NOAA Teacher at Sea Program Mid-Atlantic Alumni Workshop: November 2014 Report

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Workshop Goals and Content

Based on the following best practices for the objective as stated in a report from the Federal Inventory of STEM Education Fast-Track Action Committee on Federal Investments in STEM Education (FI-STEM) and the Committee on STEM Education National Science and Technology Council (CoSTEM)[1] and empirical research on science teacher professional development, NOAA's Teacher at Sea Program offered a science content driven two-day teacher workshop to Teacher at Sea Alumni (TASA) in the Mid-Atlantic Region (MD, VA, DE, DC and WV) with the **following goals**:

1. Enhance science content knowledge and pedagogical skills.
2. Model scientific field investigations and classroom activities.
3. Promote environmental stewardship
4. Strengthen a sustainable NOAA Teacher at Sea Alumni network in the Mid-Atlantic region.

Federal Inventory of STEM Education Fast-Track Action Committee on FI-STEM and the CoSTEM Objective:

- Pre and In-Service Educator/Education Leader Performance: Train or retain STEM educators (K-12 pre-service or in-service, post-secondary, and informal) and education leaders to improve the content knowledge and pedagogical skills of STEM educators.

Empirical Research on Science Teacher Professional Development:

- Research reveals a positive correlation between student achievement and teacher knowledge of science content and pedagogical content (e.g., Appleton, 2007; Garet et al., 2001; Heywood, 2007; Penuel et al., 2007; U.S. Department of Education, 2000).

- Research also shows that if teachers do not sufficiently understand science content, their effectiveness in the classroom can suffer in several ways, including avoidance of teaching science altogether or failure to inculcate an understanding about the dynamic nature of science (e.g., Abell, 2007; Griffith, 2008).

- The National Research Council's Framework describes proficiency in science as both an acquisition of science knowledge and the ability to create an evidence-based model or theory that can continually be refined in order to revise knowledge. (NGSS, 2013).

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[1] http://www.whitehouse.gov/sites/default/files/microsites/ostp/costem_federal_stem_education_portfolio_report.pdf (p. 5)

Workshop Content:

Smithsonian Environmental Research Center: History and Tour

The Smithsonian Environmental Research Center (SERC) provides science-based knowledge to meet environmental challenges of the 21st century. SERC leads research on coastal ecosystems—where land meets the sea—to inform real-world decisions for wise policies, best business practices, and a sustainable planet http://www.serc.si.edu.

Headquartered on Chesapeake Bay, the nation's largest estuary, SERC sits just 25 miles from the nation's capital. Its 2,650-acre campus spans forests, wetlands, marshes and 12 miles of protected shoreline. The site serves as a natural laboratory for long-term and cutting edge ecological research. SERC explores the most pressing issues affecting the environment, including: water quality, fisheries, invasive species, conservation, land use, toxic chemicals, global change.

Charles McC. Mathias Laboratory

The Mathias Lab, which opened on September 19, 2014, emits 37 percent less CO2—and saves an estimated 42 percent on energy costs—compared to a similar lab that does not meet LEED certification standards (Leadership in Energy and Environmental Design), making it the greenest Smithsonian building to date. The lab's reduced carbon footprint comes from a heavy emphasis on renewables. A geothermal well field with 250 wells provides highly efficient heat exchange for the lab's HVAC system, while a 352-kilowatt array of solar panels provides water heating and covers 15 percent of the building's annual electricity expense. Energy efficiency received a boost from passive solar lighting, a result of its open interior design and large windows, as well as automated lighting controls and strong insulation.

The lab will also recycle 100 percent of its water through an interconnected network of systems. All domestic "gray water" will go to a wastewater treatment plant on the SERC campus within walking distance of the lab. From there, it will be sent back to the lab for reuse in fire protection, irrigation and the water-closet supply. Some of the water will nourish the 4.5-acre constructed wetland on the lab's south side. Three cisterns will capture rainwater to irrigate the wetland, which will filter stormwater and provide a habitat for native plants and animals http://sercblog.si.edu/?p=5533.

