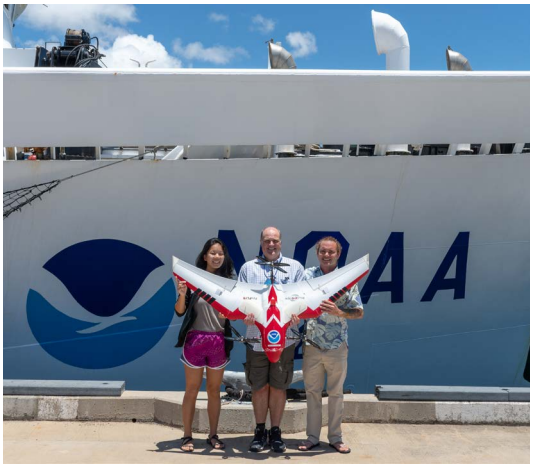
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

NOAA Education Accomplishments Report

FISCAL YEAR 2019



ADVANCING NOAA'S MISSION THROUGH EDUCATION

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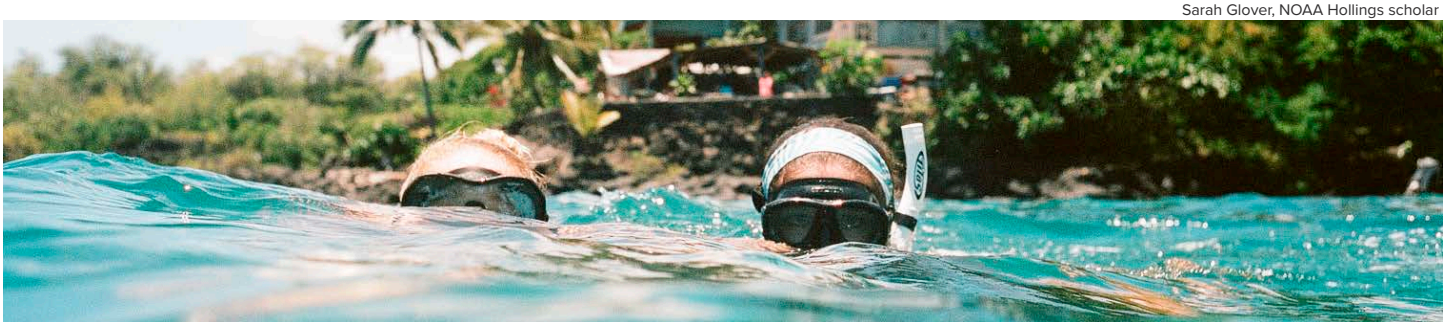
Sarah Glover, NOAA Hollings scholar



LETTER FROM THE DIRECTOR

Friends of NOAA Education,

On behalf of the NOAA Education community, I'm pleased to present our 2019 Accomplishments Report. This report highlights the important role that education played in meeting NOAA's mission of science, service, and stewardship.

This year, we introduce you to students whose restoration project saved their shoreline from a hurricane, a meteorology class that learned the art of high-stakes weather forecasting, and an educator from South Dakota who brought his students to a NOAA lab in Mississippi so they could see the ocean for the first time. Connections and opportunities like these put meaning into the work we do and drive us forward.

The stories we share in this report show how today's youth are emerging as the next generation of problem-solvers. Our educators and partners empower students to take action and make changes in their schools and communities, whether convincing school administrators to rethink cafeteria waste or educating their communities about climate change. Across these different projects, we can see how students gather data, challenge norms, and take the initiative to address environmental problems that they see around them in the places and spaces they care about. NOAA provides the opportunities, and youth lead the way.

It is gratifying to see the students we train go on to do great things for our agency and the broader fields of science, technology, engineering, and math. Thanks in part to NOAA's dedicated partnerships with minority serving colleges and universities, our alumni are breaking through barriers for underrepresented groups in the sciences and championing the next generation. I am heartened to see our community's ever-growing commitment to equitable and inclusive education programs, and I look forward to seeing what the future will bring in the years to come.

Finally, we deeply appreciate the contributions of our partners and the people we serve. Without innovative organizations, talented students, and passionate educators, we would not be able to accomplish so much in support of NOAA's mission. We thank you and look forward to many years of future collaborations.

Sincerely,

Louisa Koch
Director of NOAA Education

INTRODUCTION

Advancing NOAA's mission through education

The **National Oceanic and Atmospheric Administration** (NOAA) is a scientific agency that observes and predicts conditions in our ocean and atmosphere. From daily weather forecasts to long-term climate monitoring and from fisheries management to marine commerce, NOAA provides communities, decision-makers, and people across the country with the information they need when they need it.

Education extends NOAA's role in environmental research, forecasting, management, and protection. The complex task of improving economic and social well-being through Earth science would not be possible without an engaged public. It is not enough for NOAA to study the ocean and atmosphere; our agency must also educate so that individuals can use this information to support robust economies, resilient communities, and healthy ecosystems.

The University of the Virgin Islands Storm Strong Program, funded by NOAA's Environmental Literacy Program, hosted an eight-week workshop series that focused on teaching participants about hazards and how to prepare communities for hurricanes and their impacts. (Kristin Wilson Grimes/University of the Virgin Islands)

NOAA takes an "all hands on deck" approach to education. Our educators and partners work in different offices, programs, states, and even countries, covering topics that span from the surface of the sun to the depths of the ocean. NOAA Education reaches preschoolers through retirees both inside and outside the classroom. We rely not only on full-time educators, but also on scientists, resource managers, and others who volunteer their time to share their expertise and passion for their work.

