • Creating opportunities for individuals to become involved in NOAA research through citizen  
183 science, place-based education, hands-on experimentation, and training.
- 184 • Supporting the development of literacy frameworks that outline the fundamental concepts  
185 of Earth system science.

- 186       • Performing outreach designed to build awareness, develop relationships, promote  
187       education products, and inspire the public to pursue more learning opportunities.

188 NOAA cannot engage the entire Nation in education and outreach on its own. Partnerships expand  
189 NOAA's reach by leveraging expertise and sharing resources (Payne and Baek, 2014). NOAA's  
190 partners include museums and aquariums; nongovernmental organizations; educational  
191 businesses; professional societies; education associations; stakeholder groups and resource users;  
192 fishery management councils and commissions; state, local, and tribal governments; state and local  
193 school systems; academia; and individuals. NOAA endeavors to act as a catalyst to advance scientific  
194 literacy by participating in planning initiatives, funding agreements, joint research, sharing  
195 educational content, and working on other collaborative projects of common interest.

## 196 **Guiding Principles**

197 NOAA is committed to developing and supporting education programs and products with high  
198 quality standards. NOAA strives to provide education activities that are:

- 199       • Aligned with the agency's strategic goals and include measurable objectives;  
200       • Aligned with appropriate national and state education standards;  
201       • Based on the best available science;  
202       • Informed by evidence-based practices;  
203       • Designed to incorporate authentic scientific practices;  
204       • Supportive of literacy principles that are relevant to the agency's scientific mission;  
205       • Responsive to the needs of the participants through engagement and open communication;  
206       • Designed to be replicable, consistent in quality, and sustainable; and  
207       • Continually evaluated and improved.

## 208 **NOAA's Education Goals**

209 Based on NOAA's mission, strengths, and the future needs of our society, the agency has established  
210 five education goals:

### 211 **Goal 1: Science-Informed Society**

212 An informed society has access to, interest in, and understanding of NOAA-related sciences and  
213 their implications for current and future events.

### 214 **Goal 2: Conservation & Stewardship**

DRAFT for public comment. Not intended for interim use.

215 Individuals and communities are actively involved in stewardship behaviors and decisions that  
216 conserve, restore, and protect natural and cultural resources related to NOAA's mission.

217 **Goal 3: Safety and Preparedness**

218 Individuals and communities are informed and actively involved in decisions and actions that  
219 improve preparedness, response, and resilience to challenges and impacts of hazardous weather,  
220 changes in climate, and other environmental threats monitored by NOAA.

221 **Goal 4: Future Workforce**

222 A diverse and highly-skilled future workforce pursues careers in disciplines that support NOAA's  
223 mission.

224 **Goal 5: Organizational Excellence**

225 NOAA functions in a unified manner to support, plan, and deliver effective educational programs  
226 and partnerships that advance NOAA's mission.

227 **Plan Overview**

228 The NOAA Education community developed this plan through collaborative discussion, with input  
229 from NOAA educators, staff, leadership, and other interested parties. The community designed the  
230 plan to build on the strengths of NOAA Education, but also carefully considered areas for growth,  
231 including feedback from the National Research Council ([National Research Council, 2010](#)). Above  
232 all, the plan provides guidance for NOAA Education and a framework for tracking and reporting  
233 progress.

234 The goals are interrelated and each has a different scope and focus. Goal 1 aims to help the Nation  
235 understand the science that informs NOAA's work. Goal 1's audience is all members of society, as  
236 NOAA Education strives to help everyone take advantage of NOAA's resources. Goal 2 builds on  
237 Goal 1 to give individuals and communities the knowledge, skills, and tools they need to conserve  
238 and steward ocean and coastal ecosystems. Goal 3 builds on Goal 1 to help individuals and  
239 communities access the information they need to stay safe from natural hazards. The audience in  
240 Goal 2 and Goal 3 is intentionally different from that of Goal 1. Individuals and communities across  
241 the Nation have different needs and opportunities when it comes to conservation and stewardship  
242 or safety and preparedness, and may choose to build on Goal 1 in different ways. Goal 4 also builds  
243 on Goal 1 to support students and emerging professionals who choose to pursue NOAA-related  
244 career pathways and join the NOAA mission workforce. Goal 5 relates to all goals by improving  
245 internal capacity to ensure that NOAA Education operates efficiently and effectively.

246 In the pages that follow, the NOAA Education community outlines its approach for achieving these  
247 goals. Each goal is accompanied by objectives, strategies, and evidence of progress statements.

- 248 • **Goals** are the desired, long-term outcome for society.
- 249 • **Objectives** reflect the desired state NOAA’s target audiences within each of the goals.
- 250 • **Strategies** indicate what NOAA will do to achieve the objectives. Given the complexity of  
251 this Strategic Plan, the NOAA Education community chose to develop strategies that  
252 highlight high-priority, representative activities under each goal. As a result, one or more  
253 strategies may be employed to achieve the objectives.
- 254 • **Evidence of progress** statements describe the measurable results the community is  
255 working to achieve over the next five years. The evidence of progress statements mirror the  
256 objectives; for instance, Evidence of Progress 1.1a indicates what progress will look like for  
257 Objective 1.1.

DRAFT

## 258 **Goals, Objectives, and Strategies**

### 259 **Goal 1: Science-Informed Society**

260 *An informed society has access to, interest in, and understanding of NOAA-related sciences and their*  
261 *implications for current and future events.*

262 Resilient communities are founded upon a scientifically informed and engaged public. Leaders in  
263 Earth system science education echo the need for an informed society, stating that public  
264 understanding of Earth’s interconnected systems is crucial to our ability to apply knowledge and  
265 problem-solving skills to real-world issues ([Hoffman and Barstow, 2007](#)).

266 The ocean, coastal, Great Lakes, weather, and climate systems that NOAA studies affect people of all  
267 backgrounds, regardless of age, socioeconomic status, or education level. As such, NOAA works with  
268 partners in education to reach a diverse range of audiences. NOAA contributes scientific expertise,  
269 laboratories, field sites, monitoring systems, environmental satellites, weather radar, world class  
270 data centers, and more to these partnerships. NOAA’s assets can be incorporated into education  
271 programs that engage youth and adults from all backgrounds in locally and globally relevant,  
272 inquiry-based learning opportunities that are applicable to their daily lives.

273 NOAA is committed to building capacity for developing science-informed citizens through our  
274 Nation’s K-12 formal education system. NOAA collaborates with local, state, and national education  
275 decision makers and curriculum developers to establish education materials and professional  
276 development programs that support education in NOAA-related topic areas. The formal education  
277 system also provides an excellent opportunity to engage young people in NOAA-related science,  
278 service, and stewardship and inspire the next generation of environmental leaders.

