

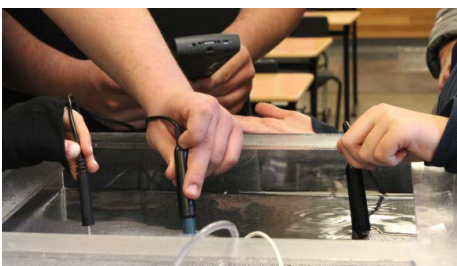


National Oceanic and Atmospheric Administration

U.S. Department of Commerce

# NOAA Education Accomplishments Report

FISCAL YEAR 2016



ADVANCING NOAA'S MISSION THROUGH EDUCATION

## ON THE COVER

**Top left:** Visitors to the Exploratorium in San Francisco, California examine marine life collected from NOAA's pCO<sub>2</sub> buoy. Credit: Lisa Strong/Exploratorium.

**Top right:** Alexandria Barkman, Hollings Intern with NOAA Sanctuaries at Papāhānaumokuākea Marine National Monument. Credit: Office of National Marine Sanctuaries.

**Middle left:** NOAA Corps LTJG Joseph Phillips releases an ozone sonde that is attached to a helium balloon. The instrument will rise 18 miles into the atmosphere to measure the thickness of ozone. Credit: Chet Waggoner/NOAA.

**Bottom left:** Students visiting a lab through the NOAA-funded Ecosystem Pen Pals program use probes to measure water chemistry. Credit: EarthEcho International.

**Bottom right:** Teachers learn about the connections between streams and rivers through a hands-on teacher workshop called Rivers to Reef. Credit: Gail Krueger/NOAA Gray's Reef National Marine Sanctuary.

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Maryland Environmental Literacy Partnership

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Earnie Olsen/Citrus County Marine Science Station

## LETTER FROM THE DIRECTOR //

### **Partners and friends of NOAA Education:**

On behalf of the NOAA Education community, I'm pleased to present our 2016 Annual Accomplishments Report. Education has an important role to play in advancing NOAA's mission of science, service, and stewardship — and this report shows how we make it happen.

If you've been following NOAA Education, you may notice some changes in this report. For the past few years, we have brought you stories that highlight education efforts across NOAA. This year we have connected these stories around themes tied to our Strategic Plan. This change allows us to show you more of what we do and to demonstrate the growing cohesion of our community. It is a sign of the increased integration and coordination that we have worked hard to foster.

I am proud of what we have accomplished this year. We set ambitious targets, challenging ourselves to deliver core programming and find ways to assess, innovate, and improve on the way we do our work. We are becoming a learning community, striving to advance our programs and performance. I can confidently say that we have made tangible steps toward achieving our strategic plan.

Throughout this report, you will see examples of how education efforts connect NOAA's assets — our people as well as our ships, labs, aircraft, buoys, data, satellites, and other tools — with the public we serve. We continue our efforts to diversify our audiences and improve collaboration. These strides would not have been possible without the help of our friends and partners. Thank you for the work that you do.

Sincerely,

*Louisa Koch*

Louisa Koch  
Director of NOAA Education



## INTRODUCTION

# Advancing NOAA's mission through education

The [National Oceanic and Atmospheric Administration](#) (NOAA) is charged with engaging society to make informed social, economic, and environmental decisions through an understanding of Earth sciences. To achieve this, members of society should understand scientific processes, consider uncertainty, and reason about the ways that human and natural systems interact. Therefore, it is not enough for NOAA to research the ocean and atmosphere; NOAA must also educate so that individuals can use that information to support healthy ecosystems, resilient communities, and robust economies.



Teacher at Sea Rosalind Echols poses with a salmon sculpted out of marine debris in Kodiak, Alaska. (Courtesy of Rosalind Echols)

NOAA takes an “all hands on deck” approach to education. Our educators and partners work in different offices, programs, states, and countries, covering topics that span from the surface of the sun to the depths of the ocean. We educate audiences from preschoolers through postgraduates and provide learning opportunities outside of the classroom for people of all ages.

Despite the challenges of geographic distribution and scope, we have worked to build a community of educators within NOAA. The [NOAA Education Council](#), composed of representatives from NOAA education programs, provides a forum for coordinating efforts and developing new ideas. The Council leads the [NOAA Education community](#), which includes NOAA staff, partners, and friends who support education.

In 2015, the NOAA Education community released an update to the [NOAA Education Strategic Plan](#), which takes us through the year 2035. In this guiding document, we outlined five goals and supporting objectives that help us advance NOAA's mission through education. These ambitious goals give the NOAA Education community shared focus across a wide range of educational activities.

The NOAA Education Council developed a two-year [implementation plan](#), through fiscal year 2017, which documents concrete steps toward our goals and objectives. We designed the plan to include actions that we undertake to expand and improve our current set of



Fifth grade students in Bayfield, Wisconsin learn to operate an ROV with Amie Egstad from the Wisconsin Department of Natural Resources. This Lake Superior-focused activity is part of ongoing meaningful watershed education experiences provided by the Bay Watershed Education and Training (B-WET) funded Rivers2Lake education program. (Toben Lafrancois/Bad River Watershed Association)

programs and responsibilities. As a result, it is a document that encourages us to reach outside of our day-to-day operations, driving increased collaboration and challenging us to make progress in measurable ways.

Demonstrating progress toward our Strategic and Implementation Plans helps us ensure accountability and transparency. This report highlights some of our successes in fiscal year 2016; however, it is not a comprehensive catalog of our activities. Education Council members submitted updates on Implementation Plan actions, most of which will continue through fiscal year 2017. Members also provided qualitative data on programs and activities that made notable progress toward our Strategic Plan. We categorized these accomplishments into themes based on the goals they support and the types of progress they represent.

This report itself also constitutes progress, as we continue to improve our communication and outreach. We hope you enjoy reading about our progress and we welcome feedback from our community.

## How to read the goal chapters

This report is divided into chapters based in the five goals in our Strategic Plan. Each goal chapter includes four sections, described below. The examples of progress highlighted in this report are not a complete catalog of our efforts. To learn more visit [NOAA.gov/education](http://NOAA.gov/education).

<b>OVERVIEW</b>	An introduction to each goal in our Strategic Plan that explains how it supports our overall vision for NOAA Education.
<b>PROGRESS TABLE</b>	A summary of how the work we highlight in this report aligns to the objectives in our Strategic Plan.
<b>GOAL HIGHLIGHTS</b>	Quick snapshots of some of the progress we have made. Highlights are brief; if you are looking for more information, please see our supporting <a href="#">reference document</a> . Highlights are indexed by the reference number in brackets.
<b>FEATURED STORIES</b>	In-depth stories about efforts that resulted in societal, environmental, or economic impacts.

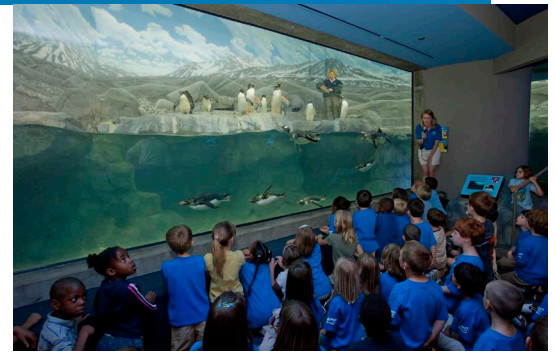
## INTRODUCTION

# NOAA Education by the numbers

Before we dive into the goals, let us consider the reach of NOAA's education programs:

### Over 58 million people visited informal education institutions hosting NOAA supported exhibits or programs.

NOAA works with institutions to infuse NOAA science into exhibits and programs at science centers, zoos, aquariums, and other informal institutions. As a result, visitors are exposed to the best available science that enhances stewardship and promotes informed decision making. These institutions become ambassadors for NOAA, helping us reach many more people than we could alone.



Todd Stailey/Tennessee Aquarium



NOAA

### Nearly 450 institutions increased their educational capacity through NOAA-funded interpretive and educational centers, exhibits, or programs.

NOAA partners with and funds educational programs and exhibits at other organizations, including museums, science centers, after school programs, and nonprofits. By investing in these partners, NOAA is able to engage more people while building enduring relationships with organizations that share our mission.

### Over 2.6 million youth and adults participated in NOAA supported informal education programs.

Both directly and through partners, NOAA supports interactive informal educational programs. Children, families, adults, and communities participate in programs that enhance stewardship and participants' understanding of the natural world. By working in the informal education setting, NOAA extends educational opportunities outside of the classroom and promotes lifelong learning.



Jennifer Stock/Office of National Marine Sanctuaries



Laura Oreland/NOAA

### Over 440,000 preK-12 students participated in NOAA supported formal education programs.

NOAA supports opportunities to work with students while they are at school, integrating NOAA science and resources into classrooms and the formal learning experience. Students therefore have the opportunity to learn about Earth science from the agency charged with understanding and predicting changes in climate, weather, ocean, and coasts.



**Over 23,000 educators participated in NOAA supported professional development programs.**

NOAA supports and trains teachers and informal educators in Earth science and related topics. The state of the science is constantly changing as we discover more and innovate new ways to gather environmental intelligence. Educator professional development programs provide direct conduits from NOAA experts to teachers and classrooms around the nation.



Jeff Dutrow/Apalachicola National Estuarine Research Reserve



NOAA

**Over 40 million people visited NOAA Education websites that support a broad spectrum of educational activities and provide critical information to the nation.**

NOAA provides educational resources online. These resources include lesson plans and materials for teachers, student opportunities, activities for children and families, online schools, career development opportunities, and more.

**Over 3,700 postsecondary students were trained in NOAA-mission related sciences through NOAA-funded higher education programs.**

NOAA prepares undergraduate and graduate students for careers at NOAA and in other STEM fields. Students participate in research and learning opportunities throughout their education and develop tools that will carry them into successful careers in Earth science, resource management, and other environmental fields.



Richard Feely/NOAA



Erik Davenport

**Nearly 750 postsecondary degrees in NOAA-related disciplines were awarded to students who were supported by NOAA in higher education programs.**

NOAA's scholarship programs support and train students as they complete bachelor's, master's, doctorate, and law degrees in NOAA-related fields. These programs aim to support the best and the brightest students from diverse backgrounds to foster the next generation of NOAA scientists, engineers, lawyers, and administrative experts.

These output measures were collected from the NOAA Education Council member programs as part of the fiscal year 2016 Unified Data Call.

## GOAL 1

# Science-Informed Society

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



Laura Oremland/NOAA

## OVERVIEW //

NOAA's education programs provide opportunities for students and the public to learn science and engage in our mission. In Goal 1, we lay the groundwork for an informed and scientifically literate society. We work with a wide array of educators and partners who collectively reach audiences in the millions. We aim to inspire students and the public, help educators incorporate NOAA resources into their classrooms, and build enduring relationships with partners whose expertise complements our own.

### OBJECTIVES

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

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

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

### FY16 PROGRESS

NOAA reached audiences from diverse backgrounds (highlights on page 9, featured story on page 13).

NOAA updated online educational resources (highlights on page 10) and improved capacity to report on the outcome of educator professional development (highlights on page 11).

NOAA worked with partners to integrate Earth science resources into their education programs and products (highlights on page 12, featured story on page 14).

## GOAL HIGHLIGHTS //

## Students from all backgrounds engage in education opportunities

NOAA education reached over 400,000 students in fiscal year 2016, but our programs are not one-size-fits-all. Recognizing the importance of giving learners from all backgrounds access to quality science education programs, NOAA Education specifically targeted diverse audiences.