We continue to strengthen this community of educators within NOAA. The community is connected through the **NOAA Education Council**, which is composed of representatives from education programs throughout the agency. It is our forum for coordinating efforts and developing new ideas. The council learns from NOAA educators and partners while providing leadership and support to the NOAA Education community.

In 2015, the NOAA Education Council released an updated **Education Strategic Plan**. In this guiding document, we outlined five goals and supporting objectives that help us advance NOAA's mission through education. These 20-year goals give the NOAA Education community a shared focus across a wide range of activities. We are currently in the process of updating our strategic plan for 2020.

To learn more about NOAA Education, please visit **www.noaa.gov/education**.

NOAA Education reaches people at every age and every stage

Each year, NOAA Education connects millions of people to Earth science. Our programs take place both inside and outside the classroom, reaching people of all ages. To quantify our impact, we collect information from the **NOAA Education Council**. These numbers capture the combined efforts of educators across the agency, spanning all of NOAA's mission areas.

61.4 million people
visited informal education institutions hosting NOAA-supported exhibits or programs.

483 institutions
increased educational capacity through NOAA-funded centers, exhibits, or programs.

489,000 P-12 students
participated in NOAA-supported formal education programs.

35,000 educators
participated in NOAA-supported professional development programs.

4,060 postsecondary students
were trained through NOAA-funded higher education programs.

861 postsecondary degrees
were awarded to NOAA-supported students in higher education programs.

2.7 million youth and adults
participated in NOAA-supported informal education programs.

33.4 million visits
were made to NOAA Education websites that host valuable activities and information.

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.

Ryan Hawk/National Marine Sanctuaries Foundation/NOAA

OVERVIEW //

NOAA observes our planet to understand its ever-changing environment. NOAA Education enables people to explore their environment, broaden their horizons, and seek solutions to environmental problems using science and technology. Through education, we encourage everyone to develop a greater understanding of Earth and its diverse systems.

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.

Teacher at Sea alumnus brings South Dakota students to Mississippi to see ocean science in action

Isolated from the ocean by 1,000 miles in every direction, Roscoe, South Dakota, is as far from the coast as it's possible to get in North America. "We really do have a connection to the ocean," explains science teacher Spencer Cody, who has gone to sea on research vessels through the **NOAA Teacher at Sea Program**. "But, you know, if you're from South Dakota, and especially if you're a student, you just really don't understand the significance of it."

For spring break, the Teacher at Sea Alumni Association and the **NOAA Fisheries lab in Pascagoula**, Mississippi, supported a field trip that allowed 11 sixth through 12th graders to travel to the Gulf of Mexico from South Dakota. For some of the students, it was the first time they had seen the ocean.

Teacher at Sea alumnus Spencer Cody and his students, visiting from South Dakota, get ready for a day trip on the Southeast Fisheries Science Center's R/V *Caretta* out of Pascagoula, Mississippi. (Ryan Hawk/National Marine Sanctuaries Foundation/NOAA)

The students gained a deeper understanding of the coastline, creatures, and careers in the Gulf of Mexico. Prior to the trip, fewer than half of the students were interested in careers related to science, technology, engineering, and math (STEM); after the trip, more than half were interested. Teacher at Sea alumni like Cody build on their time at sea to keep engaging students long after they return to shore.

Louisiana students cultivate wetland grasses in school aquaponics systems to restore coastlines

Louisiana is **losing coastal wetlands** at an average rate of a football field every hour, threatening the livelihoods and cultures of coastal communities as well as some of the country's most valuable energy and fisheries industries.

Calcasieu Parish Schools, McNeese State University Naturelab, and the City of Lake Charles Tuten Park partnered on a **Gulf of Mexico Bay Watershed Education and Training** (B-WET) grant to provide teachers and students with **Meaningful Watershed Educational Experiences** (MWEEs) that respond to this issue.

Teachers and students are now cultivating bitter panicum, a native coastal grass, and Gulf killifish, a native coastal minnow, in aquaponics systems in Lake Charles schools. Aquaponics is a system of aquaculture in which the waste produced by farmed fish supplies nutrients for plants grown hydroponically. The plants in turn purify the water. In the spring of 2020, approximately 600 coastal grasses produced through aquaponics will be planted in high-erosion areas.

A student from Bell City High School plants bitter panicum at the Lake Charles Boston Academy Aquaponics Lab in Louisiana. (Nick Limberis)

So far, by participating in these MWEEs, students have demonstrated a 23 percent knowledge gain in environmental concepts, watershed understanding, water quality parameters, and aquaponics. "The lessons, aquaponics tanks, and activities helped my students relate to real-world science issues that I was able to share in real life, not just in a book or in a simulated experience," said Tracy Pearce, sixth grade science teacher at S.J. Welsh Middle School in Lake Charles.

New partnership expands NOAA ocean exploration professional development for educators in Puerto Rico

For 20 years, NOAA's **Office of Ocean Exploration and Research** (OER) has paired ocean discovery missions with professional development programs for educators through **Education Alliance Partners**. These science centers and museums partner with OER to offer in-person workshops.