279 Informal education is uniquely positioned to connect the public with current research and plays a  
280 critical role in delivering unbiased, robust, and timely information to aid decision making ([Field and](#)  
281 [Powell, 2001](#)). Indeed, most Americans learn the majority of their scientific information outside of  
282 the classroom in free-choice learning environments ([Falk and Dierking, 2010](#)). NOAA collaborates  
283 with informal education institutions and organizations to showcase and interpret NOAA-related  
284 science, data, and discoveries. NOAA also provides and supports citizen science opportunities that  
285 involve individuals in collecting data for research and resource management.

286 NOAA supports a variety of activities that allow NOAA staff to share their expertise, communicate  
287 one-on-one with the public, and stimulate further interest in NOAA-related issues. NOAA supports  
288 environmental literacy by contributing to resources such as the ocean and climate literacy  
289 frameworks. NOAA experts serve as judges at science and career fairs, meet with groups of students  
290 and professionals, visit classrooms, and more. The agency participates in outreach at industry  
291 events, professional education network meetings, and other venues. All of these activities facilitate  
292 open communication with the public to create opportunities for education, engagement, and  
293 societal input.

294 NOAA Education Goal 1 aims to increase the public's ability to access, understand, and use the  
295 science and services that NOAA provides. The agency's actions – such as issuing severe weather  
296 warnings, providing reliable climate science and data, maintaining safe and productive fisheries,  
297 protecting endangered marine species, and collecting environmental data – protect people's lives  
298 and livelihoods. Likewise, the resources NOAA manages are impacted by the choices that  
299 individuals and communities make. Goal 1 lays the groundwork to support society in making sound  
300 environmental decisions and being effective stewards of the natural resources that NOAA manages.

301

## 302 **Objectives**

303 1.1. Youth and adults from all backgrounds improve their understanding of NOAA-related  
304 sciences by participating in education and outreach opportunities.

305 1.2. Formal and informal educators integrate NOAA-related sciences into their curricula,  
306 practices, and programs.

307 1.3. Formal and informal education organizations integrate NOAA-related science content  
308 in, and collaborate with NOAA scientists on the development of, exhibits, media,  
309 materials, and programs that support NOAA's mission.

## 310 **Strategies**

311 1.A. Collaborate with local, state, and national K-12 education decision-makers and  
312 curricula developers to establish regionally relevant education materials and  
313 professional development programs that support the implementation of education  
314 standards.

315 1.B. Partner with informal education institutions and organizations to showcase and  
316 interpret NOAA-related science, data, and discoveries.

317 1.C. Develop and support local, regional, and national educator networks to promote and  
318 facilitate the teaching of NOAA-related content.

319 1.D. Promote and coordinate citizen science opportunities.

320 1.E. Develop and support collaborative learning opportunities for educators, students, and  
321 the public to interact directly with experts via face-to-face and distance learning  
322 venues.

323 1.F. Develop and support the creation and distribution of tools, exhibits, and learning  
324 materials.

#### 325 **Evidence of Progress**

326 As evidence of advancing this goal and supporting objectives in the next five years, NOAA will have:

327 1.1a. Developed more education and outreach opportunities for youth and adults from all  
328 backgrounds.

329 1.2a. Increased integration of NOAA resources and topics by educators into their curricula,  
330 practices, and programs.

331 1.3a. Expanded partnerships that lead to deeper integration of NOAA resources into  
332 development of exhibits, media, materials, and programs.

333 **Goal 2: Conservation and Stewardship**

334 *Individuals and communities are actively involved in stewardship behaviors and decisions that*  
335 *conserve, restore, and protect natural and cultural resources related to NOAA's mission.*

336 NOAA is responsible for fulfilling conservation laws that protect ecosystems, conserve marine  
337 species, and promote sustainable use of living marine resources. Human actions have had a  
338 profound impact on natural systems and these laws have been enacted so our Nation can conserve  
339 resources for generations to come. At NOAA, stewardship education aims to improve societal  
340 understanding of the agency's role in management and the science behind it. NOAA also conducts  
341 stewardship education to provide participants with opportunities to connect with local ecosystems  
342 and tools to understand how individual behavior impacts the environment. These activities give  
343 people an active voice in managing and protecting resources that affect them on both a local and  
344 global scale.

345 NOAA embraces educational methods that promote environmental problem-solving and  
346 stewardship behaviors to build appreciation of the connections between people and the  
347 environment. NOAA promotes hands-on scientific inquiry, which results in increased knowledge of  
348 important environmental concepts and stronger environmental stewardship behavior ([Penuel et](#)  
349 [al., 2005](#)). Providing environmental education opportunities for children has been shown to have a  
350 positive influence on adult conservation behavior ([Damerell et al., 2013](#)). Expanding awareness,  
351 building confidence, and providing support for these experiential teaching methods are part of  
352 NOAA's strategy in addressing the need for a science-informed society that bases conservation and  
353 stewardship decisions on sound science.

354 NOAA's stewardship and conservation programs are often based in the coastal areas that NOAA  
355 manages. Place-based education immerses the learner in local heritage, culture, landscapes, and  
356 experiences. These opportunities form a foundation for studying STEM, language arts, social  
357 studies, history, and other subjects. This interdisciplinary approach encourages participants to use  
358 the schoolyard, community, public lands, and other special places as resources, turning  
359 communities into classrooms. The National Marine Sanctuary System, National Estuarine Research  
360 Reserve System, and living coastlines that NOAA manages provide real-world contexts for hands-on  
361 educational opportunities. NOAA's grants and educational partnerships extend the agency's ability  
362 to positively impact communities.

363 Education programs and products can provide unique cultural contexts. Stewardship education is  
364 an important component of co-managing natural resources with Native groups. Native science, or  
365 ways of knowing, and NOAA-related science can come together to develop a mutually inclusive  
366 learning experience ([Maryboy et al., 2012](#)) where science builds on Native ways of knowing, and  
367 indigenous knowledge provides a way to better understand the complexity and interrelationships  
368 of the systems that NOAA studies.

369 Making decisions on topics such as sustainable fisheries management, endangered species  
370 conservation, and other NOAA-related topics has been a source of controversy between resource  
371 managers, the public, and industry. Stewardship education is intended to help navigate conflicts by  
372 engaging the public early and often in decisions and actions that affect the resources they use and  
373 care about. Understanding the principles of sustainable management can also help the public  
374 support local industries and take appropriate action when concerned about environmental issues.  
375 Conservation and stewardship education promotes greater civic engagement and informed choices,  
376 creating an educated public with an improved capacity to make scientifically-informed  
377 environmental decisions.