### OBJECTIVE 1.1.

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

- ▶ One hundred and ninety indigenous students living near national marine sanctuaries from Washington, Hawaii, and American Samoa shared stories of their cultural connection to the ocean, climate change, and ocean acidification through an Ecosystem Pen Pal program supported by a [Bay Watershed Education and Training \(B-WET\)](#) grant. In Washington state alone, 80 high school students participated, representing four tribes and one Indian Nation. [10]
- ▶ The [NOAA Outreach and Education on Protected Species](#) program continued to reach diverse audiences in the Woods Hole region of New England through classroom visits by [Northeast Fisheries Science Center](#) scientists. The program reached 1,790 students in 95 classrooms from preschool to high school in the 2015–2016 school year. [14]
- ▶ The [NOAA Enrichment in Marine Sciences and Oceanography \(NEMO\)](#) program continued in its ninth year to reach diverse audiences in Washington, D.C., through field trips and hands-on activities. NEMO aims to increase ocean literacy and introduce careers in marine and fisheries science to inner-city students. [29] (see Goal 4)
- ▶ The [Alaska Fisheries Science Center](#) reached diverse audiences in Alaska through community-based partners who work with youth not traditionally engaged in science, including disabled youth, girls, and rural students. One hundred and fifty students were able to participate in various NOAA Fisheries education programs, including the NOAA Sun to Sea summer camp, visits to [Auke Bay Laboratory](#), and working with female shark scientists. [30] (see Goal 4)
- ▶ [NOAA Fisheries Science Camp](#) in Hawaii targeted 35 incoming 8th graders from low income communities. The five-day camp highlighted current fisheries topics and marine science careers. The students completed six science modules that were later converted to kit lessons that align with the Hawaii Department of Education Standards. [31] (see Goal 4)
- ▶ [National Ocean Service](#) increased its reach to diverse students by partnering with the U.S. Fish and Wildlife Service and other federal agencies to present the second annual [Inter-Tribal Youth Climate Leadership Congress](#). Eighty-seven high school participants learned about climate change and resiliency during the week-long event. [77]
- ▶ The [Sapelo Island National Estuarine Research Reserve](#) partnered with the North Carolina and South Carolina National Estuarine Research Reserve to expand the Seeds to Shoreline habitat restoration program. There were 226 middle school and high school students who harvested *Spartina* seeds in the salt marsh, germinated them in their schools, and planted 69 *Spartina* in their designated restoration areas. [53] (see Goal 2)



Inter-Tribal Youth Climate Leadership Congress attendees work together to define climate issues and ideas to become climate resilient. (Alejandro Morales/U.S. Fish and Wildlife Service)

## GOAL HIGHLIGHTS //

## NOAA makes online collections more educator friendly

Websites are the most efficient way to make NOAA's education resources accessible to all. We strive to get NOAA's online resources into the hands of educators and, from there, into the minds of students. In the fast-paced world of Internet and technological innovations, we continue to update our resources to keep them relevant and useful.

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

- ▶ The [Climate Program Office](#) curated the [Climate Literacy and Energy Awareness Network \(CLEAN\)](#) annotated collection of digital educational resources. In 2016, efforts were focused on improving the quality, effectiveness, and relevance of these resources by aligning the collection to support the new three-dimensional science learning standards. [18]
- ▶ The [Climate Program Office](#) improved the awareness, access, and ease of use of the [CLEAN collection](#) of digital climate educational resources. The Climate Program Office launched a teacher's guide with new three-dimensional learning sequences of CLEAN Collection resources and raised awareness for state science supervisors and school administrators through formal agreements and the [#Teach4Climate](#) social media campaign. [19]
- ▶ The [National Ocean Service](#) redesigned their website architecture so that content is compatible with multiple platforms and mobile technology. The website layout was reorganized by topic to make content easier to find. [34]
- ▶ The [NOAA Education Council's Products and Programs Development and Delivery \(P2-D2\) Working Group](#) developed a special [online collection](#) of NOAA education resources. Group members reviewed and selected a number of products that highlight areas that NOAA is uniquely positioned to support based on the expressed needs of state and district science supervisors. [43] (see Goal 5)
- ▶ [NOAA Fisheries](#) conducted an inventory of educational materials on endangered species managed by NOAA Fisheries. One hundred and seventeen products were identified and assessed for up-to-date conservation and stewardship information. Understanding the current inventory of materials allowed Fisheries educators to determine any gaps and curate them for a collection accessible through a central website. [44] (see Goal 2)
- ▶ [Data in the Classroom](#) modules were edited, redesigned, and modified to align with appropriate standards. Two modules, Sea Level and Water Quality, have been revised to better meet the Next Generation Science Standards (NGSS) requirements. The other two have been mapped to demonstrate how the activities support NGSS. [51]



The NOAA Education Council's Programs and Products Development and Delivery (P2-D2) Working Group created an online collection of resources that support new science standards.

## GOAL HIGHLIGHTS //

## Educators take NOAA resources back to students of all ages

NOAA provides professional development to help educators gain hands-on experience with NOAA science and resources. But what we really want to know is whether educators plan to use these resources in their classrooms. To address this need, NOAA Education developed common outcome measures that report data on integration of NOAA resources.

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

- ▶ In the 2016 [Unified Data Call](#), education programs from across NOAA reported on the outcome of professional development for the first time. NOAA found that 2,138 educators reported that they intend to implement the training they received from NOAA. In addition, 207 educators reported that they have implemented NOAA resources as a result of professional development programs.
- ▶ The [NOAA Climate Stewards Education Project](#) held nine webinars for formal and informal educators across the United States. Reducing the time it takes to deliver recordings to the archives was identified in a fiscal year 2016 needs assessment as way to better serve educators who cannot attend a live broadcast. As of July 2016, the recordings have been viewed over 1,575 times. [7]
- ▶ With the creation of the [Office of National Marine Sanctuaries](#) new webinar series, formal and informal educators now have a greater ability to teach about ocean and climate literacy through national marine sanctuaries. Over 250 participants have attended, with more than 50% indicating that they intend to use the NOAA resources provided. [25]
- ▶ [Teacher at Sea](#) alumna, Sue Zupko, continued to integrate NOAA resources by hosting the second annual family science night in Alabama. Zupko shared NOAA science, her experience aboard the ship, and hosted a special guest from [NOAA Corps](#) with over 200 participants. [61] (see Goal 5)
- ▶ The [Teacher at Sea](#) program integrated measurement of use of NOAA resources into their pre-cruise, post-cruise, and alumni surveys. One hundred percent of 2016 participants intend to integrate NOAA resources in their teaching. [64] (see 5.4)
- ▶ [NOAA Ocean Exploration and Research's](#) evaluation report of the Why Do We Explore? and How Do We Explore? Workshops in 2013–2015 indicated that 72% of participants intended to integrate workshop materials into their instruction. [66]
- ▶ [Puerto Rico Sea Grant](#) developed a marine educational training model covering specific topics such as marine birds, marine vegetation, whales, sea turtles, corals, and plankton. A total of 137 teachers attended the training workshops and returned a workshop evaluation form. Ninety-five percent of participants stated they had learned new information about marine topics and 93% were confident they could use the materials in class. [88]
- ▶ [NOAA Ocean Exploration and Research](#) redesigned their NOAA Ship *Okeanos Explorer* workshops into a single 7-hour professional development workshop. The new series, titled Deep Ocean Discoveries, is offered at 15 Alliance Partner sites. [48]

Educators from American Samoa learn about ocean exploration in an Office of Ocean Exploration and Research professional development course. (NOAA)



## GOAL HIGHLIGHTS //

## Partners help NOAA meet its education mission

NOAA could not accomplish its goals in a vacuum. As a result, we cultivate relationships with other federal and private organizations who share our mission to advance climate, ocean, weather, and environmental education.

- ▶ [NOAA Research](#) and the [Office of Education](#) collaborated with the Exploratorium, an innovative science museum in San Francisco, California. This partnership strengthened public programming at the science museum through better coordination with NOAA ship dockings and research aboard NOAA ships. A protocol document is near completion. [13]
- ▶ Montgomery County Schools in Maryland used [B-WET](#) grant funds to develop the “Our Neighborhood, Our Watershed” curriculum. Over the past three summers, all fourth grade teachers have been trained to implement these lessons, which are now required for all 12,000 fourth grade students. [22]
- ▶ The [National Ocean Service](#) worked with a network of schools, universities, and institutions who came together for two [National Climate Game Jams](#) in fiscal year 2016. The White House Climate Literacy Initiative provided a new avenue for students to engage with NOAA content and staff in climate topics. Over 500 students, from grades 5 to 12 and college, worked with climate experts to design games that encourage stewardship action by players. [24]
- ▶ The [NOAA Climate Stewards Education Project](#) partnered with six organizations to host seven regional workshops for 484 educators. These workshops provided opportunities for educators to receive free professional development from local scientists in climate change, its impacts on their region, and how to engage their students on these topics in the classroom. [46]
- ▶ The [National Satellite and Information Service](#) supported the National Aeronautics and Space Administration (NASA) Space Place by providing supporting materials to be displayed in the exhibit. This display is curated by NASA and housed in 275 museums across this country. [79]
- ▶ The [National Satellite and Information Service](#) collaborated with the American Meteorological Society to develop a suite of eight short courses for science professionals and students on satellites, data, and analysis used to bring about awareness and discussion regarding the latest satellite technology. To date, 50 individuals have participated in at least one of these courses. [81]
- ▶ The [Sapelo Island National Estuarine Research Reserve](#) played an integral role in training coastal environmental educators during two on-the-reserve sessions. One session was for 11 naturalists on Little St. Simon’s Island, Georgia, and the other session was for 10 new Burton 4-H instructors on Tybee Island, Georgia. The naturalists were given instruction on Georgia’s coastal ecosystems, current research, as well as the complex environmental issues affecting the coast. [83]

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

## FEATURED STORY //

## Fourth Grade students engage with NOAA through Every Kid in a Park Initiative

**Eighty percent** of American families live in cities today, creating a disconnect with the natural world. Today's children spend more time on computers and smart phones than exploring nature. This disconnect from nature was the impetus for the White House's **Every Kid in a Park** program, which provides an opportunity for every fourth grade student across the country (approximately four million) to experience federal lands and waters first hand at no cost. This exposure at an early age helps create the next generation of outdoor stewards and users of our nation's lands and waters.

NOAA's **National Marine Sanctuary System** and **National Estuarine Research Reserve System** are part of our natural and cultural heritage. Several offices across NOAA came together to offer hands on experiences for fourth grade students to introduce them to the vast places NOAA protects, including marine sanctuaries, research reserves, and a fisheries laboratory. The places NOAA manages are already free to visit but by working in partnership with foundations and friends groups such as the National Marine Sanctuaries Foundation and the National Park Foundation for financial support, schools were able to get transportation and even supplies covered for their field trips.

In total over 3,200 fourth grade students were able to experience NOAA programs during 51 events in just one year. Students were out on the water in national marine sanctuaries and national estuarine research reserves, toured labs, went to visitor centers, conducted water quality monitoring, built remotely-operated vehicles, and conducted beach cleanups — all while making connections to these special places NOAA manages.

**“Thank you so much for letting Ottawa school come to Thunder Bay [National Marine Sanctuary]. I loved it. I learned so much about the Great Lakes... When I grow up I want to be just like you.”**

**- Every Kid in a Park participant**

Providing experiences like these to fourth grade students helps open the eyes of students who are just beginning to make connections to how the world around them works. As they move forward in their lives they will hopefully take with them an appreciation and understanding of the importance of our nation's public lands and waters. As Russell Callendar, Ph.D., assistant administrator for NOAA's National Ocean Service said, “We are proud to be part of the Every Kid in a Park initiative. NOAA's National Marine Sanctuaries and National Estuarine Research Reserves provide fourth graders and their families the chance to experience the sense of wonder that our ocean, coasts, and Great Lakes bring.”