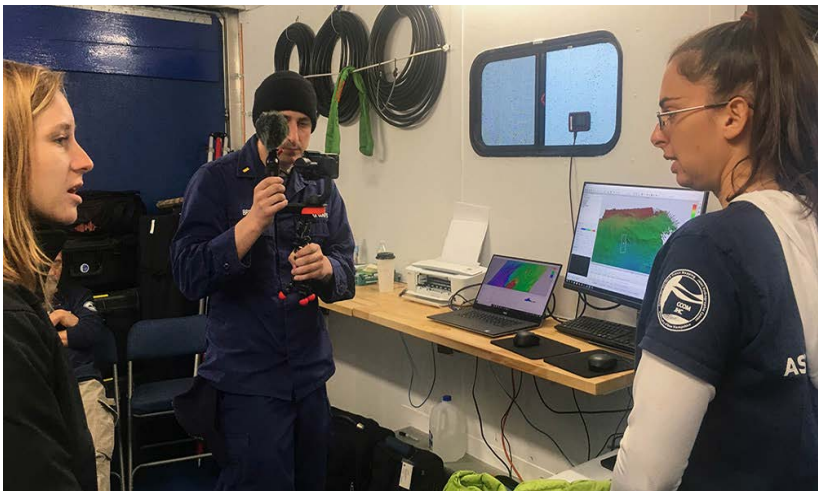
In November 2018, OER and the EcoExploratorio Science Museum in San Juan, Puerto Rico, hosted a full-day professional development opportunity, bringing together 27 educators from around the island. The event highlighted OER's **2018 expedition** in the territory's deep ocean and demonstrated hands-on activities, providing materials and instruction in both English and Spanish.

Following the successful workshop, the EcoExploratorio joined OER as an Education Alliance Partner. The museum will now regularly host ocean exploration workshops, which will expand OER's efforts to expand their reach to communities in Puerto Rico and Spanish speakers elsewhere in the United States. New workshops are planned for 2020 to reach the U.S. territories of Saipan, Guam, and the U.S. Virgin Islands.

Workshop participants hold up a methane hydrate model they built using candy and toothpicks. Methane hydrates can form in deep-sea sediments. (NOAA Office of Ocean Exploration and Research)

Sanctuaries Live expeditions offer real-time video and communication feeds from underwater

With 95 percent of the ocean unexplored, the **NOAA Office of National Marine Sanctuaries** sought to deepen our understanding of protected areas through deep-water exploration and research in sanctuaries in 2019.



Thanks to a $3.5 million award from the Office of National Marine Sanctuaries, viewers with a screen and access to the internet engaged in two-way conversations with expedition teams as they explored the ocean and Great Lakes. The Global Foundation for Ocean Exploration, Ocean Exploration Trust, and Woods Hole Oceanographic Institute led **seven expeditions** — from Massachusetts to American Samoa — in search of discoveries in and to further understanding of our national marine sanctuaries.

Team members broadcast live from a mission control van on the shore of Lake Huron. During this mission, the team deployed an autonomous surface vehicle to search for shipwrecks in Thunder Bay National Marine Sanctuary. Sanctuaries Live connected directly to classrooms, science centers, and Facebook Live. (Ocean Exploration Trust)

Classrooms, museums, science centers, and other organizations connected to these live programs. Over the course of five months and more than 90 days at sea, 25,000 viewers streamed live feeds and programming to experience the hidden mysteries of the deep sea in real time. More than 4,500 students in classrooms throughout North America tuned in as well. "I never miss a chance to join NOAA on an expedition," said John Caplis, a teacher at Alpena High School in Alpena, Michigan. "I love having access to scientists, historians, archaeologists, and the technicians operating the sonar and ROVs as they explore. We always learn something, and that learning fuels the next lesson."

GOAL 2

Conservation and 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.

Paul R. Meyer

OVERVIEW //

NOAA's science lays the foundation for stewardship and conservation, and everyone has a part to play in protecting our coastal and marine resources. NOAA Education provides a framework to help people and communities make informed choices that support the environment and take actions to protect the resources they care about.

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.

Creating a social norm: A student-designed program to reduce marine debris

In 2015, five middle school students from Falmouth, Massachusetts, noticed a problem. Although millions of metric tons of plastic waste were entering the ocean each year, the people around them kept using single-use plastics. In short, plastics were the norm.

To address this problem, the students worked with Falmouth Water Stewards to create a campaign called "Skip the Straw." Soon, they teamed up with undergraduate students through Sea Education Association (SEA) to create the "Trash Shouldn't Splash" campaign, with funding from NOAA's **Marine Debris Program**. SEA sends undergraduates aboard tall sailing ships for a semester, where they have the opportunity to observe plastic pollution in the open ocean.

The Trash Shouldn't Splash Toolkit provides signage that can be used inside restaurants to encourage visitors to use alternatives to single-use plastic. (Falmouth Water Stewards and Sea Education Association)

Working together, these partners created a toolkit of communication aids for different audiences, including local businesses. Ten restaurants in Woods Hole, Massachusetts, committed to reducing single-use plastics. The campaign reached more than 1,000 K-12 students through classroom visits and art contests, and more than 135 SEA undergraduate students have participated. The project continues to grow, with 44 toolkit downloads and 2,500 visits to the **Trash Shouldn't Splash** website from around the world.

NOAA Fisheries celebrates International Year of the Salmon through education

Healthy salmon populations are important to individual livelihoods, state and national economies, and indigenous cultures up and down the Pacific and Atlantic coasts. However, with 29 populations listed as endangered or threatened in the United States, it's more important than ever to protect these iconic fish.