## 378 **Objectives**

- 379 2.1. Youth and adults from all backgrounds are knowledgeable about conservation and  
380 stewardship practices and skilled in applying them to address local, regional, national, and  
381 global issues related to NOAA's mission.
- 382 2.2. Formal and informal educators integrate NOAA-related conservation and stewardship  
383 concepts and activities in their curricula, practices, and programs.
- 384 2.3. Formal and informal education organizations establish guidance and provide support  
385 towards increasing participation of education audiences in conservation and stewardship  
386 activities related to NOAA's mission.

## 387 **Strategies**

- 388 2.A. Participate in and coordinate with local, state, and national environmental education  
389 initiatives that support NOAA's mission.
- 390 2.B. Develop and support opportunities for youth and adults to understand conservation  
391 policies and engage in stewardship actions.

392 2.C. Partner on education initiatives with organizations that share NOAA's conservation and  
393 stewardship goals.

394 2.D. Deliver and support hands-on science education programs that explore the influences of  
395 human activity on ocean and coastal ecosystems.

396 **Evidence of Progress**

397 As evidence of advancing this goal and supporting objectives in the next five years, NOAA will have:

398 2.1a. Increased participation of youth and adults from all backgrounds in education  
399 programs that promote conservation and stewardship.

400 2.2a. Increased integration of NOAA-related conservation and stewardship information by  
401 educators into their curricula, practices, and programs.

402 2.3a. Expanded partnerships that lead to increased participation of youth and adults in  
403 conservation and stewardship activities.

404 **Goal 3: Safety and Preparedness**

405 *Individuals and communities are informed and actively involved in decisions and actions that improve*  
406 *preparedness, response, and resilience to challenges and impacts of hazardous weather, changes in*  
407 *climate, and other environmental threats monitored by NOAA.*

408 NOAA is responsible for the science behind understanding, forecasting, and responding to threats  
409 that involve weather, climate, and the marine and coastal environment. NOAA issues forecasts,  
410 watches, and warnings based on observations of the natural world from weather radar, ground  
411 observations, ships, satellites, and sophisticated models of environmental systems. Since  
412 individuals and communities take action based on this guidance, it is important that NOAA's  
413 constituents understand when and how to respond to hazards. Education is a key component of a  
414 safe and prepared nation, and directly supports NOAA's Weather-Ready Nation initiative.

415 Safety and preparedness education involves fostering an understanding of environmental threats to  
416 ensure that individuals and communities are safe from immediate danger and prepared to handle  
417 future events and conditions. These decisions not only protect lives and property, but also maintain  
418 safe access to recreational opportunities and support vibrant economies on land and sea. NOAA  
419 continues to expand its scientific capacity and skill at providing safety and preparedness  
420 information, but recognizes that an accurate forecast is only valuable when people know how to  
421 access it and are prepared to take action if necessary. Education can help communities make the  
422 best choices to plan for long-term resiliency.

423 Environmental threats are complex, urgent, and have the potential to impact peoples' daily lives.  
424 NOAA strives to make science content accessible and engaging to all members of society. In order to  
425 reach audiences from all backgrounds, safety and preparedness education takes place in formal and  
426 informal educational settings, as well as outreach events.

427 Safety and preparedness education is an example of integrated STEM education, which emphasizes  
428 connections between subjects and relevance to daily life ([National Academy of Engineering  
429 Research Council, 2011](#)). When anticipating, preparing for, and responding to a single event such  
430 as an oil spill, tsunami, or hurricane, the NOAA draws from a wide array of expertise, including  
431 meteorology, fisheries, nautical charting, oceanography, and social science. These topics are also  
432 highly relevant to individuals and communities. Infusing NOAA's science content into the classroom  
433 exposes children to integrated STEM topics that not only matter in their daily lives, but might even  
434 help save them. Students often relay this information to their families and communities, which is

435 particularly useful for accessing underserved communities in which English is not the primary  
436 language.

437 People use NOAA's educational resources on environmental threats because they trust the  
438 information NOAA provides. NOAA's managers and scientists must be creative and flexible in  
439 understanding where people get information they trust, and ensuring that NOAA's information is  
440 accessible through these sources. Informal education helps ensure that messages reach a broader  
441 audience and that science education includes practical knowledge of potential environmental  
442 threats, what causes them, and how to respond during an event. To this end, NOAA also partners  
443 with emergency management organizations and the private sector to reach diverse audiences and  
444 achieve an integrated approach in responding to and preparing for environmental hazards.

#### 445 **Objectives**

- 446 3.1. Youth and adults from all from all backgrounds are aware of, prepare for, and  
447 appropriately respond to environmental hazards that impact health, safety, and the  
448 economy in their communities.
- 449 3.2. Formal and informal educators use and produce education materials and programs that  
450 integrate and promote consistent science-based messaging on hazards, impacts, and  
451 societal challenges related to water, weather, and climate.
- 452 3.3. Formal and informal education institutions integrate water, weather, and climate hazard  
453 awareness, preparedness, and response information into curricula, exhibits, and programs  
454 that create learning opportunities for youth and adults.

#### 455 **Strategies**

- 456 3.A. Collaborate and coordinate with partners on national risk awareness and response  
457 education campaigns to integrate science content and expertise.
- 458 3.B. Build and partner on education products and programs focused on improving economic  
459 and health conditions in response to weather, water, climate, and other environmental  
460 threats.
- 461 3.C. Engage youth and adults directly and through partners in multi-generational learning  
462 activities to improve community awareness and involvement in preparedness and  
463 response efforts.

464 **Evidence of Progress**

465 As evidence of advancing this goal and supporting objectives in the next five years, NOAA will have:

466 3.1a. Increased awareness by youth and adults from all backgrounds of environmental hazards,  
467 their impacts, and preparedness actions.

468 3.2a. Increased integration of safety and preparedness information by educators in their formal  
469 and informal education and professional development programs.

470 3.3a. Expanded partnerships that lead to increased integration of safety and preparedness  
471 information into curricula, exhibits, and programs.

DRAFT

472 **Goal 4: Future Workforce**

473 *A diverse and highly-skilled future workforce pursues careers in disciplines that support NOAA's*  
474 *mission.*

475 NOAA relies on a world-class workforce with the scientific and technical skills needed to address  
476 the environmental challenges confronting our Nation and the planet. Rising Above the Gathering  
477 Storm, Revisited ([National Academy of Sciences, 2010](#)), states that building a workforce literate in  
478 STEM is crucial to maintaining America's competitiveness in a rapidly changing global economy. As  
479 the global population increases, there is greater demand on the Earth's natural systems; this creates  
480 a greater need for education and research to understand the complexities of human impacts and  
481 develop strategies for sustainable solutions.