Students learn about local marine organisms during an Every Kid in a Park visit to Cordell Bank National Marine Sanctuary. (Jennifer Stock/NOAA)

FEATURED STORY //

# Partners raise youth voices at COP21 through the Climate Education and Literacy Initiative

In December 2013, the White House Office of Science and Technology Policy launched the [Climate Education and Literacy Initiative](#) to connect American students and citizens with the best-available, science-based information about the challenges and opportunities of climate change. A series of federal and non-federal commitments were announced and numerous roundtable discussions held to discuss how best increase the nation’s climate and energy literacy. As the partners considered the value of reaching youth directly, NOAA and the others realized that through collaboration they could have a greater collective impact.



Two students had the unique opportunity to represent the youth voice at the U.S. Center in the opening side event and an Association of Science-Technology Centers (ASTC) and Unverscience interactive video conference to engage young leaders around the world. (@ecoworksdetroit on Twitter)

Youth join forces to support climate action. (Courtesy of Connect4Climate)

The NOAA [Climate Program Office’s](#) Communication and Education Program and a network of partners engaged youth worldwide around the historic 21st Conference of Parties (COP21) global climate talks in Paris and beyond. Federal agencies and external organizations in the United States committed to work to enhance youth engagement, forming the [#Youth4Climate – Road to COP21](#) campaign through coordinating youth and education efforts.

Prior to the Paris conference, The Wild Center, a nature museum, the Association of Science Technology Centers, CommEd, and others worked to promote a Youth Climate Summit model across the country, inspiring summits in Detroit, Vermont, Seattle, and Finland. The summits engaged students in climate literacy through dialogue and action planning.

The campaign used the hashtag [#Youth4Climate](#) to coordinate events, activities, and related educational efforts — many of which fulfill Climate Education and Literacy Initiative commitments — up to and during the climate negotiations at COP21 in Paris in December 2015. This initiative reached 33 million social media impressions during the conference, making it the largest youth focused social media presence at COP21. The [#Youth4Climate](#) partnership continues and focused again on the COP22 in Marrakesh, Morocco in November 2016.





## GOAL 2

# Conservation & Stewardship

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



Courtesy of Angela Huntemer-Sidrane

### OVERVIEW //

Promoting awareness of conservation issues and stewardship actions is an important way to share NOAA's mission with students and the public. Our education programs offer opportunities to participate in habitat restoration, everyday behaviors, and policy changes that help improve natural resource management. We are making progress by getting better at understanding how our education portfolio supports stewardship and by encouraging educators and institutions to integrate stewardship actions into their educational projects.

#### OBJECTIVES

2.1. Youth and adults from all backgrounds are knowledgeable about conservation and stewardship practices and skilled in applying them to address local, regional, national, and global issues related to NOAA's mission.

2.2. Formal and informal educators integrate NOAA-related conservation and stewardship concepts and activities into their curricula, practices, and programs.

2.3. Formal and informal education organizations establish guidance and provide support toward increasing participation of education audiences in conservation and stewardship activities related to NOAA's mission.

#### FY16 PROGRESS

NOAA promoted awareness by organizing outreach events and encouraged stewardship actions (highlights on page 16, stories on pages 19 and 20).

Programs measured whether educators integrated stewardship projects as a result of participating in professional development programs (highlight on page 17, featured story on page 21).

NOAA updated funding opportunities to encourage stewardship action and diversify audiences (highlights on page 18).

## GOAL HIGHLIGHTS //

## Raising awareness, taking action for conservation and stewardship

NOAA engages students and the public in serious environmental issues that NOAA is responsible for managing. Improving public understanding of how human actions impact natural systems is a big step toward conserving and protecting natural resources. This year, we not only increased awareness, but also encouraged some people to take the next step: action.

### OBJECTIVE 2.1.

Youth and adults from all backgrounds are knowledgeable about conservation and stewardship practices and skilled in applying them to address local, regional, national, and global issues related to NOAA's mission.

### NOAA raises awareness of stewardship issues through creative community events

- ▶ Over 5,000 people attended the 2015 Right Whale Festival to celebrate the return of these endangered mammals to the warm coastal waters where they give birth to and nurse their young. For the past seven years, [NOAA Fisheries](#) has been celebrating this family-fun event in Jacksonville Beach, Florida to raise awareness of the threats to right whales and how we can help in their recovery. [2]
- ▶ [NOAA Fisheries West Coast Regional Office](#) coordinated a research cruise for students from Rainier Beach High School in Seattle, Washington. Students learned about remotely operated vehicle (ROV) research, threatened and endangered rockfish species of Puget Sound, and the impact of urbanization on Puget Sound. [28] (see Goal 4)
- ▶ [NOAA Fisheries](#) organized 100 volunteers from the greater Seattle area to paint a 6-by-12-foot mural in the shape of a salmon. This event receives over one million visitors annually and is aimed to promote conservation and celebrate World Fish Migration Day in May at Seattle's Hiram Chittenden Locks. [32]
- ▶ [NOAA Fisheries Southeast Regional Office](#) developed an outreach program to address illegal human interactions with bottlenose dolphins that "strand feed" on the shores of Kiawah Island, South Carolina. Educators monitored the beaches and informed over 800 beachgoers about how to protect these dolphins and worked with the community to spread the word to residents and tourists. [47]
- ▶ [NOAA Fisheries Southeast Regional Office](#) used creative communication methods, such as aerial banners, to relay conservation and stewardship messages about bottlenose dolphins and North Atlantic right whales. They also developed a permanent marine mammal conservation display at Fort De Soto Park, Florida, which receives more than 2.7 million visitors annually. Banners have been flown over crowds as large as 300,000 people. [59]
- ▶ The [Office of National Marine Sanctuaries](#) on-the-water volunteer docent and naturalist program, Team OCEAN, helps ensure safe wildlife viewing and ocean etiquette. This year the program expanded to Hawaiian Island Humpback Whale National Marine Sanctuary to put interpreters on areas of Maui frequented by visitors and tourists. [62]



North Atlantic right whales are an endangered species protected by NOAA Fisheries. (Georgia Department of Natural Resources, Permit 15488)

- ▶ **Texas Sea Grant** extension staff developed programming to address coastal education needs in Matagorda County and along the Colorado River watershed. In 2015 approximately 140 youth and adults attended programs at Austin Public Library branches to learn about Texas’ diverse coastal ecosystems, watershed stewardship, and the connectivity between inland activities and impacts to coastal environments. [89]

**Students take stewardship actions in their communities**

- ▶ One Cool Earth used **B-WET** funds to engage over 650 students from low income schools in the Central Valley of California with community conservation partners to reduce water use. They installed a low-water native plant and vegetable garden, provided home water conservation kits to all students, and installed rain barrels throughout the school campuses. [56]
- ▶ The MERITO Foundation used **B-WET** grant funds to empower students in California to address climate change and ocean acidification. They worked with predominantly Hispanic and Latino students to provide them with the tools to research, design, and innovate energy efficiency or other sustainability models their schools can adopt, or develop ocean acidification awareness campaigns that inform their communities. [57]



Students formulate a hypothesis during a stream exploration field trip in Washington. This Meaningful Watershed Educational Experience was supported through a B-WET grant. (Nooksack Salmon Enhancement Program)

GOAL HIGHLIGHTS //

**Programs help educators integrate stewardship actions into classrooms**

NOAA helps fulfill the agency’s responsibility to promote stewardship and conservation behaviors by offering professional development programs for educators. NOAA’s programs continue to build their capacity to collect and report the integration of stewardship activities by educators as a direct result of participation.

**OBJECTIVE 2.2.**  
Formal and informal educators integrate NOAA-related conservation and stewardship concepts and activities into their curricula, practices, and programs.

- ▶ This year, for the first time, NOAA has collected agency-wide data on the 153 educators that intend to and 109 educators have integrated Meaningful Watershed Educational Experiences (MWEEs) as a result of **B-WET** professional development programs. These programs provide educators with tools and resources that can be integrated into their curriculum and shared with students.

## GOAL HIGHLIGHTS //

## Shaping funding opportunities to encourage stewardship actions

Stewardship education offers tangible solutions to environmental problems, connecting people with actions they can take on issues that matter to them. Recognizing its value, NOAA Education expanded the role of stewardship in educational partnerships.

- ▶ The **B-WET** program established a new Meaningful Watershed Educational Experience (MWEE) definition that emphasizes stewardship actions. The new definition was included in 5 of 6 regional federal funding opportunities. As a result, 61% of proposals had a well-described stewardship action component as part of their project design. [11]
- ▶ The **Ocean Guardian School** program marketed the program in urban areas of California, including San Francisco, Alameda, Oakland, San Jose, Salinas, and Watsonville. Fifteen schools from these areas applied and ten were funded. Ocean Guardians now enables more schools that serve predominantly underserved and underrepresented students to promote stewardship action projects that help protect the ocean and encourage sustainable behaviors. [40]

### OBJECTIVE 2.3.

Formal and informal education organizations establish guidance and provide support toward increasing participation of education audiences in conservation and stewardship activities related to NOAA's mission.



Teachers discover invertebrates up close during a Teachers on the Estuary workshop at the San Francisco Bay National Estuarine Research Reserve. (Sarah Ferner/San Francisco Bay National Estuarine Research Reserve)

- ▶ This is the first year **Teachers on the Estuary**, a field-based training program to improve teachers' understanding of the environment and promote stewardship, is formally included in the operations grants of all **National Estuarine Research Reserves**. Twenty-three of the 28 reserves delivered at least one workshop this summer. [50]

## FEATURED STORY //

## Mississippi students convince their community to permit permeable paving to protect their watershed

The Rotten Bayou Watershed encompasses 22,446 acres and lies in Harrison and Hancock counties in Mississippi. Rotten Bayou is a tributary of St. Louis Bay that has been identified as having impaired water quality. As a result, the State of Mississippi and partners worked to implement a Nutrient Reduction Strategy for Rotten Bayou Watershed. The Gulf Coast Community Design Studio, an outreach program of Mississippi State University's College of Architecture, funded through a [Gulf of Mexico Bay Watershed Education and Training \(B-WET\)](#) grant, designed an education program to support the reduction initiative. The fifth grade students of East Hancock Elementary School in Mississippi not only learned about the impact of development on the health of their local Rotten Bayou watershed and coastal ecosystem, but also took action.

Students learned that solid surface parking lots have the potential to increase the amount of polluted runoff, that enters the watershed, which has a deleterious effect on the water quality and plants and animals living in the watershed. Through watershed experiments and hands on-learning activities, students gained an understanding of the value of healthy watersheds and learned about solutions, such as permeable paving, to decreasing harmful runoff. When students considered how this information could be used to improve their natural surroundings, they found that the community's laws did not allow for permits to be given to construct permeable paving systems, or parking lots. Permeable paving is made of sustainable materials that allow stormwater to move through the parking lot surface, filtering the pollutants out and reducing polluted runoff that enters the watershed, thereby improving water quality. In response, students provided presentations to the City Council documenting their watershed investigations and the proposed solutions to improving water quality and watershed health.



Staff from the Gulf Coast Community Design Studio, an outreach program of Mississippi State University's College of Architecture, show a map of the Rotten Bayou watershed as context for their Meaningful Watershed Educational Experience. (Barbara Ambrose/NOAA)



Following the presentation, posters summarizing the students' work remained on display in the City Hall for others to learn about the situation. As a result of the students' work, a zoning amendment to allow permeable paving systems in commercial parking areas in the community passed at a City Council meeting. This will allow future permeable parking areas to be constructed and may result in improved watershed health.