Ecosystems on the Edge

This online video series highlights coastal zones that offer life, from lush inland forests and fertile soils to the bounty of the sea. Biologically they are the most fruitful ecosystems on Earth, and yet they are fragile. Invasive species, pollutions, and climate change are threats to their survival http://ecosystems.serc.si.edu/.

Marine Invasions Research Lab: Biologists: Monaca Noble, Darrick Sparks, and Dr. Kim Holzer

The Marine Invasions Research Lab is a national and international center for research on biological invasions in coastal marine ecosystems. Biological invasions (the establishment of species beyond their historical range) are a major force of ecological and evolutionary change. Invasions are fundamentally changing the structure and function of ecosystems around the world and are impacting many dimensions of human society.

Biogeochemistry Lab: Gary Peresta, Environmental Engineer;
Biogeochemist, Pat Megonigal

The Biogeochemistry Lab studies element cycling to better understand how ecosystems respond to global changes, such as sea-level rise, nitrogen pollution, invasive species and elevated CO2.
Scientists take a holistic approach to these issues by integrating the responses of both plants and microbes, the two dominant life forms regulating the capture and release of energy in organic compounds.
The Lab also operates the Smithsonian's Global Change Research Wetland. The NSF-LTREB tidal marsh has operated since 1985 and is home to three long-term field manipulations of key global change factors. Major research themes include the stability of tidal wetlands to sea-level rise, regulation of methane emissions from wetlands and upland forests, and carbon sequestration in blue carbon ecosystems.

Chesapeake Field Experience

This is a hand-on program consisting of five stations in which the living and non-living components of the Chesapeake Bay Ecosystem are explored. Stations:

- About Crabs - Blue Crab anatomy, behavior and habitat
- Water Testing - Water quality testing – salinity, pH, turbidity, and temperature
- Oyster Bar Community - Oyster shell habitat and filtration
- Investigating Plankton - Plant and animal plankton sampling and observation
- Seining - Sample and identify organisms and fish from the Rhode River and discuss physiological aspects of fish anatomy

Science Content Classroom Application and Pedagogical Skills: Robert Keddell, Director - Motivation Education - Educators Connecting Research to the Classroom (ECRC)

Bob Keddell's thirty-three year career includes experiences in rural, suburban, and inner-city education positions. Education innovation has been a hallmark of Mr. Keddell's career as he has written curriculum for the Volvo Round the World Sailing Race, Chicago Public Schools, the EPA, USGS, Virginia Magnet Schools, Howard County Public Schools, and the Ingenuity Project of Baltimore City Public Schools. National recognition has included two Presidential Teaching Awards, the OHAUS Award for Creative Teaching, national consultant opportunities, and over $450,000 in grant awards.

Mr. Keddell's current education positions include teaching Action Research for School Improvement and the Capstone Course in Teacher Leadership in Johns Hopkins University's Teacher Leadership graduate program, as well as a position as Program Developer and Evaluator for Wilde Lake Middle School and Lime Kiln Middle School in Howard County, Maryland. His latest project finds him serving as Director for a new organization entitled "Educators for Connecting Research to the K-16 Classroom – ECRC."

Participants

Candice Autry	*Thomas Jefferson* 2006	Sheridan School Washington, D.C.
Elizabeth Bullock	*R/V Walton Smith* 2011	Green Acres School Bethesda, MD
Kathleen Harrison	*Oscar Dyson* 2011	Hampton High School, Hampton, VA
Julie Karre	*Oregon II* 2013	Armistead Gardens Elementary and Middle, Baltimore, MD
Rebecca Kimport	*Oscar Dyson* 2010	Apple Early Learning Public Charter School Washington, D.C.
Joan Le	*Henry Bigelow* 2014	Washington-Lee High School, Arlington, VA
Elizabeth Martz	*Albatross IV* 2007	Middletown Middle School, Frederick, MD
Amanda Peretich	*Oscar Dyson* 2012	Calvert High School Prince Frederick, MD
Christina Peters	*Oregon II* 2013	Farmland Elementary, Rockville, MD
Rita Salisbury	*Oscar Elton Sette* 2013	Sussex Technical High School, Georgetown, DE