In 2019, **NOAA Fisheries** participated in the International Year of the Salmon to raise awareness of challenges faced by salmon and to foster community stewardship of salmon populations. In the Northeast, NOAA Fisheries collaborated with the educational technology company Agents of Discovery to launch **Sea-Run, GO!**, a game similar to Pokémon Go that provides educational "missions" with unique geo-triggered "challenges" in which players learn about wild Atlantic salmon migration. In Washington state, more than 3,000 students raised and released salmon into the Columbia River, while NOAA Fisheries' **Pasco Research Station** led fish dissections and hosted an interactive station. NOAA Fisheries created a **series** including a children's book, an educational board game, and an elementary curriculum, all available in English and Spanish. These resources help students understand the cultural, economic, and environmental importance of salmon and how they can become salmon stewards. Materials were distributed to more than 111 schools in Washington, Oregon, Idaho, and California.

NOAA Fisheries scientist Matt Nesbit talks about salmon at the annual Salmon Summit in Pasco, Washington, in April 2019. (NOAA Fisheries Northwest Fisheries Science Center)

Rainscaping education helps communities prevent polluted runoff

During a downpour, rainwater hits pavement and flows into drains, picking up pollutants like oil, fertilizers, and road salts along the way. Urban runoff is a particular concern in states like Indiana, where **urban areas are expanding** and the **risk of winter flooding** is expected to increase over the coming decades.

To address this problem locally, **Illinois-Indiana Sea Grant** and **Purdue Extension** are teaching residents the art and science of rainscaping. Through the **Purdue Rainscaping Education Program**, a multidisciplinary "rainscaping team" has published a curriculum, led several state-wide workshops, and contributed to a **rain garden app**. The program is designed to teach communities and residents around Indiana how to use sustainable landscaping to prevent polluted runoff from reaching bodies of water.

Rainscaping workshops give community members and leaders the knowledge and resources they need to implement rainscaping in residential or small public spaces. (Illinois-Indiana Sea Grant)

Rain gardens installed as part of training workshops have the capacity to reduce runoff by a combined 319,720 gallons per year. As the program and the network continue to grow, rain gardens that have been designed, facilitated, or installed by participants or their partners will reduce runoff even more, moderating flow and capturing pollutants before they reach waterways.

Students spot solutions to stem the tide of trash in their schools

With funding from the **NOAA Planet Stewards Education Project**, three teachers from Maine and Virginia implemented projects with third through 12th grade students to stem the tide of waste entering their local waterways.

In Maine, Title I elementary school students led by teacher Tish Manning and middle school students led by science teacher Martha Conway-Cole targeted waste reduction at their schools by showing just how cool they were in their "BRRRR" — Belfast Refuse, Reduce, Reuse, and Recycle — clubs. During the 2018-2019 school year, students convinced their cafeteria staff and school administrators to stop using plastic dressing cups. They also began serving bulk cereals served in reusable bowls, doing away with single-serve breakfast cereal packages. In doing so, they reduced the amount of plastic generated from their cafeteria by 75 percent.

A girls' lacrosse team at Chantilly High School in Virginia collected recyclables and worked to reduce waste in the school stadium where many recyclables were previously not discarded properly. (Michele Gates, NOAA Planet Steward)