A middle school student participating in a Meaningful Watershed Educational Experience along the banks of the Rotten Bayou, Mississippi looks for invertebrates in his net sample. Invertebrates are an indication of water quality health. (Barbara Ambrose/NOAA)

## FEATURED STORY //

## Sapelo Island National Estuarine Research Reserve expands the Seeds to Shoreline program to Georgia

Georgia's salt marshes serve a valuable role in the coastal ecosystem by acting as a filter for upland and sea borne contaminants and as a buffer from storms. Saltmarshes generate millions of dollars for the local economy, both as a nursery for commercially and recreationally valuable fish and as a scenic draw for tourism. The [National Estuarine Research Reserves](#) in North Carolina, South Carolina, and Florida offer the Seeds to Shoreline program, in which students propagate *Spartina alterniflora* — the dominant plant species in the saltmarsh. The program provides a hands-on educational approach to saltmarsh stewardship and an understanding of the scientific method. In 2016, this successful program was expanded to Georgia's [Sapelo Island National Estuarine Research Reserve](#).

Middle school and high school students were permitted to harvest *Spartina* seeds from the salt marsh, germinate them in their schools, grow them out in greenhouses and plant the *Spartina* in marsh die-back areas, human disturbed areas, and living shoreline sites. Teachers from ten coastal middle and high schools were trained and given supplies to conduct this program. Students from these schools were allowed to harvest *Spartina*

seeds from the marsh in the fall and store them in refrigerators throughout the winter. In the spring the students transplanted their germinated seeds into grow out containers. Students were given lectures and relevant scientific papers on *Spartina* and encouraged to stratify their storage and grow out procedures. In the spring, these students were taken to sites approved by the Georgia Department of Natural Resources and allowed to plant the seedlings into the marsh. These sites were then monitored by the students and growth data were collected.

A total of 226 students were engaged through this program. Successful plant propagation was highly variable during this pilot year, but all teachers and students who participated in this program rated it as very helpful in introducing science principles into the classroom and allowing students to stratify experimental treatments in a real world scenario. Robert Hodgen, a science teacher at Richmond Hill High School, commented, "In our standardized test driven culture, there are very few opportunities for students to participate in real-world scientific activities that are meaningful and that provide tangible benefits for the stakeholders in our community. Seeds to Shoreline provides students with opportunities to participate in activities that they might otherwise only read about or see in a video clip. Most students don't develop a passion for environmental stewardship through reading or through media clips alone. They develop passion through doing."

Students venture into the Sapelo Island National Estuarine Reserve through the Seeds to Shoreline program. (Sapelo Island National Estuarine Research Reserve)



**“Most students don’t develop a passion for environmental stewardship through reading or through media clips alone. They develop passion through doing.”**

**- Robert Hodgen,  
science teacher,  
Richmond Hill High  
School**

## FEATURED STORY //

## Climate Stewards bring stewardship projects to classrooms

NOAA's [Climate Stewards Education Project](#) was created to increase educators' understanding of climate science and to reach youth as the beginning of a long-term strategy to make communities more resilient to climate change impacts. Educators can participate in an online community that provides webinars with experts and educational resources. Recognizing that knowledge is best synthesized through real world problem solving, Climate Stewards also includes a stewardship project component funded through a competitive application process. Educators in the program learn climate science, communication strategies, and science teaching techniques as the basis for developing and implementing locally relevant stewardship projects with their students and communities.



Bagging the bad guys – students remove invasive plants to prepare an area for planting native plants in Hawaii. (Courtesy of Angela Hunter-Sidrane)

For example, in Hawaii, sea level rise and increased storm action from climate change will force animals and plants in coastal wetland habitats to move inland to survive. On the North Shore of Oahu, erosion and invasive plants make habitat inhospitable and are threatening nesting sites for migratory birds like the Laysan albatross. Elementary educator Angela Hunter-Sidrane received funding from the Climate Stewards Education Project for two school years to restore habitat on Kahuku Point. During the project, 45 third graders removed 110 square meters of invasive plants, planted 800 grass starters, and 500 native plants — including endangered species grown from seed specifically for the project. They also removed 110 kilos (243 pounds) of trash and marine debris. The second year of the project will target 600 square meters of habitat, involving past and current third graders, 100 fourth graders, and 200 10th and 12th grade students from local high schools. By the end of the year, each student will have spent at least 12 hours restoring Kahuku Point.

Since the program began, over 400 educators have joined the NOAA Climate Stewards stewardship community and engaged thousands of students and community members in their stewardship projects. In 2016, 21 educators received stewardship project funding from Climate Stewards, reaching nearly 5,500 students to mitigate or adapt to climate change.

## GOAL 3

# Safety & Preparedness

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



NOAA

### OVERVIEW //

NOAA is committed to building a nation that is resilient to environmental hazards. Our agency provides sound environmental science to help guide choices that protect lives and property and support a strong economy. Public awareness is a crucial aspect of national safety and preparedness. Resilience to environmental hazards also depends upon coordination. Therefore, NOAA's education programs cultivate relationships with many partner organizations that help connect NOAA's science to actions that keep communities safe.

#### OBJECTIVES

3.1. Youth and adults from all backgrounds are aware of, prepare for, and appropriately respond to environmental hazards that impact health, safety, and the economy in their communities.

3.2. Formal and informal educators use and produce education materials and programs that integrate and promote consistent science-based messaging on hazards, impacts, and societal challenges related to water, weather, and climate.

3.3. Formal and informal education institutions integrate water, weather, and climate hazard awareness, preparedness, and response information into curricula, exhibits, and programs that create learning opportunities for youth and adults.

#### FY16 PROGRESS

NOAA provided creative outreach to improve public awareness of environmental hazards (highlights on page 23, featured stories on pages 26 and 27).

NOAA completed work in this area through strong partner relationships. Please see Objective 3.3.

NOAA refined and leveraged relationships with partners to promote resilience and hazard awareness (highlights on pages 23–24, featured story on page 25).



## GOAL HIGHLIGHTS //

## Reducing the risk of environmental hazards through education and outreach programs

It is important to reach everyone who might be affected by weather and other environmental hazards. For this reason, NOAA educates through both social and traditional media. Media impressions create teachable moments that improve people's understanding of the risks that environmental hazards pose in their daily lives.

- ▶ The [National Weather Service](#) expanded their communication and outreach efforts to create a robust social media presence for weather education. The National Weather Service spearheaded Trivia Tuesday, Fact Friday, Weather-Ready Classroom, and two very successful Back-to-School campaigns. [38]
- ▶ Through a live monthly radio program, [Cordell Bank National Marine Sanctuary](#) helped listeners in the Marin County, California listening area learn more about such topics as harmful algal blooms, discharge regulations, and the effects of El Nino on the region. Ocean Currents has been on the air for 10 years and serves as a source for safety awareness and preparedness to the region. [39]

## OBJECTIVE 3.1

Youth and adults from all backgrounds are aware of, prepare for, and appropriately respond to environmental hazards that impact health, safety, and the economy in their communities.

## GOAL HIGHLIGHTS //

## Partners help NOAA build a resilient nation

The concept of resilience is multifaceted, spanning from ecosystems to economies and preparedness to recovery. NOAA works with partners to achieve coordinated responses. Internally, we continue to better define education's role in resilience and its implications for our portfolio.

- ▶ [Raytheon](#), one of NOAA's first [Weather-Ready Nation Ambassadors](#), recently launched eight safety training modules that focus on the actions to take before, during, and after extreme weather, flooding, and tsunamis. Modules are recommended based on geographic location. For example, the application recommends that people in Colorado learn about winter weather hazards and recommends people in Florida learn about hurricanes and rip currents. [55]
- ▶ The [National Weather Service](#) and its partners, [PLAN!T NOW](#) and the [National Weather Association](#), added five additional cities in 2016 to host a WeatherFest. WeatherFest has become a very popular event where the public meets scientists from their local National Weather Service offices and local weather professionals in their community. This past year over 10,000 people participated in six WeatherFest rallies in New Orleans, Louisiana; Fayetteville, Arkansas; Detroit, Michigan; San Diego, California; Norfolk, Virginia; and Atlanta, Georgia. [68]

## OBJECTIVE 3.3

Formal and informal education institutions integrate water, weather, and climate hazard awareness, preparedness, and response information into curricula, exhibits, and programs that create learning opportunities for youth and adults.

## GOAL HIGHLIGHTS //

- ▶ The **Weather-Ready Nation (WRN)** initiative has over 3,600 organizations participating as WRN Ambassadors. In April 2016, the **National Weather Service Office of Communications** launched a WRN Ambassadors Educators newsletter for nearly 400 education organizations. The newsletter is published monthly and contains articles on NOAA’s weather education activities and programs of interest to educators. The newsletter also includes information from education partners such as the American Meteorological Society, the Federal Emergency Management Agency Affirmers Program for Youth, and NASA. [85]
- ▶ The **Environmental Literacy Program** strengthened the connections between community resilience initiatives and education efforts. The program set a new standard for resilience education by requiring grant applicants to leverage and incorporate relevant state and local hazard mitigation and/or adaptation plans. All applications considered for funding in 2016 met this standard, compared to less than half the applicants in 2015. [5]
- ▶ The **National Weather Service** conducted the first stage of a product inventory of education materials. Surveying field offices about their publications and outreach needs is the first step toward developing a resource guide for weather education. The resource guide will promote consistent messaging and make resources available for NWS field offices and partners, helping educators integrate science-based messaging on weather hazards into their offerings. [35]
- ▶ NOAA’s **Office for Coastal Management (OCM)** identified a knowledge gap in understanding how education programs support coastal resilience efforts, both in their own office and in the education community at large. OCM addressed this gap by creating a conceptual map of resilience education that draws connections between activities in the National Estuarine Research Reserve System and actions that make coastal communities more resilient. [41]

Students conduct a colorimetric test for water quality with NatureBridge, an Environmental Literacy Grantee. (NatureBridge)



- ▶ Since 2011, the education staff at **New Jersey Sea Grant (NJSG)** have partnered with their extension counterparts to extend NJSG’s rip current research and outreach activities to school-aged children through various means. In 2015, 10,000 copies of NJSG’s “Rip Current Kids” booklet were distributed to New Jersey’s K-12 schools. Schools were made aware of the availability of the booklet through social media and email notifications. Bulk orders were sent to teachers upon request. [90]

WeatherFest participants learn about severe weather science and how to protect themselves and their families when severe weather strikes their community. (American Meteorological Society)

## FEATURED STORY //

## Environmental Literacy Grantee offers free “PreparAthon” to help build resilience through education

Resilience is an issue of great concern for the state of Virginia. According to NOAA’s State of the Coast, 82 percent of Virginia’s shores are at “high” or “very high” risk for vulnerability to sea level rise, placing Virginia’s coasts just behind those of North Carolina and Florida. Climate change and resulting changes to weather patterns put the entire state at risk for damage caused by more frequent incidents of high winds, tidal flooding, rainfall flooding, severe storms, and drought. NOAA’s new resilience education grants help Virginia’s communities and others around our nation build the environmental literacy necessary for resilience to extreme weather events and environmental changes. The Science Museum of Virginia, one of the eleven [Environmental Literacy Grant](#) award recipients from the 2015–2016 cohort, held its first major public event as part of its “Learn, Prepare, Act — Resilient Citizens Make Resilient Communities” grant-funded project. The “PreparAthon” was offered in August 2016 and had a tremendous response from the community.