482 Workforce considerations begin by inspiring students to consider careers in disciplines that  
483 support NOAA's mission early in their education. A study found that 78% of STEM college students  
484 had decided to major in STEM fields by the time they were in high school; 21% had discovered their  
485 interest in STEM in middle school or earlier ([Harris Interactive, 2011](#)). Youth who expected to have  
486 a career in science (i.e. who identified an interest in science in middle school or earlier) were more  
487 likely to graduate from college with a science degree, emphasizing the importance of early  
488 engagement ([Tai et al., 2006](#)). For this reason, NOAA provides opportunities for career exploration  
489 at all grade levels.

490 It is important to maintain continuity in workforce development so that youth who are excited  
491 about disciplines that support NOAA's mission have opportunities to build research skills and other  
492 real-world applications. NOAA provides unique access to ships, laboratories, data, and other  
493 resources that can be incorporated into students' experiences, augmenting their education and  
494 providing hands-on work experience. NOAA partners with academic communities by providing  
495 grants, internships, fellowships, and other experiential activities to students, educators,  
496 researchers, policy makers, managers, and institutions in support of continued education and  
497 professional development. NOAA has several programs with mandates to support students in  
498 advancing in higher education programs and completing internships in disciplines that support  
499 NOAA's mission.

500 Workforce shortages are anticipated in disciplines that support NOAA's mission, including  
501 quantitative ecology and economics ([U.S. Dept. of Commerce and U.S. Dept. of Education, 2008](#)).  
502 Workforce considerations extend beyond NOAA's immediate needs to the entire network of

503 researchers, analysts, educators, and others who collaborate with NOAA. NOAA partners  
504 extensively with academic educators and researchers, informal education institutions, and  
505 nonprofit organizations to achieve the agency's mission.

506 In order to maintain a pipeline of innovative talent, NOAA strives to cultivate a workforce that  
507 reflects the diversity of the Nation. According to the U.S. Census Bureau, minorities constituted 36  
508 percent of the U.S. population in 2011, and this proportion is growing rapidly. In 2013,  
509 underrepresented minorities (based on gender, race, and ethnicity) constituted 17 percent of  
510 NOAA's federal workforce and 9.5 percent of those in leadership positions (at or above GS-13).  
511 NOAA Cooperative Science Centers, Minority Serving Institutions, and national technical,  
512 professional, and industrial organizations that serve underrepresented groups are all essential to  
513 achieving this goal and inspiring students to consider a career path related to NOAA. Diversity  
514 brings a wider variety of perspectives and approaches to leadership, policy, strategic planning,  
515 problem solving, and decision making ([Forbes, 2011](#)). NOAA is committed to strengthening the pool  
516 of candidates from underrepresented groups who are trained and graduated in NOAA mission  
517 fields.

## 518 **Objectives**

- 519 4.1. Students, particularly from underrepresented groups, consider education and career  
520 pathways in disciplines that support NOAA's mission.
- 521 4.2. NOAA and partner institutions leverage federally funded assets to provide students,  
522 particularly those from underrepresented groups, with experiential learning, research,  
523 and scholarship opportunities.
- 524 4.3. Postsecondary students, particularly from underrepresented groups, pursue and complete  
525 degrees in disciplines critical to NOAA's mission.
- 526 4.4. Graduates completing NOAA-supported student opportunities continue education and  
527 enter careers in disciplines that support NOAA's mission.

## 528 **Strategies**

- 529 4.A. Provide and support formal and informal career exploration programs and education  
530 resources that target youth and young adults, particularly those from underrepresented  
531 communities.

532 4.B. Provide scholarships, fellowships, internships, and student training opportunities that  
533 promote experiential learning.

534 4.C. Establish and maintain partnerships with Minority Serving Institutions, professional  
535 associations, and other organizations to improve graduation rates of underrepresented  
536 students.

537 4.D. Collaborate with academic partners to align student preparation with NOAA's scientific  
538 and workforce needs.

539 4.E. Strengthen the links between education initiatives and career pathways at NOAA and  
540 related organizations with emphasis on high-need career fields and underrepresented  
541 groups.

#### 542 **Evidence of Progress**

543 As evidence of advancing this goal and supporting objectives in the next five years, NOAA will have:

544 4.1a. Increased integration of college and career information into education programs.

545 4.2a. Increased the number of students, particularly from underrepresented groups, who  
546 participate in experiential learning, research, and scholarship opportunities.

547 4.3a. Increased the proportion of trained students from underrepresented groups pursuing  
548 careers in disciplines critical to NOAA's mission.

549 4.4a. Improved understanding of the trajectories of NOAA-supported students along their  
550 education and career pathway.

551 **Goal 5: Organizational Excellence**

552 *NOAA functions in a unified manner to support, plan, and deliver effective educational programs and*  
553 *partnerships that advance NOAA's mission.*

554 NOAA strives to use taxpayer dollars efficiently and effectively. Given the magnitude of the  
555 challenges facing the Nation and the increasing role that NOAA science plays in maintaining  
556 resilient communities and economies, NOAA's education efforts must be coordinated, monitored,  
557 and continually improved.

558 NOAA's people are the driving force behind organizational excellence. NOAA Education is made  
559 possible by the work of passionate educators, scientists, and other individuals – all of whom work  
560 in their respective roles to keep NOAA Education moving forward. The America COMPETES Act  
561 provides a mandate all of NOAA to participate in education. NOAA leadership has embraced this  
562 call, establishing a policy to that encourages employee participation in NOAA programs, projects,  
563 events, and activities that seek employee volunteers to engage, educate, or inspire audiences ([NOAA](#)  
564 [Administrative Order, 2013](#)).

565 The NOAA Education Council is the coordination body that promotes organizational excellence  
566 among NOAA's education programs. The scope of the Education Council has become more  
567 representative and inclusive of NOAA's education activities, evolving from an early focus on  
568 education policy to its current focus on connecting with, learning from, and supporting the NOAA  
569 Education community. The Education Council helps facilitate cross-agency work, increases capacity  
570 for NOAA educators, and provides a forum for discussion and improvement with the aim of helping  
571 NOAA's education programs to achieve more collectively than they could alone. The Education  
572 Council also supports efforts to highlight the value of NOAA Education to audiences both internal  
573 and external to NOAA.

574 NOAA Education programs are more relevant and effective when they are responsive to constituent  
575 needs. For example, knowing topics to include in professional development programs for external  
576 educators or ensuring that NOAA products are compatible with current environmental education  
577 initiatives and national science standards allows NOAA to better serve its audiences. NOAA must  
578 understand and respond to the needs of its educational partners and constituents when developing  
579 educational products and services. Collaboration and partnerships within and outside of NOAA are  
580 essential to maximizing the agency's effectiveness and broadening its reach in education projects.