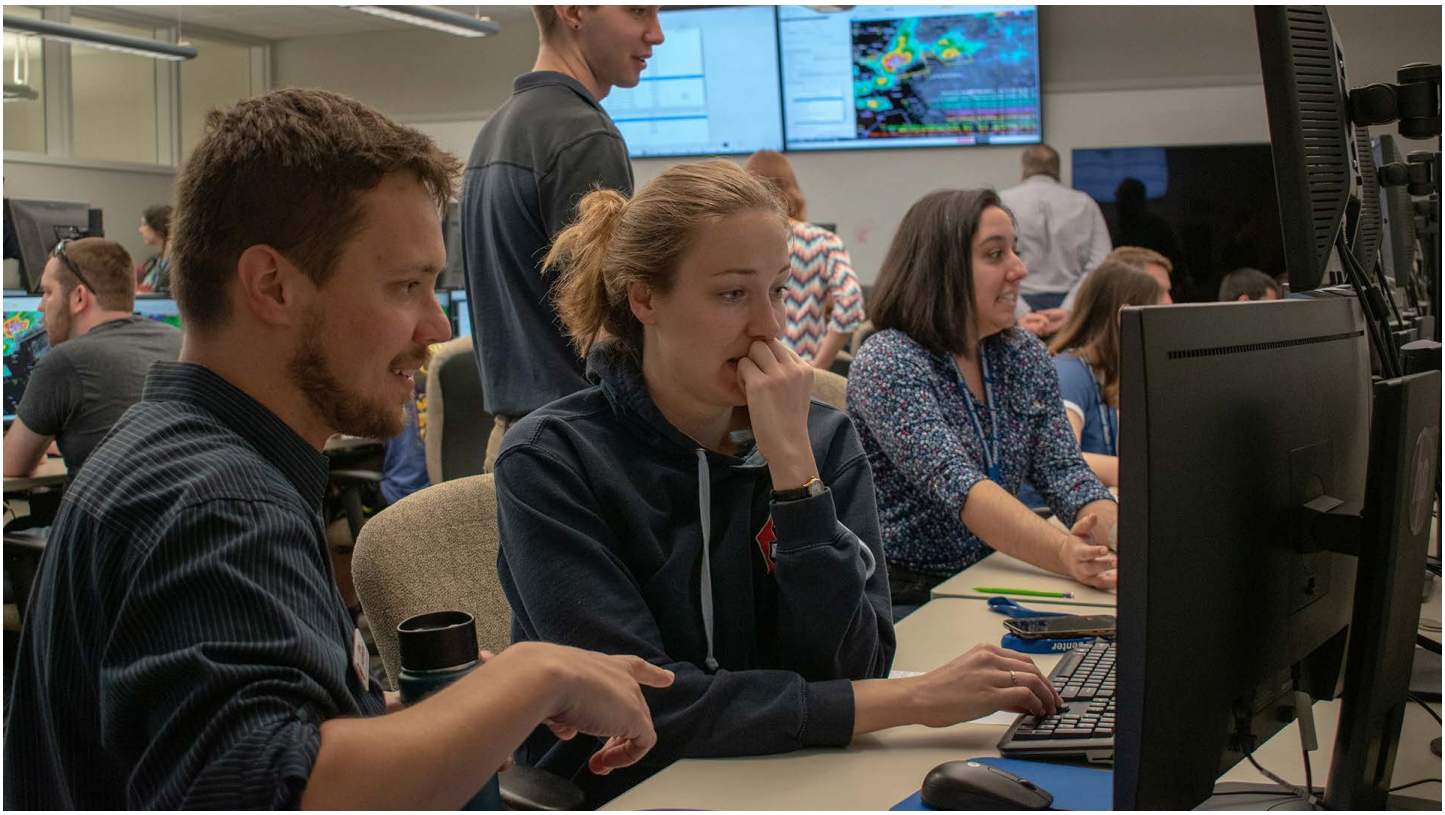
At Chantilly High School in Chantilly, Virginia, students led by science teacher Michele Gates tackled water bottle reduction. The students noticed that many empty plastic water bottles were not recycled during sporting events. In addition to installing hydration stations at their school, the students placed recycling bins around campus, including at their athletic stadium and fields. By the end of the school year, the students' efforts prevented 14,754 single-use water bottles from being used, and they collected more than 32 60-gallon trash bags full of recyclables from recycling bins they placed around the campus.

Manning, Conway-Cole, and Gates became NOAA Planet Stewards in 2019. Through their efforts, 290 students contributed 1,120 hours of stewardship activities to help their classmates to refuse, reduce, reuse, and recycle waste at their schools.

GOAL 3

Safety and 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.



Emily Summars/University of Oklahoma Cooperative Institute for Mesoscale Meteorological Studies/NOAA

OVERVIEW //

In 2019, the United States experienced **14 disasters** that each resulted in damages of $1 billion or more. After each event, communities have had to come together to rebuild lives, strengthen physical infrastructure, and improve policies — all of which depend on public engagement. NOAA Education programs not only help people improve their understanding of science, but also help them become ready, responsive, and resilient to environmental threats.

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.

Student marsh restoration protects shoreline from devastating hurricane

In October 2018, Hurricane Michael smacked the Florida Panhandle with winds up to 160 mph and storm surges as high as 14 feet. In Franklin County, houses were damaged and roads washed out. But at the **Apalachicola National Estuarine Research Reserve**, a ribbon of salt marsh extending about 1,000 feet along the coast was remarkably undisturbed in the wake of that category five storm — a testimony to the power of local students.

This particular marsh had been under the care of the children of Franklin County since 2011, when the reserve began to use it as the centerpiece for their education program. Every local child has the opportunity to learn about their estuary and how to protect it, not once, but six times as they move from pre-K to high school. In fifth grade, students pull on boots, slog through the mud, and plant cordgrass in the marsh. Students later return to measure the progress of marsh growth and to count periwinkle snails, which are an indicator of the health of the food web.

In the wake of Hurricane Michael, students and educators got to see how their efforts helped protect the shoreline and the estuary that many families depend on for their livelihoods. The restored marshland acted as a natural buffer, absorbing the wind and water from storms to protect inland areas.

Restored marsh in the Apalachicola National Estuarine Research Reserve protected the shoreline from hurricane Michael. (Courtesy of Jeff Dutrow)

Workshop gives educators the tools to teach interdisciplinary climate change education

Understanding climate change requires an interdisciplinary education and approach, beyond the natural and physical sciences. In summer 2019, the **NOAA Climate Program Office** partnered with the nonprofit **Climate Generation** to host their 14th annual **Summer Institute for Climate Change Education** at the Lowell School in Washington, D.C.

This multiday professional development opportunity provided 35 teachers from eight states with resources to integrate climate change into humanities and social sciences curricula.

From reading and writing climate stories to learning how to communicate data through art, educators left more confident about teaching climate-related concepts. In turn, their students will gain newfound knowledge and skills, empowering them to contribute to and accelerate action in their communities.

Based on the success of the Lowell institute model, Climate Generation and NOAA are looking to expand to new communities in 2020.