The Science Museum of Virginia’s Preparathon featured local NBC broadcast meteorologist, Andrew Freiden, who engaged the audience by testing their knowledge of local weather hazards. (Chris Rand/Science Museum of Virginia)

Nearly 3,000 attendees, many first-time museum visitors, took advantage of this free event and learned about Virginia’s particular vulnerabilities to climate-related threats from severe storms, flooding, and rising seas and how they can prepare for them. Disaster preparedness workshops and preparedness kits were provided to 200 families and later, additional kits were provided to those on a wait list. Workshops providing the knowledge and materials to build rain barrels were sold out. Attendees filled the seats of the theater to listen to NOAA’s Bill Sammler from the local weather forecast office, and local broadcast meteorologist, Andrew Freiden, who discussed the weather hazards facing Virginia and what actions to take when one is forecast. NOAA’s Science On a Sphere® was used as a platform to present global datasets on climate change and changes occurring in the ocean, such as sea level rise. Emergency managers from 29 local, state, and federal organizations were on site with equipment and vehicles providing opportunities for the public to talk with local firefighters, city planners, and non-profit organizations involved in preparedness and resilience.

Because this free event reached a large number of people, many of whom do not typically visit the museum, additional “PreparAthon” events will be offered annually during the 3-year grant project, which involves a range of offerings by the science museum, all reinforcing the message of why resilience is important to Virginians. This event exemplifies the similar efforts to build resilience through education that are underway in projects throughout the nation supported by NOAA’s [Environmental Literacy Program](#). Since the program began offering grants for resilience, the response has been the largest in the program’s 10-year history. In 2016, 170 applications, requesting more than \$77 million, were submitted from 40 states, the District of Columbia, and 3 U.S. Territories. The magnitude of this response highlights the need to build a long-term foundation for resilience through education.



The Science Museum of Virginia’s Preparathon engaged attendees with hands-on activities such as this “Challenge lab,” in which families tested water filtration methods. (Chris Rand/Science Museum of Virginia)

## FEATURED STORY //

## USC Sea Grant engages citizen scientists to track urban tides

Sea level rise in Southern California is expected to match global projections with an increase of 5–24 inches by 2050. Evidence of these new risks can be visualized through images of current flooding and erosion due to winter storms and high tides. This information enables community leaders and local governments to set priorities as they plan strategies that will help the region adapt to the future impacts of sea level rise. Water levels can be determined from photos, and in this way, images also provide critical information for scientists to help ground truth and calibrate scientific models used to project future sea level rise and identify vulnerable locations along the coast. These models are critical tools communities use to aid in adaptation planning.

To help fill this need for data, [University of Southern California \(USC\) Sea Grant](#) launched the Urban Tides Community Science Initiative in 2015. Urban Tides is a community based science effort to photo-document current tidal lines, beach erosion, and coastal flooding in Southern California. USC Sea Grant built partnerships with more than 25 non-formal education centers, scientists, schools, nonprofit organizations, and local municipalities in Southern California to engage communities in this effort. Urban Tides engages citizen scientists across the region to submit photos from local beaches and wetlands. Urban Tides is also a unique way to engage communities in meaningful science, increase ocean and climate literacy, and effectively invite more voices into the discussion of how we can adapt to rising seas.

USC Sea Grant has developed Urban Tides from the concept stage to implementation. The initiative has designated a series of beach and wetland locations where scientists need data. To make the data collection process efficient and reliable, Urban Tides established photo-taking protocols and developed a mobile app and database that lets users upload images, GPS location, and other observations with just a few clicks. USC Sea Grant has led seven beach walks and trainings bringing together scientists, community members, and government leaders. So far, the program has engaged more than 100 citizen scientists contributing photos, gathered more than 300 photo records, and effectively increased data gathering capacity for several researchers in the region. Visualizing risks through images of current flooding and erosion helps community members and local governments to set priorities as they plan strategies that will help the region adapt to the future impacts of sea level rise.



Urban Tides is a community based science effort launched in 2015 to document current tidal lines, beach erosion, and coastal flooding. (USC Sea Grant)

## FEATURED STORY //

## Hurricane awareness tour reaches new audiences

Hurricanes threaten the U.S. coast every year, but decades may pass before a tropical storm makes landfall in any given region. To help maintain awareness of this persistent yet widespread hazard, NOAA's [National Weather Service](#) and the [U.S. Air Force](#) conduct the annual Hurricane Awareness Tour, an outreach event that has been 30 years in the making. The tour allows weather forecast offices to engage with local partners, including emergency managers, airports, schools, and media. This year, the Hurricane Awareness Tour reached new audiences by adding an inland stop and webinar to their annual event.

Each of the five stops along this year's Hurricane Awareness Tour hosted hundreds of school children. Frank Revitte, Weather Forecast Office New Orleans Warning Coordination Meteorologist, summed it up: "It would be hard to beat a field trip for the targeted school aged group where they can not only tour hurricane hunter aircraft and related displays, but also have the opportunity to talk and interact with the on-board personnel who fly and navigate the planes and vessels; and of course the opportunity to interact with local NWS and National Hurricane Center meteorologists."

For the first time, the Hurricane Awareness Tour made an inland stop in San Antonio, Texas to highlight the inland threats from tropical storms. Inland flooding continues to play a significant role in fatalities and dangers associated with landfalling tropical weather systems; even if a storm is not classified as a hurricane, it can still produce copious amounts of rain. Residents along the Southeast U.S. Coast do not necessarily realize the risks they face from an inland tropical storm. During this stop, the San Antonio Weather Forecast Office partnered with FLASH (Federal Alliance for Safer Homes) to help push the #HurricaneStrong message.

For students not located along the coast or at one of the Hurricane Awareness Tour stops, the National Hurricane Center partnered with the University of Rhode Island to offer a live webinar for school kids across the country. The webinar was conducted from the Galveston, Texas stop since this was the location of the deadliest U.S. hurricane, which occurred in 1900. More than 500 classes and 9,000 students participated.

Students attend the 2016 Hurricane Awareness Tour, where they got to meet with National Weather Service personnel and tour Hurricane Hunter aircraft. (Frank Revitte/NOAA)

On the recent Hurricane Awareness Tour, several stops drew tens of thousands of residents in locations that have not experienced a landfalling hurricane in recent years. The Hurricane Awareness Tour provided an opportunity to learn about hazards, meet emergency managers, and gather information from local National Weather Service personnel. Events like these help to educate the public and enhance awareness of the mission and operations of NOAA with respect to hurricane forecasting and warning operations.



## GOAL 4

# Future Workforce

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



National Weather Service

### OVERVIEW //

Building and supporting a diverse and skilled future STEM workforce is critical to NOAA's mission. NOAA relies on a sustainable workforce pipeline that ranges from introducing young students to NOAA careers to transitional programs that prepare graduates to be successful in the workforce. Stories in this section exemplify how NOAA programs are inspiring and cultivating the next generation of scientists that resembles our diverse nation.

#### OBJECTIVES

4.1. Students, particularly from underrepresented groups, consider education and career pathways in disciplines that support NOAA's mission.

4.2. NOAA and partner institutions leverage federally funded assets to provide students, particularly those from underrepresented groups, with experiential learning, research, and scholarship opportunities.

4.3. Postsecondary students, particularly from underrepresented groups, pursue and complete degrees in disciplines critical to NOAA's mission.

4.4. Graduates completing NOAA-supported student opportunities continue education, enter the workforce, and advance in careers that support NOAA's mission.

#### FY16 PROGRESS

NOAA provided career awareness opportunities for underserved groups, such as low income families, inner-city students, disabled youth, and minority groups (highlights on page 29, featured stories on pages 33 and 34).

Scholarship programs established relationships with Minority Serving Institutions to recruit applicants who have not traditionally applied (highlights on page 30).

Critical education-to-workforce positions were created or expanded to strengthen the link between NOAA student opportunities and workforce entry (highlights on page 31, featured story on page 35).

NOAA improved data collection to capture the trajectories of NOAA-supported students and the NOAA workforce (highlights on page 32, featured story on page 36).

## GOAL HIGHLIGHTS //

## Expanding career options for students

Several programs provided opportunities for K-12 students to gain first-hand experience with NOAA-related science and career options. Many programs targeted underrepresented groups including students from low income families, inner-city students, disabled youth, girls, and students from minority groups such as Alaska Natives, Latino teens, and Pacific Islanders.

### OBJECTIVE 4.1

Students, particularly from underrepresented groups, consider education and career pathways in disciplines that support NOAA's mission.

- ▶ **NOAA Fisheries West Coast Regional Office** developed a pilot program to expose students from underserved communities to scientists and different career pathways, including oceanography, marine biology, and science journalism. Six students from Rainier Beach High School in Washington were selected to participate in two experiences: a classroom visit by experts and a research-based field trip. [28] (see Goal 2)
- ▶ **Alaska Fisheries Science Center's Auke Bay Laboratories** partnered with community organizations to provide students with opportunities to tour labs, meet scientists, and participate in summer camps and other hands-on activities. These partnerships have fostered presentations to over 150 students from underserved communities in Alaska during fiscal year 2016, exposing them to education and career pathways in NOAA Fisheries-related disciplines. [30] (see Goal 1)
- ▶ The third annual **NOAA Fisheries Science Camp** highlighted current fisheries topics and marine science careers to 35 incoming 8th graders from low income communities. In order for the camp materials to reach many more students in the coming years, seven science modules from the camp were developed into kit lessons aligned with Hawaii Department of Education standards. [31] (see Goal 1)
- ▶ The Energy Efficiency to Mitigate Climate Change and Ocean Acidification (EECCOA) program used **B-WET** grant funds to empower students to address climate change and ocean acidification. EECCOA is a science education program that works with predominantly Hispanic and Latino middle and high school students by facilitating students' action and innovation through project-based learning. EECCOA requires the application of scientific concepts into engineering practices to reduce the carbon footprint of their school campus in a measurable way. [75]
- ▶ In 2016, the **National Weather Service Office of Communications** and **Office of Equal Opportunity and Diversity** created a new career resource. The **Faces of the National Weather Service** contains career resources, student and employment opportunities, as well as personnel profiles of a diverse group of NWS employees in multiple career fields. Between the launch in June and October of 2016, the site had approximately 40,000 site visits. [86]



A student visits a National Weather Service exhibit to learn about weather forecasting technologies and college opportunities in Earth system sciences. (National Weather Service)

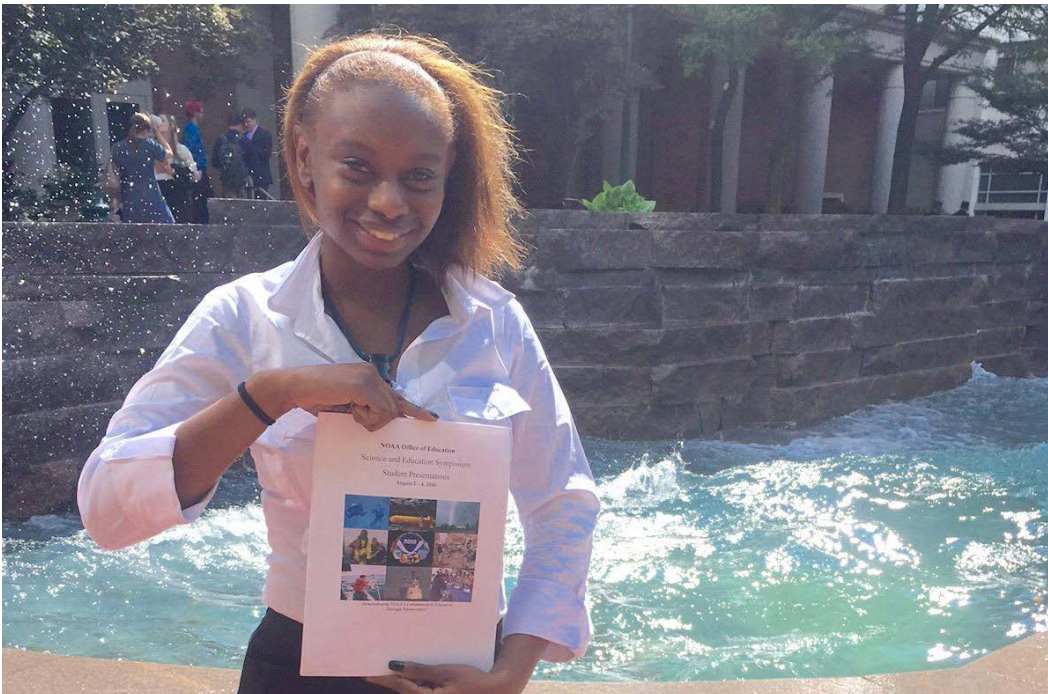
## GOAL HIGHLIGHTS //

## Targeted communication to recruit diverse audiences

Scholarship programs aimed to attract more underrepresented students through targeted recruitment and outreach. By leveraging established relationships with Minority-Serving Institutions and providing students with application information, NOAA was able to expand and diversify the pool of applicants.