581 In a time of increased scrutiny of federal investments, NOAA must be able to report progress  
582 toward goals and objectives and demonstrate the value of its activities. Therefore, evaluating this  
583 Strategic Plan is one of the NOAA Education community's top priorities. The evidence of progress  
584 statements, for instance, will allow NOAA Education programs across the agency and the Nation to  
585 report shared accomplishments toward the objectives.

586 Underserved communities are often most vulnerable to the environmental hazards within NOAA's  
587 purview, indicating a growing need to develop materials that are culturally relevant. To meet these  
588 needs, the NOAA Education community aims to produce a coordinated portfolio of educational  
589 products, programs, and services targeting underserved audiences. This aspect of Goal 5  
590 complements Goal 4, which focuses specifically on workforce development, by increasing  
591 communication and coordination within and beyond NOAA to maximize the reach and impact of  
592 NOAA's education programs.

### 593 **Objectives**

594 5.1 Leaders internal and external to NOAA recognize and support education investments as a  
595 way to achieve agency mandates, mission, and goals.

596 5.2 NOAA's Education community develops and implements agency education priorities  
597 informed by constituent needs and national initiatives.

598 5.3 NOAA educators and partners collaborate at local, regional, and national levels to  
599 coordinate efforts and better serve educational audiences.

600 5.4 NOAA and partner organizations use effective evaluation, performance monitoring, and  
601 evidence-based approaches in the design and management of educational programs,  
602 products, and services.

603 5.5 NOAA develops and supports a coordinated portfolio of products, programs, and  
604 partnerships that improves education opportunities in NOAA-related content areas for  
605 underserved audiences.

### 606 **Strategies**

607 5.A. Collect and present to key decision-makers the best available evidence to demonstrate the  
608 connection between NOAA's education investments and the agency's mission.

609 5.B. Collaborate with federal and non-federal partners to leverage expertise and funding.

- 610 5.C. Establish and support NOAA educator networks with emphasis on cross-agency  
611 communication, coordination, and professional development
- 612 5.D. Develop consistent and coordinated educational approaches across NOAA for high-  
613 priority educational topics.
- 614 5.E. Create and adopt common performance measures and evaluation practices in NOAA-  
615 funded education programs.

616 **Evidence of Progress**

617 As evidence of advancing this goal and supporting objectives in the next five years, NOAA will have:

- 618 5.1a. Increased recognition by leaders of the importance of education in achieving NOAA's  
619 mission.
- 620 5.2a. Implemented systematic approaches for collecting data about constituent needs to inform  
621 NOAA's education priorities.
- 622 5.3a. Expanded opportunities for communication and learning within the NOAA Education  
623 community.
- 624 5.4a. Improved the practice of evaluation by educators to inform the improvement and  
625 management of NOAA Education programs.
- 626 5.5a. Developed a coordinated portfolio of products, programs and partnerships that target  
627 underserved audiences.

## 628 **Implementation**

629 The America COMPETES Act not only requires NOAA to develop education goals, but also calls for  
630 the development of actions to carry out this Strategic Plan.

631 The NOAA Education community actively participated in developing this Strategic Plan. As a result,  
632 it is aligned with the agency's various education mandates and priorities and NOAA Education  
633 programs have an improved line of sight between their work and this Strategic Plan. The goals,  
634 objectives, and strategies provide a framework to focus and coordinate NOAA Education. This  
635 guidance builds on the existing capabilities of NOAA Education programs and partnerships to  
636 accomplish this work. The NOAA Education community will develop shorter-term implementation  
637 plans that consider immediate needs, opportunities, and resources.

## 638 **Evaluation and Monitoring**

639 This Strategic Plan provides the foundation for the NOAA Education performance measurement  
640 system. NOAA is committed to strengthening the monitoring and evaluation capabilities of its  
641 education programs and using data to drive improvements in program delivery. The NOAA  
642 Education Council oversees NOAA-wide efforts to improve the measurement and evaluation of  
643 education programs.

644 The evaluation plan for this Strategic Plan will monitor NOAA's progress toward the long-term  
645 goals, objectives and evidence of progress statements. The plan includes a review process that  
646 leverages existing data collection and reporting processes and draws on the best available evidence  
647 on an annual basis. To assess progress, the NOAA Education community will review data from its  
648 own programs, projects, and products as well as contributions from partners. Each annual review  
649 of the Strategic Plan will include the results, findings, and conclusions of individual evaluations  
650 from within the portfolio. These results will be used to inform adjustments in implementation. This  
651 evaluation strategy meets accountability requirements and takes a comprehensive view across the  
652 entire NOAA Education portfolio to assess progress across the NOAA Education community.

653 The NOAA Education community will collect and use the following evidence to inform  
654 implementation and effectiveness:

- 655 • **Common measures:** A shared and consistent set of definitions developed with input from  
656 the NOAA Education Council that enables NOAA Education programs to report consistent

657 outputs and outcomes. Members of the Education Council implement, collect, and report  
658 findings. The NOAA Education community will continue to develop new measures to  
659 address gaps in evidence of outcomes and impacts.

- 660 • **Program evaluations:** Individual programs, units, and offices are responsible for  
661 evaluating and improving their own programs. Evidence from these studies will be  
662 included in the annual review as results become available.
- 663 • **Annual accomplishments:** Qualitative evidence told in a narrative format that includes the  
664 points of relevance, response, and results. Accomplishments tell the impact of a program in  
665 context, providing a richer picture than can be shown with quantitative data alone, and are  
666 presented in a NOAA Education Annual Accomplishment Report.
- 667 • **Working group milestones:** Working groups are the main avenue for organizing  
668 collaborative efforts at the Education Council. Evidence of progress cannot rely only on  
669 outcomes, but also needs to monitor the activities undertaken to reach those outcomes.  
670 Milestones are major tasks that have been completed, or performance thresholds that have  
671 been exceeded.
- 672 • **Web analytics:** Websites are an important part of reaching the Nation and disseminating  
673 information and products and data about how visitors use the website are useful. Web  
674 analytics are powerful tools for tracking the success of efforts that use the Web as part of  
675 their program.
- 676 • **National statistics:** Data from government agencies, research studies, and nonprofit  
677 organizations can be used to provide a picture of relevant characteristics of target  
678 populations. The statistics also provide context to the scope of issues being addressed by  
679 programs as they work to achieve outcomes within these target populations.