The following NOAA Teacher at Sea Alumni from Washington D.C., Delaware, MD, VA, and WV were also invited to attend the workshop:

Steven King	*R/V Kilo Moana* 2010	Shepherd Elementary School, Washington, D.C.
Mary Murrian	*Oscar Dyson* 2014	William Henry Middle School, Dover, DE
Gina Henderson	*Ronald H. Brown* 2012	US Naval Academy Annapolis, MD
Jim Jenkins	*Miller Freeman* 2005	Mountainview Elementary, Purcellville, VA
Caitlin Fine	*Walton Smith* 2011	Francis Scott Key Elementary, Arlington, VA
John Sammons	*Albatross IV* 2005	Greenbrier Intermediate School Chesapeake, VA
Yaara Crane	*Thomas Jefferson* 2013	Annandale High School, Annandale, VA
Joan Raybourn	*Albatross IV* 2005	Norfolk Highlands Primary, Norfolk, VA
Rita Larson	*Rainer* 2009	King Elementary School, Woodbridge, VA
Lynette Swiger	*Freedom Star* 2008	Monongah Elementary, Monongah, WV

Workshop Staff and Support:

Jennifer Annetta	NOAA Teacher at Sea Program Office
Jennifer Hammond	NOAA Teacher at Sea Program Office
John Baek	NOAA Office of Education
Tina Bishop	The College of Exploration
Mark Saaman	The College of Exploration
Mark Haddon	Smithsonian Environmental Research Center
Robert Keddell	Motivation Education

Agenda

NOAA Teacher at Sea Alumni (TASA) Mid-Atlantic Region Workshop
November 7-8, 2014
Smithsonian Environmental Research Center
http://www.serc.si.edu
647 Contees Wharf Road
Edgewater, MD 21037

Day 1 - Friday, November 7, 2014

8:30 – 9:00	Breakfast
9:00 – 9:30	Welcome, Introductions, Agenda, Logistics
9:30 – 10:30	SERC Orientation and History
10:30 – 10:45	Break
10:45 – 12:30	Tour SERC Facilities
12:30 – 1:00	Lunch at the Charles McC. Mathias Laboratory
1:00 – 1:30	Ecosystems on the Edge
1:30 – 2:00	Marine Invasions Research Lab – Biologists, Monaca Noble, Darrick Sparks, and Dr. Kim Holzer
2:00 – 3:00	Watershed and Stream Monitoring
3:00 – 4:00	Biogeochemistry Lab –Research Biogeochemist, Dr. Patrick Megonigal and Environmental Engineer, Gary Peresta
4:00 – 4:15	Travel to Reed Center
4:15 – 4:45	Discussion/Wrap-Up

Day 2 – Saturday, November 8, 2014

8:30 – 9:00	Breakfast
9:00 – 9:30	Agenda/Logistics
9:30 – 12:00	Estuary Chesapeake Field Experience: About Crabs, Seining, Investigating Plankton, Oyster Bar Community and Water Quality
12:00 – 12:45	Lunch
12:45 – 3:00	Classroom Activities and Resources – Director, Motivation Education - Educators Connecting Research to the K-16 Classroom, Robert Keddell
3:00 – 3:15	Break
3:15 - 4:15	Activities and Resources Continued
4:15 – 5:00	Next Steps/Evaluation/Wrap-Up

Data

Results from the NOAA Teacher at Sea Program Workshop Evaluation (n=10)

Participants were asked to select from - poor, adequate, good, excellent or N/A for the following items:

- Overall Workshop - 100% Excellent
- Quality of Workshop Content - 100% Excellent
- Relevance to your work, professional development - 80% Excellent; 20% Good
- Workshop Location - 100% Excellent
- Accommodations - 40% Excellent, 10% Good, 50% N/A
- Communication Prior to the Workshop - 90% Excellent, 10% Good