### OBJECTIVE 4.2

NOAA and partner institutions leverage federally funded assets to provide students, particularly those from underrepresented groups, with experiential learning, research, and scholarship opportunities.



Educational Partnership Program with Minority-Serving Institutions Undergraduate Scholar Char'mane Robinson at the 2016 Science & Education Symposium at NOAA Headquarters in Silver Spring, Maryland. (Courtesy of Char'mane Robinson)

- ▶ The [Hollings Scholarship Program](#) recruited more underrepresented students through the use of targeted outreach. For example, recruiters visited campuses of six Historically Black Colleges and Universities and two Minority-Serving Institutions. [17]
- ▶ The [Dr. Nancy Foster Scholarship Program](#) targeted Minority Serving Institutions through direct messaging to recruit more non-traditional applicants. For fiscal year 2016, there were 118 applicants from 101 institutions with at least one applicant from 16 new institutions. Of the new institutions, four were the top producers of bachelor's, master's, and doctoral degrees in the marine science and fisheries disciplines for Black and Hispanic students. [23]
- ▶ Representatives from the NOAA Education community who provide student opportunities — including the [Educational Partnership Program with Minority Serving Institutions](#), the [Hollings Scholarship Program](#), the [Sea Grant Knauss Marine Policy Fellowship](#), the [Office of Coastal Management](#), and the [Dr. Nancy Foster Scholarship Program](#) — collaborated to develop a common rack card that houses key information for NOAA undergraduate and graduate opportunities. The NOAA rack card gives students a brief synopsis of several NOAA student opportunities and provides a website link to application information. [73]



## GOAL HIGHLIGHTS //

## What's next? How NOAA is helping students start their careers

Programs provided more scholarship and training opportunities that prepare students to enter the workforce. These opportunities strengthen the link between NOAA student opportunities and NOAA-related career paths by developing the skills and networks students need to transition and be competitive in the workforce.

**OBJECTIVE 4.3.**  
Postsecondary students, particularly from underrepresented groups, pursue and complete degrees in disciplines critical to NOAA's mission.

- ▶ The **Office of Education** expanded the pool of students eligible to participate in the National Science Foundation (NSF) Graduate Research Internship Program (GRIP) at NOAA. Before 2016, students had to be in the Graduate Research Fellowship Program to be eligible for this internship. This expansion allows any student supported by an NSF Geosciences grant to apply for GRIP and intern at NOAA. [74]
- ▶ The **National Satellite and Information Service** partnered with the NOAA-funded Cooperative Remote Sensing Science & Technology Center to provide internships for graduate students. Students were matched with NOAA scientists and trained in skills specifically for research-to-operations. The goal of this program is to provide students with in-depth training to develop critical research and technical skills. [15]
- ▶ The **Quantitative Ecology and Socioeconomics Training (QUEST)** program was initiated by **NOAA Fisheries** to enhance education and training for the next generation of ecosystem scientists, stock assessment scientists, and economists. QUEST connects faculty, graduate students, and undergraduates with NOAA Fisheries scientists in the fields of quantitative ecology and socioeconomics through funding, resources, and research opportunities for faculty and students. [45]

Hollings Scholars visit NOAA's campus in Suitland, Maryland during their scholarship orientation. (Marlene Kaplan/NOAA)



## GOAL HIGHLIGHTS //

## Using data to understand the NOAA workforce pipeline

Which factors are instrumental in influencing students' career choices? To address this question, NOAA improved data collection and maintenance to better understand student trajectories and the NOAA workforce.

**OBJECTIVE 4.4.**  
Graduates completing NOAA-supported student opportunities continue education, enter the workforce, and advance in careers that support NOAA's mission.



Hollings Scholar Ashley Hann conducts research during her summer internship with NOAA Fisheries. (Courtesy of Ashley Hann)

- ▶ The [Educational Partnership Program with Minority-Serving Institutions](#) and the [Hollings Scholarship Program](#) tracked and updated post-graduation records for over 70% of alumni, allowing the programs to better understand student career trajectories. In addition, EPP is developing a prototype for a new user-friendly database that will allow for efficient input, export, and analysis of critical student and alumni data. [12]
- ▶ The [NOAA Education Council's Diversity and Professional Advancement Working Group](#) (DPAWG) developed and disseminated a NOAA-wide survey that identified disparities between the minority and majority NOAA workforce perceptions on job satisfaction, mentorship, career advancement, and diversity. DPAWG briefed the NOAA Executive Council, obtained individual commitments from NOAA Leadership to increase inclusion efforts, and assisted with the development of NOAA's Diversity and Inclusion policy. [9]
- ▶ Students trained by [QUEST](#) are continuing their education and entering the workforce in careers that support [NOAA Fisheries'](#) mission. Currently, 10 QUEST faculty are advising 12 master's and 36 doctoral students. They also have 7 postdoctoral and 14 undergraduate students conducting research in their labs. Of past participants, two are working for NOAA Fisheries, one is in academia, three are working for state government agencies, and one is working for a non-profit organization. [45]

## FEATURED STORY //

## Latino high school students receive training for green careers

The Pájaro Valley region in California faces many challenges, including high local poverty rates and low academic achievement. As a result, many local high school graduates would be entering low-paying service sector or farm worker jobs. However, the local green job market is growing and will need more workers. To address both this need and opportunity, the newly created Green Careers Institute, funded by a grant from the [California Bay Watershed Education and Training \(B-WET\)](#) program, works primarily with Latino teens from low-income families in the Pájaro Valley to provide training in environmental careers.

The goal of the Green Careers Institute is for teens to be exposed to a wide range of green careers, to become stewards of the environment, to understand the impact of climate change and other environmental challenges facing the community, to learn skills in green careers, and to develop networks with local green career professionals. Twelve teens participated in a four-week, paid, intensive summer job training program. They shadowed and assisted professionals in the day-to-day operations of a wide range of green careers: water quality management, marine and wetland conservation, sustainable agriculture, and restoration ecology.

Pre- and post-internship surveys showed that at the end of the program 90% of the students were able to list and describe five green careers, 75% were able to name three or more facts they learned about the different green careers they experienced throughout the month, 100% spent more time in nature, and 90% said they think about the environment in their daily personal decision making. The vast majority of interns felt the program changed their lives in exposing them to many previously unknown careers and university study paths.



“This program changed my life”, said Gonzalo, one of the interns who went through the Green Careers program and graduated high school. Gonzalo was hired shortly after the program ended at the Lonely Mountain Farm, where he is surrounded by a supportive team who are encouraging him to choose college and a career path. A second intern, Evelyn, is now working as an environmental mentor to younger students and is planning on becoming an environmental educator. Evelyn’s post survey said “This program had a great impact on my life because I got to learn and see many things. It also helped me to view animals and plants different because in the end it all matters.”



Gonzalo, one of the graduated interns, works on the Lonely Mountain Farm, a job he secured after the Green Careers program ended. (Watsonville Wetlands Watch)

Geneva, a Green Careers intern, takes water quality measurements to assess the health of Watsonville slough. (Watsonville Wetlands Watch)

## FEATURED STORY //

## Finding NEMO in Washington, D.C.

### NOAA and partners work together to inspire the next generation of ocean scientists in the nation's capital

The demographic makeup of the United States is changing, but minorities continue to be underrepresented in sciences — including the ocean sciences. Helping to bridge this gap, a small NOAA program called **NEMO** (NOAA Enrichment in Marine Sciences and Oceanography) brings together NOAA scientists, teachers, and local partners to provide students in Washington, D.C.'s diverse, inner city public schools (DCPS) with mentors and unique opportunities to learn about the ocean sciences.

The program began as a one-year effort in 2007 to help DCPS field its first-ever team in the [National Ocean Sciences Bowl Program](#), a national academic competition for high school students in the ocean sciences. Nearly 10 years later, NEMO has reached several hundred students from 10 schools, and 18 DCPS teams have participated in the National Ocean Sciences Bowl.

NEMO consists of after-school activity sessions led by teachers and field trips coordinated by NOAA and its partners. In fiscal year 2016, students from McKinley Technology Middle School participated in several programs as part of NEMO, including a boat trip to study the Potomac River ecosystem with the Chesapeake Bay Foundation, squid dissections with the National Aquarium in Baltimore, Maryland, building miniature buoys with the NOAA Chesapeake Bay Program Office, and explorations of the Smithsonian Ocean Hall along with a tour of the NOAA Fisheries National Systematics Laboratory.

Participating students have also brushed elbows with leaders in the ocean science community, discussing ocean health and fisheries with NOAA Fisheries Chief Science Advisor Dr. Richard Merrick, touring the U.S. Naval Observatory with former Oceanographer and Navigator of the Navy, Rear Admiral David Gove, and meeting with Dr. Don Walsh, who co-piloted the only manned descent to the deepest part of the ocean, Challenger Deep.

The program depends on close partnerships with teachers, local organizations, scientists who serve as mentors, and NOAA staff. Program evaluation data show students experience many “firsts” through NEMO, such as being on a boat or studying physiology through dissection. NEMO also sparked students’ interest to further explore marine science, college studies, and STEM careers.

Zaire Garrett, one of NEMO's first participants from 2007, recently graduated with a degree in landscape architecture from the University of Rhode Island, and reflected on his NEMO experience. “If they [students] haven’t decided on a career, [NEMO] opens up a lot of ideas for what you might want to do in your life and is a really great start.”



Students from McKinley Technology Middle School take water samples from the Potomac River to assess river health while participating in an instructional boat trip offered by the Chesapeake Bay Foundation and NOAA Fisheries. (Laura Oremland/NOAA)

## FEATURED STORY //

## National Weather Service leverages the Pathways Internship Program to expand NOAA's workforce

The [National Weather Service](#) (NWS) is dedicated to building a Weather-Ready Nation by providing accurate and timely weather forecasts and warnings. NWS meteorologists must be able to quickly analyze weather data and provide critical information that can help save lives and property during extreme weather events. The NWS has over 600 vacancies and the number of jobs in atmospheric sciences is anticipated grow by at least ten percent between 2012–2022. As society becomes more vulnerable to extreme weather events, we need to cultivate a workforce pipeline that is highly capable of carrying out the NWS's role in protecting lives and property. The NWS is taking steps to address this need by providing transitional training opportunities that can lead directly to employment.