## 680 **Glossary**

681 **Adults.** Individuals, 18 years and older, who engage in lifelong learning activities with the aim of  
682 enhancing their own knowledge, skills, and competencies from a personal, civic, social, or  
683 employment-related perspective.

684 **Citizen Science.** An approach in which volunteers partner with scientists to answer real-world  
685 questions. (Source: Citizen Science Central, <http://citizenscience.org>)

686 **Disciplines that support NOAA's mission.** The entire suite of professional disciplines that support  
687 NOAA. This includes all NOAA-related sciences, as well as engineering, vessel and airplane  
688 operation, nautical charting, policy, graphic design, illustration, communications, law, management,  
689 uniformed services, and marine observer programs.

690 **Earth system science.** An integrated approach to the study of the Earth that stresses investigations  
691 of the interactions among the Earth's components in order to explain Earth dynamics, evolution,  
692 and global change. (Source: NASA's Earth Observatory Glossary,  
693 <http://earthobservatory.nasa.gov/Library/glossary.php3?mode=alpha&seg=e>)

694 **Education.** The process by which individuals develop their knowledge, values, and skills. Education  
695 encompasses both teaching and learning. (Source: adapted from The Definitions Project,  
696 <http://www.definitionsproject.com/>)

697 **Engagement.** A two-way relationship between a service provider and society. It implies a  
698 commitment of service to society through a partnership based on reciprocity and sharing of goals,  
699 objectives, and resources, e.g., between NOAA and the society it serves. Implicit to engagement is a  
700 respect for each partner that involves listening, dialogue, understanding, and mutual support.

701 **Environmental literacy.** An environmentally literate person is someone who, both individually  
702 and together with others, makes informed decisions concerning the environment; is willing to act  
703 on these decisions to improve the well-being of other individuals, societies, and the global  
704 environment; and participates in civic life. Those who are environmentally literate possess, to  
705 varying degrees:

- 706 • the knowledge and understanding of a wide range of environmental concepts, problems,  
707 and issues;
- 708 • a set of cognitive and affective dispositions;

- 709       • a set of cognitive skills and abilities; and  
710       • the appropriate behavioral strategies to apply such knowledge and understanding in order  
711       to make sound and effective decisions in a range of environmental contexts.

712       (Source: [Hollweg et al. 2011](#))

713       **Environmental stewardship.** The responsible use and protection of the natural environment  
714       through conservation and sustainable practices to enhance ecosystem resilience and human well-  
715       being (Source: [Chapin et al. 2011](#))

716       **Experiential learning.** Experiential education programs engage learners in constructing meaning  
717       by immersing them in direct and meaningful hands-on experiences. This approach incorporates  
718       learning using real-world problems and interaction with natural phenomena. (Source: Association  
719       for Experiential Education, <http://www.aee.org/>)

720       **Formal education.** Learning within a structured education system in which children or adults are  
721       required to demonstrate proficiency.

722       **Free-choice learning.** Self-directed, voluntary education guided by an individual's needs and  
723       interests.

724       **Indigenous knowledge.** The traditions, culture, and belief systems of people whose ancestors  
725       inhabited a place or country when persons from another culture or ethnic background arrived on  
726       the scene.

727       **Informal education.** Learning outside the established formal system that meets clearly defined  
728       objectives through organized education activities.

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

732       **Literacy principles.** Essential knowledge validated by a community of researchers, educators, and  
733       policy-makers that is needed to fully understand a specific content area and apply it in daily  
734       decision making. The determination and refinement of literacy principles is a dynamic, on-going  
735       process.

736 **Minority Serving Institutions.** Colleges and universities, including state colleges, private schools,  
737 religiously affiliated colleges, liberal arts colleges, and community colleges, that have a special focus  
738 on serving the needs of a minority audience. These universities have a historical tradition or  
739 mandate to serve a specific demographic of student, but often serve non-minority students as well.  
740 The term “minority institution” means an institution of higher education whose enrollment of a  
741 single minority or a combination of minorities exceeds 50 percent of the total enrollment. (Source:  
742 [U.S. Department of Education, 20 U.S.C. § 1067k\(3\)](#))

743 **Native science.** The knowledge held by indigenous people around the world that has been  
744 gathered, adapted, refined, and transmitted following precise protocols, traditions, and values  
745 maintained since before written history. The core of Native science is interdependencies and  
746 relationships that make up the whole. (Adapted from The Native Science Academy definition,  
747 <http://www.silverbuffalo.org/NSA-NativeScience.html>)

748 **NOAA Education.** Education efforts undertaken by NOAA-supported programs.

749 **NOAA Education community.** Individuals who engage in education activities on behalf of NOAA.

750 **NOAA-related science.** The collection of scientific disciplines that NOAA employs in its  
751 investigations, monitoring, evaluating, and forecasting of conditions and trends in the ocean, coasts,  
752 Great Lakes, weather, and climate and in building understanding of these natural systems and their  
753 relationship with human activities.

754 **Outreach.** Opportunities designed to build awareness, develop relationships, and inspire action  
755 (e.g., pursuit of further learning opportunities, behavioral change). Involves information exchange  
756 between provider and target audience. Frequently designed to reach diverse audiences, but can be  
757 personal and interactive, designed to identify and appeal to an individual’s personal interest or  
758 motivation for information. Outreach for education activities are designed to build awareness,  
759 develop relationships, promote education products, and inspire educators, students, and the public  
760 to pursue further learning opportunities.

761 **Place-based education.** This method of instruction encourages participants to use the schoolyard,  
762 community, public lands, and other special places as resources, turning communities into  
763 classrooms. (Modified from source: Place-based Education Evaluation Collaborative definition,  
764 <http://www.peecworks.org/PEEC/Benefits of PBE-PEEC 2008 web.pdf>)

765 **Resilience.** The ability to adapt to changing conditions and withstand and rapidly recover from  
766 disruption due to emergencies. (Source: Presidential Policy Directive 8: National Preparedness,  
767 <http://www.dhs.gov/presidential-policy-directive-8-national-preparedness>)

768 **Social science.** Academic disciplines concerned with the study of the social life of human groups,  
769 and individuals, including anthropology, economics, communications, geography, philosophy,  
770 psychology, history, education, outreach, political science, and sociology.

771 **Service learning.** A method under which participants learn and develop through active  
772 participation in thoughtfully organized service that is conducted in and meets the needs of a  
773 community; is coordinated with an elementary school, secondary school, institution of higher  
774 education, or community service program, and with the community; and helps foster civic  
775 responsibility; and that is integrated into and enhances the academic curriculum of the students, or  
776 the educational components of the community service program in which the participants are  
777 enrolled; and provides structured time for the students or participants to reflect on the service  
778 experience. (Source: The Community Service Act of 1990)

779 **STEM.** An acronym for science, technology, engineering, and mathematics – disciplines that are  
780 crucial to maintaining America’s competitiveness in a rapidly changing global society (Source:  
781 National Academies, 2005)

782 **Stewardship education.** Programs and activities specifically designed to educate participants  
783 about environmental issues and the connection between human actions and environmental  
784 impacts; and that facilitate learning how to practice stewardship behaviors and decisions.