Above: The Summer Institute for Climate Change provided educators with the skills, resources, and confidence to integrate climate change education into humanities subjects. (Megan Van Loh/Climate Generation)

Left: Summer Institute for Climate Change Education educators toured Washington, D.C., to find examples of solutions like solar panels that are part of the city's climate action plan. (Megan Van Loh/Climate Generation)

Chicago teens help museum visitors understand the city's climate past and future

Teen Myles Williamson gestures at the NOAA Science on a Sphere® during a presentation on acid rain at the Museum of Science and Industry. This work was supported by NOAA's Environmental Literacy Program. (Museum of Science and Industry, Chicago)

Saturday visitors to the Museum of Science and Industry (MSI) in Chicago, one of the largest science museums in the world, can learn about the city's past and future climate and weather challenges from an unlikely source: Chicago teens.

To help Chicagoans understand and better respond to the city's climate challenges, MSI successfully competed for support from NOAA's **Environmental Literacy Program**, which supports community resilience through education.

MSI has facilitated an out-of-school-time project called "Teen Advocates for Community and Environmental Sustainability (Teen ACES)" for Chicago teens, most of whom were from groups that are underrepresented in STEM. Teens were trained to use the museum's NOAA Science On a Sphere® to present the global aspects of climate change to museum visitors. They also delved into regional aspects of climate change by working with datasets from the **Midwestern Regional Climate Center** and **Illinois-Indiana Sea Grant**. Ninety Chicago teens helped more than 16,000 museum visitors to improve their awareness, knowledge, and understanding of Chicago's climate.

National Weather Service partners with the deaf and hard-of-hearing to make weather safety and education accessible to all

National Weather Service meteorologist Trevor Boucher holds up his phone to take a group selfie during the Town Hall for Texas School for the Deaf and Austin Deaf Senior Citizens about weather hazards and weather safety. (Courtesy of Trevor Boucher/NWS)

On May 1-2, 2010, 13 inches of rain fell over Nashville, Tennessee, causing major flooding and damaging 11,000 structures. As flood waters rose, **NOAA Weather Radios** sounded the alarm, alerting residents to danger. However, the local deaf and hard-of-hearing community received little warning. As the city began the recovery process, the **National Weather Service** (NWS) realized that the dilemma was not just physical — it was cultural.

Local deaf and hard-of-hearing individuals joined forces with both public health and weather experts to solve the problem, developing a **SKYWARN® Spotter Training** for the deaf public. Additionally, the group gave emergency alert radios with adaptations like bed shakers and strobe lights to 150 families.

Since the 2010 flood, NWS forecasters have immersed themselves in the deaf and hard-of-hearing community, asking for advice and creating effective and relevant **weather safety resources**: videos in American Sign Language, safety messaging, a website, training, and outreach to high school groups and community organizations. May of 2020 will mark the 10th anniversary of the flooding. As the NWS looks ahead to the next decade and beyond, it will be better able to serve all Americans. In the words of NWS meteorologist Trevor Boucher, "That really kind of proves the Weather-Ready Nation concept."

GOAL 4

Future Workforce

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

NOAA Educational Partnership Program with Minority Serving Institutions

OVERVIEW //

When NOAA's workforce mirrors the composition of the communities we serve, we can better carry out our mission. NOAA Education inspires the marine biologists, meteorologists, and educators of tomorrow, introducing young students to NOAA careers and preparing emerging professionals for the workforce.

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.

University of Oklahoma students end the semester with tornado warning training

Becoming a meteorologist not only requires mastering the science of weather prediction, but also learning to cope with the high stakes of operational forecasting.

To help meteorology students experience operational weather forecasting firsthand, NOAA's **Cooperative Institute for Mesoscale Meteorological Studies** led a hands-on training at the University of Oklahoma. Based on an exercise designed for National Weather Service forecasters, the training allowed students to issue warnings in near-real time based on a past tornado and severe thunderstorm event in Texas.

They were exposed to the process — and the stress — that forecasters face when issuing warnings for life-and-death weather events, such as tornadoes, severe thunderstorms, and flash floods. At the end of the semester, these students were one step closer to becoming the next generation of confident weather forecasters.

Researcher Jill Hardy guides meteorology student Ryan Cumming through a severe weather simulation. (Emily Summars/University of Oklahoma Cooperative Institute for Mesoscale Meteorological Studies/ NOAA)

As graduate student Amanda Murphy explained, "Learning concepts in a classroom is one thing, but these hands-on experiences really help drive home concepts and cultivate real passion for both the science and serving the public."

Educational Partnership Program with Minority Serving Institutions alumna to lead American Fisheries Society

April Croxton, a NOAA program analyst, is the first African American slated to lead the American Fisheries Society, the largest professional society related to fisheries in the United States. (NOAA)

April Croxton, a program analyst with **NOAA Research**, is the first African American to be elected Second Vice President of the American Fisheries Society (AFS), the oldest professional organization for fisheries science and conservation in the United States. As Second Vice President, she begins a five-year term, culminating in the roles of President and Past President of the society.

Croxton received her Ph.D. in environmental sciences from Florida A&M University and is an alumna of NOAA's **Educational Partnership Program with Minority Serving Institutions** (EPP/MSI) Graduate Sciences Program. Successful completion of this program, which sunsetted in 2012, gave trainees the opportunity to convert to federal employees after graduation.