**“Entry-level positions within the field of meteorology are very competitive, and the National Weather Service was a dream career for me in college. The Pathways program gave me the experience necessary to achieve my short-term career goals.”**

- Connor Dennhardt, NWS El Paso, University of Nebraska

The Pathways Internship Program was created to provide opportunities for students and recent graduates to gain valuable work experience. In 2015, the NWS created and filled over 60 Pathways Internship positions. These students were placed in Weather Forecast Offices (WFOs) across the nation and will be eligible for federal employee conversion at the end of the internship. As interns, these students worked side-by-side with forecast meteorologists and gained real-world skills. Connor Dennhardt, a 2015 Pathways Intern, was able to become certified in upper-air observations and aided senior forecasters in monitoring weather in real time. Lauren Visin, also a 2015 Pathways Intern, was able to gain valuable experience in local terrain and hydrology, flash flood warning and response, and river flood warning and response during a major flooding event in Greenville, South Carolina.

**“Pathways ... allowed me to learn NWS policies and procedures, local meteorology, and operational responsibilities before converting to an Intern position, which I believe has given me an advantage in being able to independently perform Intern responsibilities.”**

- Lauren Visin, WFO Greenville-Spartanburg, Florida State University

In 2016, the NWS converted 22 of the 2015 Pathways Interns to Meteorologist Interns. A Meteorologist Intern is a permanent, career ladder position in the NWS. The 22 interns are working in WFOs across the country. Tatiana Gonzalez, a former Pathways Intern, worked at the Meteorological Development Laboratory where she played a critical role in improving the forecast efficiency of the Probabilistic Storm Surge model. Tatiana, now a federal employee for the NWS, explains, “Without the help of this program I would had never realized how much I enjoy working with models. But more importantly, I would had never been able to expand my network and have a job offer as soon as I defended my dissertation.” Now in the program's second year, the NWS currently has 25 Pathways Interns on board and is planning to bring on more fiscal year 2017.



Connor Dennhardt, a 2015 NWS Pathways Intern, poses in front of the Weather Forecast Office in El Paso, Texas. (National Weather Service)



Lauren Visin was a 2015 Pathways Intern in the Greenville-Spartanburg Weather Forecast Office in South Carolina. (National Weather Service)

## FEATURED STORY //

## Four Educational Partnership Program alumni selected as Knauss Marine Policy Fellows

NOAA's higher education programs have bolstered efforts to conduct collaborative outreach to help students, particularly those from underrepresented groups, successfully navigate the pipeline into NOAA and STEM careers. In fiscal year 2016, four [Educational Partnership Program with Minority Serving Institutions](#) (EPP/MSI) alumni were selected as [Sea Grant Knauss Marine Policy Fellows](#).

The Knauss Marine Policy Fellowship is a unique opportunity for highly qualified graduate students interested in marine, coastal, and Great Lakes policy to spend a year in Washington, D.C., working at an executive agency or on Capitol Hill. The selection of these students recognizes their outstanding academic and research achievements, as well as the strong support and resources provided by the EPP/MSI institutions. As Knauss Fellows, these students are currently applying their scientific expertise to inform policy decisions affecting the nation's natural resources.

Last year, Efeturi Oghenekaro completed her Ph.D. at the University of Maryland Eastern Shore, the lead institution of the NOAA Living Marine Resources Cooperative Science Center (LMRCSC). She studied the mesozooplankton dynamics of Maryland coastal bays. Efeturi is currently a Knauss Fellow in the Office of International Affairs for NOAA Research. Efeturi said this fellowship will be instrumental in helping her gain a working knowledge of how environmental policies are written and implemented at the highest levels of government.

Symone Johnson is currently working on her master's degree at Delaware State University, part of the NOAA Environmental Cooperative Science Center. She is developing a conservation plan for sand tiger sharks in Delaware Bay. Symone was also an EPP/MSI Undergraduate Scholar while earning her bachelor's degree in Marine and Environmental Science at Hampton University. Her fellowship placement is in the NOAA Office of Education.

Larry Redd, Jr., earned his master's degree at Hampton University, part of the NOAA LMRCSC, where he completed a research project with implications for sustainable aquaculture. "It means quite a lot to be selected for the Knauss Fellowship," said Redd, Jr., "the Marine Science field lacks diversity. Hopefully I can be an example to other students that if you put in the work and trust yourself that you can make an impact." Larry was placed with NOAA Fisheries in the Highly Migratory Species Division.

As an undergraduate student, Jhoset Burgos-Rodriguez participated in a Research Experience for Undergraduates Program at the University of Maryland Eastern Shore through NOAA LMRCSC. Jhoset is currently finishing his law degree at the University of Puerto Rico. Through his Knauss Fellowship and law degree, Jhoset aspires to be an effective link between science and the policy-making process and dedicate his career to public service. Jhoset is currently a Fellow in the Department of Interior Office of Insular Affairs.



Educational Partnership Program alumni (left to right) Jhoset Burgos-Rodriguez, Larry Redd, Jr., Efeturi Oghenekaro, and Symone Johnson were supported by NOAA in their graduate or undergraduate careers. They returned to NOAA as Knauss Marine Policy Fellows, taking an important step down the NOAA career pipeline. (Brooke Carney/Sea Grant)

**“Hopefully I can be an example to other students that if you put in the work and trust yourself that you can make an impact.”**  
- Larry Redd, Jr., 2016 Knauss Marine Policy Fellow

## GOAL 5

# Organizational Excellence

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



NOAA

## OVERVIEW //

The NOAA Education Community is dedicated to continually improving our efforts to reach the goals set out in our strategic plan. The goal of organizational excellence drives us to enhance performance, provide the best service and resources to the public, and create avenues for NOAA educators to showcase their work. By integrating partnerships, evaluation, and professional development, we are able to uphold our commitment to provide quality education opportunities and expand our reach.

### OBJECTIVES

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

5.2. The NOAA Education community develops implementation plans and establishes agency education priorities informed by stakeholder needs and national initiatives.

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

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

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

### FY16 PROGRESS

NOAA's education staff and programs received awards for achievement (highlights on page 38).

NOAA programs refined their education priorities by creating individual strategic plans (highlights on page 38).

Programs built productive and sustainable networks by connecting individuals and resources within the NOAA education community (highlights on page 39, featured stories on pages 42 and 43).

NOAA improved education efforts by collecting information on program activities and outcomes and assessing educator needs (highlights on page 40).

NOAA cataloged and supported programs that target underserved audiences (highlights on page 41).

## GOAL HIGHLIGHTS //

## NOAA Education recognized for advancing NOAA's mission

NOAA Education programs and projects have earned internal and external awards highlighting our work. These awards acknowledge the creativity and dedication of the NOAA Education community.

- ▶ A marine debris feature produced for [NOAA's Ocean Today](#) multimedia kiosk received a Regional Emmy® Award from the National Capital Chesapeake Bay Chapter of the National Academy of Television Arts and Sciences. The [15-minute video](#) explains what marine debris is, how it affects our ocean, and what people can do to prevent it. [65]
- ▶ The [NOAA Education Council's Diversity and Professional Advancement Working Group](#) received the NOAA Administrator's Award for Challenging the Status Quo and Driving Agency Priorities on Diversity and Inclusion. NOAA leadership took action toward a diverse and inclusive workforce based on results of a NOAA-wide survey that gathered perspectives about diversity, inclusion, and opportunities for professional advancement. [69]
- ▶ Jennifer Saari, a [National Weather Service](#) meteorologist intern, was named Employee of the Month in 2016 for her work to help the deaf and hard-of-hearing community stay safe from lightning. Over the last four years, Jennifer has led local and national efforts to better serve this community, including building awareness among Warning Coordination Meteorologists and creating the targeted slogan "[See a Flash, Dash Inside!](#)" [72]

## OBJECTIVE 5.1.

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

## GOAL HIGHLIGHTS //

## Strategically planning for success

Education programs refined their direction through strategic planning to improve effectiveness and efficiency. Strategic planning helps programs clearly outline educational priorities based on the needs of those served and connect those priorities to NOAA's mission.

- ▶ NOAA's [Office of Education](#) and the members of the [Coastal Ecosystem Learning Center Network](#) developed a new strategic plan that emphasizes the unique nature of the network: that its members work together to engage the public in protecting coastal and marine ecosystems. The network has identified two priorities for the upcoming year, youth engagement and community resilience. [33]
- ▶ The [National Weather Service](#) developed an education strategic plan. Through the strategic plan, the National Weather Service established a common vision and goals for education, which encompasses a large and disparate network of weather professionals across the country. [36]

## OBJECTIVE 5.2.

The NOAA Education community develops implementation plans and establishes agency education priorities informed by stakeholder needs and national initiatives.



## GOAL HIGHLIGHTS //

## Working together to strengthen our programs

Programs started to build productive and sustainable networks by connecting individuals and resources within the education community. These connections are especially important because they provide forums for regular communication and coordination within NOAA educator networks and build capacity through professional development.

### OBJECTIVE 5.3.

NOAA educators and partners collaborate at local, regional, and national levels to coordinate efforts, build capacity, and better serve educational audiences.



Educators from the National Marine Sanctuaries System participate in a team building exercise in Santa Cruz, California at their yearly education team meeting. (Tracy Hajduk/Office of National Marine Sanctuaries)

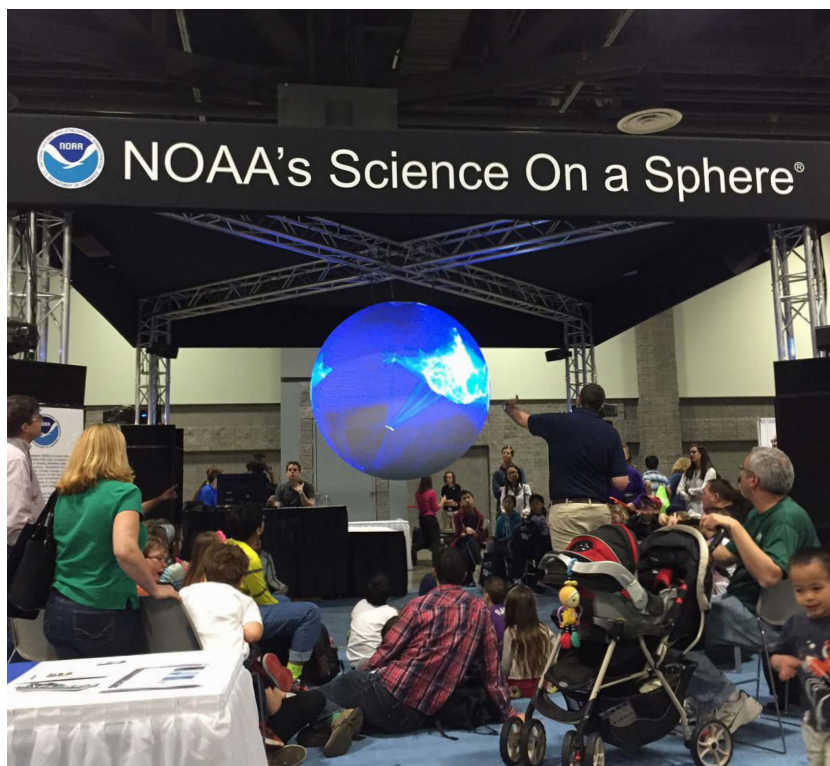
### NOAA educators strengthened network connections and capacity to share NOAA science