785 **Stewardship behaviors.** Protection, restoration, and conservation actions, sustainable practices,  
786 and civic engagement activities that help prevent or mitigate environmental threats.

787 **Student opportunities.** Internships, grants, scholarships, fellowships, and educational programs  
788 provided to students on a competitive basis for introducing them to careers and to support their  
789 pursuit of higher education in mission-critical disciplines.

790 **Training.** A process of transferring knowledge and skills using standardized instructional methods  
791 and techniques to targeted professional audiences for the purpose of developing and enhancing  
792 professional competencies.

793 **Underserved audiences.** Individuals and groups who have traditionally not had access to  
794 environmental education or interpretive programs, activities, or experiences. (Source: adapted  
795 from the National Association for Interpretation)

796 **Underrepresented audiences.** Demographic groups that have disproportionately less  
797 representation in specific workforce occupations than in the general populace.

798 **Workforce development.** Education, employment, and job training systems designed to provide  
799 the skilled workers that employers need to succeed and the education and training that individuals  
800 need to succeed in today's labor market. (Source: National Governors Association, 2008)

801 **Youth.** Individuals, younger than 18 years old, who engage in lifelong learning activities with the  
802 aim of enhancing their own knowledge, skills, and competencies from a personal, civic, social, or  
803 employment-related perspective.

DRAFT

## 804 **References**

- 805 Chapin, F. S., S. R. Carpenter, G. P. Kofinas, et al. (2010). Ecosystem Stewardship: Sustainability  
806 Strategies for a Rapidly Changing Planet. *Trends in Ecology and Evolution*, 25(4).  
807 [http://dash.harvard.edu/bitstream/handle/1/9774650/Clark\\_EcosystemStewardship.pdf?](http://dash.harvard.edu/bitstream/handle/1/9774650/Clark_EcosystemStewardship.pdf?sequence=1)  
808 [sequence=1](http://dash.harvard.edu/bitstream/handle/1/9774650/Clark_EcosystemStewardship.pdf?sequence=1).
- 809 Committee on STEM Education National Science and Technology Council (2013). Federal Science,  
810 Technology, Engineering, and Mathematics (STEM) Education 5-Year Strategic Plan.  
811 [http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem\\_stratplan\\_2013.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf).
- 812 Damerell, P., C. Howe, and E. J. Milner-Gulland (2013). Child-oriented Environmental Education  
813 Influences Adult Knowledge and House Behavior. *Environmental Research Letters* 8(1).  
814 <http://iopscience.iop.org/1748-9326/8/1/015016/article?fromSearchPage=true>.
- 815 Falk, J. and L. Dierking (2010). The 95% Solution. *American Scientist*, 98.  
816 <http://www.americanscientist.org/issues/feature/2010/6/the-95-percent-solution>.
- 817 Field, H. and P. Powell (2001). Public Understanding of Science Versus Public Understanding of  
818 Research. *Public Understanding of Science*, 10(4).  
819 <http://pus.sagepub.com/content/10/4/421.short>.
- 820 Forbes (2011). Global Diversity and Inclusion: Fostering Innovation Through a Diverse Workforce.  
821 Forbes Insights. [http://www.forbes.com/forbesinsights/innovation\\_diversity/](http://www.forbes.com/forbesinsights/innovation_diversity/).
- 822 Harris Interactive (2011). STEM Perceptions: Student and Parent Study. Commission by Microsoft  
823 Corp.  
824 <http://news.microsoft.com/download/archived/presskits/citizenship/docs/stemperceptio>  
825 [nsreport.pdf](http://news.microsoft.com/download/archived/presskits/citizenship/docs/stemperceptio).
- 826 Hoffman, M. and D. Barstow (2007). Revolutionizing Earth System Science Education for the 21st  
827 Century: Report and Recommendations from a 50-State Analysis of Earth Science Education  
828 Standards. Cambridge MA : TERC Center for Earth and Space Science Education.  
829 [http://www.oesd.noaa.gov/noaa\\_terc\\_study\\_lowres.pdf](http://www.oesd.noaa.gov/noaa_terc_study_lowres.pdf).
- 830 Hollweg, K. S., J. R. Taylor, R. W. Bybee, T. J. Marcinkowski, W. C. McBeth, and P. Zoido (2011).  
831 Developing a Framework for Assessing Environmental Literacy. Washington, DC: North  
832 American Association for Environmental Education.

833 [http://www.naaee.net/sites/default/files/framework/DevFrameworkAssessEnvLitOnlineEd.](http://www.naaee.net/sites/default/files/framework/DevFrameworkAssessEnvLitOnlineEd.pdf)  
834 [pdf.](http://www.naaee.net/sites/default/files/framework/DevFrameworkAssessEnvLitOnlineEd.pdf)

835 Institute of Medicine, National Academy of Sciences, and National Academy of Engineering. (2007).  
836 Rising Above the Gathering Storm: Energizing and Employing America for a Brighter  
837 Economic Future. Washington, DC: The National Academies Press.  
838 [http://www.nap.edu/catalog.php?record\\_id=11463.](http://www.nap.edu/catalog.php?record_id=11463)

839 Intergovernmental Panel on Climate Change (IPCC) (2013). Climate Change 2013: Mitigation of  
840 Climate Change. Contribution of Working Group III to the Fifth Assessment Report to the  
841 IPCC. [http://www.ipcc.ch/report/ar5/wg3/.](http://www.ipcc.ch/report/ar5/wg3/)

842 Marybow, N. C., D. Begay, L. Peticolas, J. Stein, and S. Valdez (2012). The Cosmic Serpent: Bridging  
843 Native Ways of Knowing and Western Science in Museum Settings.  
844 [http://cosmicserpent.org/uploads/downloadables/CS-LegacyDoc27Nov2012.pdf.](http://cosmicserpent.org/uploads/downloadables/CS-LegacyDoc27Nov2012.pdf)

845 Melillo, J. M., T. C. Richmond, and G. W. Yohe, Eds., 2014: Climate Change Impacts in the United  
846 States: The Third National Climate Assessment. U.S. Global Change Research Program.  
847 [http://nca2014.globalchange.gov/report.](http://nca2014.globalchange.gov/report)