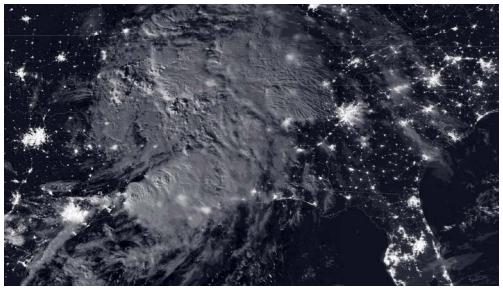
Croxton says, "EPP/MSI has been one of the most instrumental vehicles for my career. Exposure to opportunities within NOAA opened doors and created learning experiences that benefited me throughout my career." Now, she makes important connections between AFS and NOAA. With professional societies like AFS, Croxton suggests, "Join early and be active. They are a great way to build relationships with professionals in your field."

Problem solved! Summer intern gets a satellite algorithm back up and running

Daniel Hueholt, a 2018 **NOAA Ernest F. Hollings** scholar, interned with NOAA's **Satellite and Information Service** and NOAA's **Cooperative Institute for Meteorological Satellite Studies** working with satellite datasets.

He focused on the "Day-Night" Band, which was generated using the Visible Infrared Imaging Radiometer Suite instrument on NOAA's **JPSS-1 satellite**. This sensor uses filtering techniques to observe city lights, gas flares, wildfires, and auroras at night. In 2016, the monthly Day-Night Band images stopped compiling.

Enter Daniel Hueholt! He updated the algorithm and automated the process to easily generate new images, which are now publicly available through the University of Wisconsin's **RealEarth**. Hueholt says, "The people I worked with were also great — Tommy Jasmin and Margaret Mooney, in particular, went far beyond the call of duty to make me feel welcome! Overall, I had a great time on this internship, and would highly recommend this program to any future undergraduate!"



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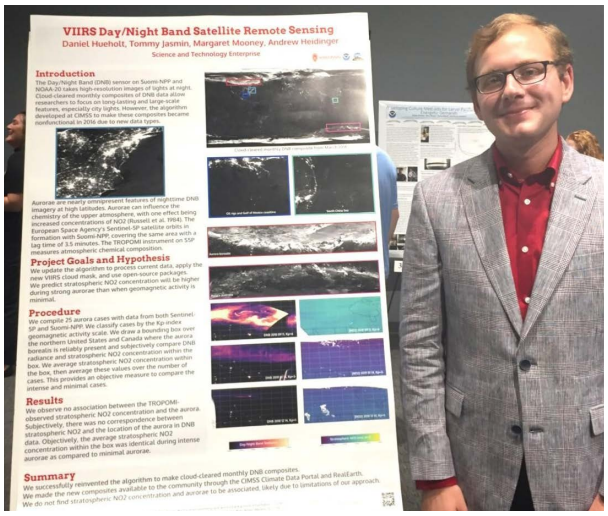

Daniel Hueholt, a 2018 NOAA Hollings scholar, presents his research at the NOAA Student Science and Education Symposium at NOAA headquarters in Silver Spring, Maryland. He focused on an algorithm to support nighttime light composite imagery (left). (Courtesy of Daniel Hueholt)

National Weather Service experts show students the many facets of operational forecasting

Meteorology students face plenty of career choices: should they go into broadcast, research, or operational forecasting? Each track offers a very different experience. And while students are exposed to broadcasters on television and researchers at their universities, it can be a challenge for them to experience operational forecasting.

When the University of Kansas needed to fill a teaching position, they reached out to the local National Weather Service (NWS) office. Ariel Cohen, former Science Operations Officer at the **Topeka Weather Forecast Office**, accepted the challenge and suggested a team-teaching approach.

A group of NWS forecasters taught lessons in their areas of expertise with the goal of providing students with realistic insights into tasks and assessments that are routinely completed by NWS employees. The students explored basic operational meteorology, applied it to real-world case studies, and practiced **Impact-based Decision Support Services**.

"I really like how engaged [the NWS instructors] were in making sure we learned the material. I love how many different things we learned about," said one student.

Topeka Weather Forecast Office meteorologists used a new team approach to teaching a University of Kansas operational forecasting class. (Ariel Cohen/NOAA)

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.

Kayla do Couto/NOAA

OVERVIEW //

NOAA Education represents the combined effort of dedicated education professionals across our agency. The strength of our community is built on the relationships between these passionate individuals, their partners, and the audiences they serve. Our community's focus on excellence drives us to enhance and measure performance to provide the best service to the public.

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.

NOAA partners with Department of Education to bring watershed education to out-of-school programs

Students in the largest out-of-school program in the nation will have increased access to environmental education that advances STEM. **NOAA Office of Education** is pleased to continue its partnership with the **U.S. Department of Education** to implement high quality, watershed-focused STEM education at **21st Century Community Learning Centers** (21st CCLCs).

In fiscal year 2019, NOAA entered into a three-year, $3.2 million interagency agreement, which will be implemented in partnership with the North American Association for Environmental Education. **Watershed STEM projects** will use the **NOAA Bay Watershed Education and Training** (B-WET) program's **Meaningful Watershed Educational Experience** (MWEE) model, which incorporates learning both outdoors and in the classroom.

Seaberry Nachbar (third from the left) and Bronwen Rice (second from the right) accept the NOAA Bronze Medal Award on behalf of the Bay Watershed Education and Training Program, which received the award for their work piloting a successful partnership with the U.S. Department of Education. (NOAA)

This program aims to provide MWEEs at 60 21st CCLCs and impact more than 3,000 youth, primarily from high-poverty and low-performing schools, annually. Watershed STEM projects will be selected through a competitive opportunity serving 28 states, organized around the seven regions served by the NOAA B-WET program. This partnership builds on a successful pilot program in 2017, which received the 2019 NOAA Bronze Medal Award, the **highest honor** granted by the NOAA Under Secretary of Commerce for Oceans and Atmosphere that recognizes federal employees for superior performance.