- ▶ The [National Sea Grant College Program](#) re-energized the Sea Grant Educators' Network. Data on what Sea Grant educators expect from and will contribute to the network were collected, and bimonthly webinars were created as an incentive to convene regularly. In 2016 there was a 35% increase in the number of Sea Grant educators attending the network meeting at the National Marine Educators Association conference. [8]
- ▶ [NOAA Fisheries](#) reinvigorated the network of Fisheries educators through the Fisheries Education Council. As a result of consistent, monthly engagement, the network developed a common process to share best practices through the web, and these best practices documents were shared or updated at least six times in fiscal year 2016. [27]
- ▶ The [NOAA Education Council's Local/Regional Collaboration Working Group](#) set out to support the establishment and maintenance of regional NOAA educator networks. Four pilot networks identified priority education issues unique to their regions to address over the next two years. The working group coordinators tracked and shared best practices across regions. [49]

## GOAL HIGHLIGHTS //

**Professional development for NOAA educators**

- ▶ The [Office of Education](#) trained 23 presenters from across NOAA line offices to use [Science On a Sphere®](#) for the 2016 USA Science and Engineering Festival. Approximately 365,000 people attended the festival in Washington, D.C. The presenters are now available to support future events at the Science On a Sphere at NOAA Headquarters in Silver Spring, Maryland. [3]
- ▶ The [NOAA Education Council's Internal Professional Development Working Group](#) developed six informational webinars that provide an overview NOAA's educational enterprise. The goal of this series is to serve as an orientation for NOAA educators to help ensure that staff are aware of education and outreach programs and resources available throughout our agency. [20]
- ▶ The [Office of National Marine Sanctuaries](#) aimed to improve climate change education and communication for sanctuary educators. This year, 20 out of 27 targeted site educators (74%) have participated in professional development opportunities geared toward effectively communicating climate change messages to the public. [42]



Families gather around NOAA's Science On a Sphere at the USA Science and Engineering Festival. (NOAA)

## GOAL HIGHLIGHTS //

**Improving programs through evaluation**

Programs implemented evaluation strategies to improve education programs, products, and services. Evaluation is a tool that helps programs efficiently measure progress and demonstrate impact. This year, NOAA made improvements by collecting information on program activities and outcomes as well as assessing educator needs.

- ▶ The [National Estuarine Research Reserve System](#) implemented a new system for collecting information about [Teachers on the Estuary \(TOTE\)](#) workshops. With a database, this information will be collected for the first time and will allow the program to tell a national TOTE story. [63]
- ▶ The [Teacher at Sea Program](#) added pre- and post-season survey questions to track the use of NOAA resources by Teacher at Sea participants and alumni. This information will be used to improve support to participants and alumni as they integrate their ship-based research experience into their curricula and teaching practice. [64] (see Goal 1)

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

## GOAL HIGHLIGHTS //

## Understanding the portfolio of NOAA programs for underserved groups

Members from the NOAA Education community identified and cataloged NOAA programs that target underserved audiences. Awareness is a prerequisite to coordination; by developing records of the number and range of programs geared toward reaching diverse audiences, the NOAA education community can better support them in the future.

- ▶ The [NOAA Education Council's Underserved Audiences Working Group](#) conducted an inventory and identified 44 education programs that specifically target underserved groups. This information will not only help articulate and understand how education supports NOAA's goals of diversity, inclusion, and reaching audiences from many backgrounds, but also how these programs can be better supported in NOAA. [58]
- ▶ The [Office of National Marine Sanctuaries](#) provided over \$28,000 to fund six programs that support diversity and inclusion education. Five of the funded programs focused on bringing sanctuary stories and experiences to underrepresented audiences around the country. [82]

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



A group of young surfers hit the winter swell in Santa Barbara. (Claire Fackler/Office of National Marine Sanctuaries)

## FEATURED STORY //

## Teacher at Sea alumni find creative ways to keep bringing the sea home to students

### Alumni Association maintains connection to NOAA and amplifies program benefits

NOAA's [Teacher at Sea Program](#) provides unique hands-on ocean research experiences for educators, and many participants have described their experiences as life-changing. However, the true demonstration of the program's value comes in the months and years after teachers sail with NOAA, as they work to find creative ways to share what they've gained with their students, schools, local communities, and the general public.



The Teacher at Sea Program's Alumni Association exists to track and support these outreach efforts, thereby amplifying the program's benefits. In fiscal year 2016, alumni participated in 35 events tied to their experiences at sea, including presentations, workshops, conferences, field trips, and other outreach opportunities. A total of 62 alumni volunteered or gave presentations about their experience at 8 local, regional, and national conferences. Other program alumni collaborated with as many as 30 NOAA scientists via field trips and classroom visits. These collective efforts reached thousands of students and members of the community.

Teacher at Sea Sue Zupko poses with the shipment containing the drifter buoy her class adopted in 2014. (Courtesy of Sue Zupko)

One standout example of this continued Teacher at Sea alumni–NOAA partnership comes from Huntsville, Alabama. Teacher Sue Zupko, inspired by her at-sea experiences in 2011 and 2014, launched an annual ocean-themed festival for students and families at her school. On April 15, 2016, Ms. Zupko hosted the second annual Seven Seas Celebration at Weatherly Heights Elementary. More than 200 students and parents attended the marine science and math activity night. Participants made nautical flags, weighed and measured fish that they created, followed the drifter buoy that was launched during Ms. Zupko's 2014 research cruise, and played ocean-themed games. Students collected Pokémon-inspired marine life cards at each station.

With support from the program, NOAA Corps Lieutenant (LT) Jonathan Heesch traveled to Huntsville for the event and taught students about the importance of ship safety. LT Heesch brought water survival suits for the students to try wearing, and they had fun racing to see who could don their suit the fastest. "Ultimately, through the process of having fun, the kids received an understanding of the dangers posed by being at sea and a solid exposure to the possibility of a career at sea," said LT Heesch.

By maintaining strong relationships with our program alumni, we are able to see the lasting benefits to the educators, their students, and their school communities.

NOAA Corps LT Jonathan Heesch stands with a Seven Seas Celebration participant wearing a water survival suit. LT Heesch traveled to the Huntsville, Alabama event to teach students and parents about ship safety. (Sue Zupko)



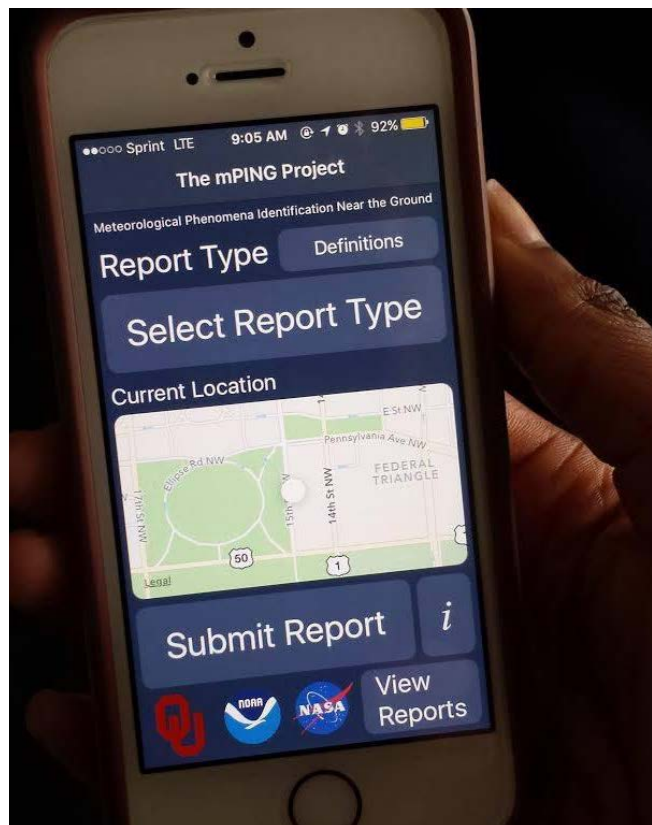
## FEATURED STORY //

## NOAA collaborates with White House and partners to advance citizen science and crowdsourcing

The rapidly growing field of citizen science offers opportunities for government to better partner with the public to address real-world challenges. John Holdren, Assistant to the President for the Science and Technology, issued a memo entitled Addressing Societal and Scientific Challenges through Citizen Science and Crowdsourcing to detail a plan for taking advantage of these opportunities. Released on September 30th, 2015, the memo states that citizen science projects can provide hands-on STEM learning and increase STEM literacy, enhance scientific research, and address societal needs. It outlines principles federal agencies should apply to ensure future use of citizen science and crowdsourcing in a way that is appropriate and leads to greatest value and impact. It calls for improved coordination of and support for citizen science and crowdsourcing within and between agencies.

To address this call, NOAA worked through the Federal Community of Practice for Crowdsourcing and Citizen Science in partnership with the White House Office of Science and Technology Policy to assist with the creation and launch of [CitizenScience.Gov](http://CitizenScience.Gov). This government-wide website is designed to accelerate the use of crowdsourcing and citizen science across government agencies and aid in coordination of government-wide efforts. Launched in April 2016, it serves as a one-stop hub to access resources, including a toolkit for starting and supporting projects, a catalog of projects, the home for the federal community, and a blog that tells citizen science stories.

This work resulted in increased awareness of and interest in federal citizen science initiatives. [CitizenScience.Gov](http://CitizenScience.Gov) has had over 25,000 visits to date. Following the launch of the site, the recruitment rate for the [Federal Community of Practice for Crowdsourcing and Citizen Science](http://FederalCommunityofPracticeforCrowdsourcingandCitizenScience) more than doubled with the community growing to 322 members representing 60 federal organizations. NOAA submitted 40 of the 306 projects currently in the catalog. [CitSci.org](http://CitSci.org), the largest database of citizen science projects in the world, has partnered to expand the reach of the catalog. Ten posts telling the stories of NOAA projects made on to [CitizenScience.Gov's blog](http://CitizenScience.Gov'sblog). Many of these stories were also posted on [NOAA's Education and Outreach Facebook page](http://NOAA'sEducationandOutreachFacebookpage), where they had an average reach of over 2,000 people.



The NOAA National Severe Storms Laboratory is collecting citizen science weather reports through the Meteorological Phenomena Identification Near the Ground, “mPING,” app. This is one of the 40 projects NOAA contributed to the federal catalog of citizen science projects on [CitizenScience.gov](http://CitizenScience.gov). (June Teisan/NOAA)

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A glass-bottom boat takes a group of 4th grade Michigan students to visit the shipwrecks of Thunder Bay National Marine Sanctuary as part of the Every Kid in a Park program. (Thunder Bay National Marine Sanctuary)



# ACKNOWLEDGMENTS

## NOAA Education Council

The NOAA Education Council members listed below represent and coordinate education programs across the agency. Council members presented the stories in this report to highlight breadth of NOAA Education.

### Council Chair

Louisa Koch

### Council Vice Chair

Christos Michalopoulos

### Bay Watershed Education and Training (B-WET) Program

Jim Foley, Bronwen Rice

### National Satellite and Information Service

Nina Jackson, Dan Pisut

### National Marine Fisheries Service (NMFS)

Kate Naughten, Lisa Hiruki-Raring

### NOAA Teacher at Sea Program (NMFS)

Jennifer Hammond

### National Ocean Service (NOS)

Peg Steffen, Bruce Moravchik

### Office for Coastal Management (NOS)

Atziri Ibanez, Nancy Cofer-Shabica

### Office of National Marine Sanctuaries (NOS)

Tracy Hajduk, Seaberry Nachbar

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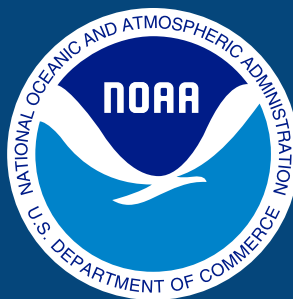
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## Image contributors

We would like to thank the many people who contributed images for this document. These images represent a sampling of the many activities, audiences, and settings in the current educational programming of NOAA and its partners.



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