848 National Academy of Engineering and National Research Council (2014). STEM Integration in K-12  
849 Education: Status, Prospects, and an Agenda for Research. Washington, DC: The National  
850 Academies Press. [http://www.nap.edu/catalog/18612/stem-integration-in-k-12-  
851 education-status-prospects-and-an.](http://www.nap.edu/catalog/18612/stem-integration-in-k-12-education-status-prospects-and-an)

852 National Governors Association (2008). Workforce Development Definition.  
853 [http://www.nga.org/portal/site/nga.](http://www.nga.org/portal/site/nga)

854 National Oceanic and Atmospheric Administration (NOAA) (2010). NOAA's Next Generation  
855 Strategic Plan, 2009-2014. [http://www.ppi.noaa.gov/ngsp/.](http://www.ppi.noaa.gov/ngsp/)

856 National Research Council (2010). NOAA's Education Program: Review and Critique. Washington,  
857 DC: The National Academies Press. [http://www.nap.edu/catalog/12867/noaas-education-  
858 program-review-and-critique.](http://www.nap.edu/catalog/12867/noaas-education-program-review-and-critique)

859 National Research Council (2010). Rising Above the Gathering Storm, Revisited: Rapidly  
860 Approaching Category 5. Washington, DC: The National Academies Press.

- 861 [http://www.nap.edu/catalog/12999/rising-above-the-gathering-storm-revisited-rapidly-](http://www.nap.edu/catalog/12999/rising-above-the-gathering-storm-revisited-rapidly-approaching-category-5)  
862 [approaching-category-5.](http://www.nap.edu/catalog/12999/rising-above-the-gathering-storm-revisited-rapidly-approaching-category-5)
- 863 National Research Council (2012). A Framework for K-12 Science Education: Practices, Crosscutting  
864 Concepts, and Core Ideas. Washington, DC: The National Academies Press.  
865 [http://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-](http://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts)  
866 [crosscutting-concepts.](http://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts)
- 867 NOAA (2000). Discovering Earth's Final Frontier: A U.S. Strategy for Ocean Exploration: The Report  
868 to the President's Panel on Ocean Exploration. Washington, DC: NOAA.
- 869 Ocean Research Advisory Panel (2013). Leverage Ocean Education Opportunities: A Report to the  
870 National Ocean Council. [http://www.nopp.org/wp-content/uploads/2010/06/Leveraging-](http://www.nopp.org/wp-content/uploads/2010/06/Leveraging-Ocean-Education-Opportunities.pdf)  
871 [Ocean-Education-Opportunities.pdf.](http://www.nopp.org/wp-content/uploads/2010/06/Leveraging-Ocean-Education-Opportunities.pdf)
- 872 Payne, D. L. and J. Y. Baek (2014). NOAA Education Partnerships 2013 Portfolio Review Final  
873 Report. Washington, DC: NOAA.  
874 [http://www.oesd.noaa.gov/leadership/edcouncil/docs/partnerships/Partnerships2013Po-](http://www.oesd.noaa.gov/leadership/edcouncil/docs/partnerships/Partnerships2013PortfolioReview-FinalReport.pdf)  
875 [rtfolioReview-FinalReport.pdf.](http://www.oesd.noaa.gov/leadership/edcouncil/docs/partnerships/Partnerships2013PortfolioReview-FinalReport.pdf)
- 876 Penuel, W. R., M. Bienkowski, C. Korbak, A. Molina, D. Russo, Y. Toyama, et al. (2005). GLOBE Year 9  
877 evaluation: Implementation supports and student outcomes. Menlo Park, CA: SRI  
878 International. [http://www.sri.com/work/publications/globe-year-9-evaluation-](http://www.sri.com/work/publications/globe-year-9-evaluation-implementation-supports-and-student-outcomes)  
879 [implementation-supports-and-student-outcomes.](http://www.sri.com/work/publications/globe-year-9-evaluation-implementation-supports-and-student-outcomes)
- 880 Place-based Education Evaluation Collaborative (2010). The Benefits of Place-based Education: A  
881 Report from the Place-based Education Evaluation Collaborative (Second Edition).  
882 [http://Tinyurl.com/PEECBrochure.](http://Tinyurl.com/PEECBrochure)
- 883 Tai, R. H., P. M. Sadler, and J. J. Mintzes (2006). Factors influencing college science success. Journal  
884 of College Science Teaching, 35(8).  
885 [http://svsd.schoolwires.net/cms/lib05/WA01919490/Centricity/Domain/457/research\\_a](http://svsd.schoolwires.net/cms/lib05/WA01919490/Centricity/Domain/457/research_and_teaching_article_fc.pdf)  
886 [ns\\_teaching\\_article\\_fc.pdf.](http://svsd.schoolwires.net/cms/lib05/WA01919490/Centricity/Domain/457/research_and_teaching_article_fc.pdf)
- 887 The Native American Academy. Explorations into Native Science: Principles of Native Science.  
888 [http://www.silverbuffalo.org/NSA-NativeScience.html.](http://www.silverbuffalo.org/NSA-NativeScience.html)

DRAFT for public comment. Not intended for interim use.

- 889 U.S. Commission on Ocean Policy (2004). An Ocean Blueprint for the 21st Century Final Report of  
890 the U.S. Commission on Ocean Policy. Washington, DC: U.S. Commission on Ocean Policy.  
891 [http://govinfo.library.unt.edu/oceancommission/documents/full\\_color\\_rpt/welcome.html](http://govinfo.library.unt.edu/oceancommission/documents/full_color_rpt/welcome.html)  
892 [#final](#).
- 893 U.S. Department of Education (2011). United States Code 20 U.S.C. § 1067k(3).  
894 <http://www.gpo.gov/fdsys/pkg/USCODE-2011-title20/html/USCODE-2011-title20->  
895 [chap28-subchapIII-partE-subpart3-sec1067k.htm](http://www.gpo.gov/fdsys/pkg/USCODE-2011-title20/html/USCODE-2011-title20-chap28-subchapIII-partE-subpart3-sec1067k.htm).
- 896 U.S. Dept. of Commerce and U.S. Dept. of Education (2008). The Shortage in the Number of  
897 Individuals with Post-baccalaureate Degrees in Subjects Related to Fishery Science. NOAA  
898 Tech. Memo. NMFS-F/SPO-91. <http://caribbeanfmc.com/pdfs/ShortageOfDegrees.pdf>.
- 899 U.S. Global Change Research Program (2012). The National Global Change Research Plan 2012-  
900 2021. Washington, DC: U.S. Global Change Research Program.  
901 <http://downloads.globalchange.gov/strategic-plan/2012/usgcrp-strategic-plan-2012.pdf>.