NOAA convenes grantees to advance education for community resilience

From April 29 through May 1, 2019, NOAA Office of Education held the second **Environmental Literacy Program** Resilience Education Grantee Workshop at the NOAA Science Center in Silver Spring, Maryland. This workshop convened the recipients of the grants awarded from 2015-2018 through the Environmental Literacy Program community resilience-focused grant competitions.

These grants aim to foster the environmental literacy necessary in the communities they serve to contribute to resilience to extreme weather events and other environmental hazards. The workshop convened 75 participants representing 36 institutions across the country, including grantee organizations, federal participants, and speakers' organizations.

NOAA's Environmental Literacy Program hosted a resilience education grantee workshop at NOAA headquarters in Silver Spring, Maryland. (Stephen Zepecki/NOAA)

Overall, the workshop strengthened the grantees' connections with each other and with NOAA staff and resources. The grantees walked away from the workshop with more resources, expanded networks, and new ideas about how to address their challenges and measure their impacts.

NOAA scientist and educator recognized with the Presidential Early Career Award for Scientists and Engineers

The Presidential Early Career Award for Scientists and Engineers is the highest honor bestowed by the United States Government to outstanding scientists and engineers who are beginning their independent research careers and who show exceptional promise for leadership in science and technology. In fiscal year 2019, **eight NOAA staff** received these awards, including **Elizabeth Siddon** with **NOAA Fisheries**. In addition to her scientific accomplishments, Siddon is passionate about education.

Elizabeth Siddon, left, was one of eight NOAA employees who received the 2019 Presidential Early Career Award for Scientists and Engineers. (Donica Payne/U.S. Department of Energy)

Siddon said of her award, “With all that is going on in the Alaska marine environment right now, the work that we are doing to provide ecosystem context for resource management decisions is really important. And just as important is that we do a good job explaining our science and communicating with the public. That is what motivated me to co-found SouthEast Exchange, a community partnership of scientists and teachers, and to become a member of Juneau’s Board of Education. For me, it’s about helping students see how the science they are learning in school is applied in the real world. In doing so, I hope to inspire a few of them to pursue careers in science.”

Diversity and Professional Advancement Working Group leads the way for the next generation of STEM professionals

The **Diversity and Professional Advancement Working Group** (DPAWG) is a NOAA employee resource group that focuses on recruitment, retention, and advancement.

This year, DPAWG successfully coordinated NOAA’s engagement in student and early-career professional events at annual scientific conferences, including the 91st annual National Technical Association Conference, Black Engineer of the Year Award STEM Conference, and the Society for Advancement of Chicanos/Hispanics and Native Americans in Science. During these conferences, DPAWG promoted NOAA science and careers and performed targeted recruitment for NOAA’s student and educator opportunities.

NOAA employees and award winners attended the Black Engineer of the Year Award Gala in February 2019. (Courtesy of DaNa Carlis/NOAA)

The working group participated in three middle school events in the D.C. area, exposing students to NOAA sciences and careers. DPAWG also connected with scholars and interns, sponsoring a networking breakfast for **NOAA Educational Partnership Program with Minority Serving Institutions** (EPP/MSI) undergraduate scholars, and mentoring three EPP/MSI Cooperative Science Center graduate interns and one **NOAA Pathways intern**.

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The NOAA Education Council represents and coordinates education efforts across the agency. The following member programs provided materials for this report to highlight breadth of NOAA Education.

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On the cover

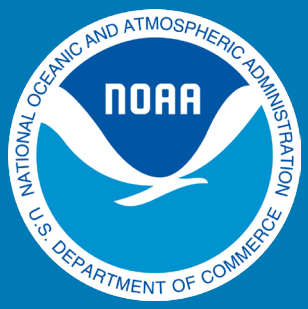
Top left: From 2014-2019, students at Gault Elementary, a NOAA Ocean Guardian School in California, removed over 4,300 square meters of invasive ice plants from local state beaches and replaced them with nearly 12,000 native dune plants. (Kate Thompson/NOAA)

Top center: Rocio Lozano-Knowlton is a former NOAA contract educator who now runs her own nonprofit called the MERITO (Multicultural Education for Resource Issues Threatening Oceans) Foundation, a long-standing California Bay Watershed Education and Training grant recipient. (Claire Fackler/NOAA)

Top right: Andrew Tokuda, a 2018 NOAA Hollings scholar, holds a chum salmon while kneeling beside the Tutka Bay estuary. Tokuda interned at the Kachemak Bay National Estuarine Research Reserve in Homer, Alaska, in summer 2019. (Jacob Argueta/Kachemak Bay National Estuarine Research Reserve)

Bottom left: Amy Li, a 2018 NOAA Hollings scholar, and her mentors Matthew Parry (center) and Rob O'Conner (right) pose with their drone outside the NOAA Inouye Regional Center. Li's summer internship focused on using unmanned aerial systems to study coral reefs. (Joseph Bennington-Castro)

Bottom right: At NOAA Kids Day in 2019, families observed electricity passing between a Van de Graaff machine and its wand. Provided by the National Weather Service, this instrument is used to teach about electricity and lightning strikes. (Kayla do Couto/NOAA)



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