- SERC History and Tour - 60% Excellent, 20% Good, 20% N/A
- Mathias Lab Tour - 60% Excellent, 20% Good, 20% NA
- Ecosystems on the Edge Videos - 90% Excellent, 10% N/A
- Marine Invasions Research Lab - 80% Excellent, 20% N/A
- Watershed and Stream Monitoring Tour - 60% Excellent, 40% N/A
- Biogeochemistry Lab - 60% Excellent, 40% N/A
- Estuary Chesapeake Field Experience - 100% Excellent
- Classroom Activities and Resources, Bob Keddell - 90% Excellent, 10% Good

When asked if alumni plan to incorporate content, activities, and experiences from the workshop into their curriculum:

90% said that they plan to incorporate workshop content, activities and experiences into their curriculum.
10% said they plan to learn more about the content, activities, and experiences before incorporating them into their curriculum.

Those alumni who said that they plan to incorporate workshop content, activities and experiences into their curriculum explained that they would do so by:

- Using the basic philosophy behind Bob's (Keddell) lessons. I want to bring my students for a field trip. Within the next few weeks something will be incorporated.
- Oh my! Everything! I've developed a list of ways to use all of this information in my class - water quality, species identification, Chesapeake Bay importance/significance, student ownership/responsibility, and so much more,
- I am immediately going to incorporate the carbon dioxide lab into my lessons. It's so much better than the lab I've been doing.
- I will do the population math model next week! All the activities can go directly to the classroom.
- I will immediately use the Ecosystems on the Edge videos and activities. It ties directly into our curriculum now. I hope to use some of the 30 minutes to Impact activities. I'll also use the bean activity this year.
- I'd like to do something with the Everest activities and definitely use the Ecosystems on the Edge videos and SERC science research. Maybe a field trip to SERC or a video conference in the field.

- Math modeling activities, Data and graphing opportunities from almost all of the activities presented.
- Ballast invasions
- Invasives and Blue Crab videos

Open - Ended Questions:

1. What was the most valuable part of the workshop?

- Seeing the TASA again, sharing activities, and learning about new resources
- Ecosystems on the Edge videos
- Talking with scientists
- Chesapeake Field Experience
- Bob Keddell's activities
- It was great to meet TAS Alumni and experience SERC educational opportunities
- The diversity of topics presented
- All of it was terrific and applicable
- I enjoyed being both inside and outside of the lab
- Biogeochemistry Lab and Chesapeake Bay Health

2. How could this workshop have been improved?

- Pace could be faster.
- It was amazing, inspiring, excellent, rewarding - Thank you!
- I don't think it could have been improved.
- It was near perfect, thank you.
- Less paper copies of things, more digital versions to adjust as needed for the classroom.
- I wish I could have come both days!
- Nothing - it was great!
- Collaborative time to develop a lesson and share.

Additional Comments:

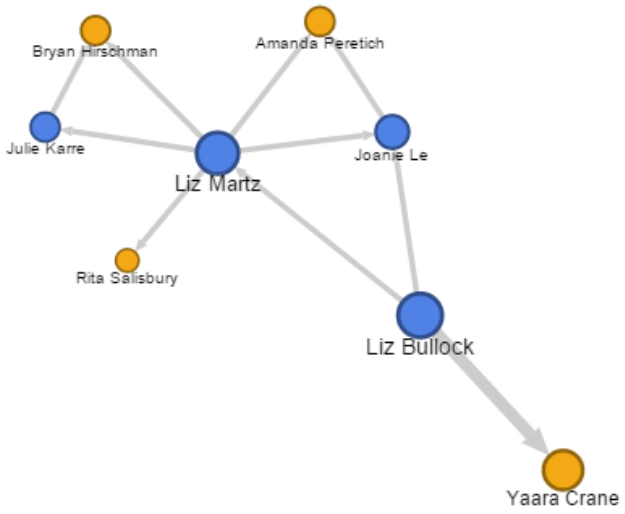
- NOAA Law Enforcement - I didn't realize this arm of NOAA existed. I'm looking forward to sharing another NOAA career with my students.
- Thank you - this was awesome!
- Awesome workshop - again!

Results from Smithsonian Environmental Research Center/Educators Connecting Research to the Classroom (SERC/ECRC) Survey (n=10)

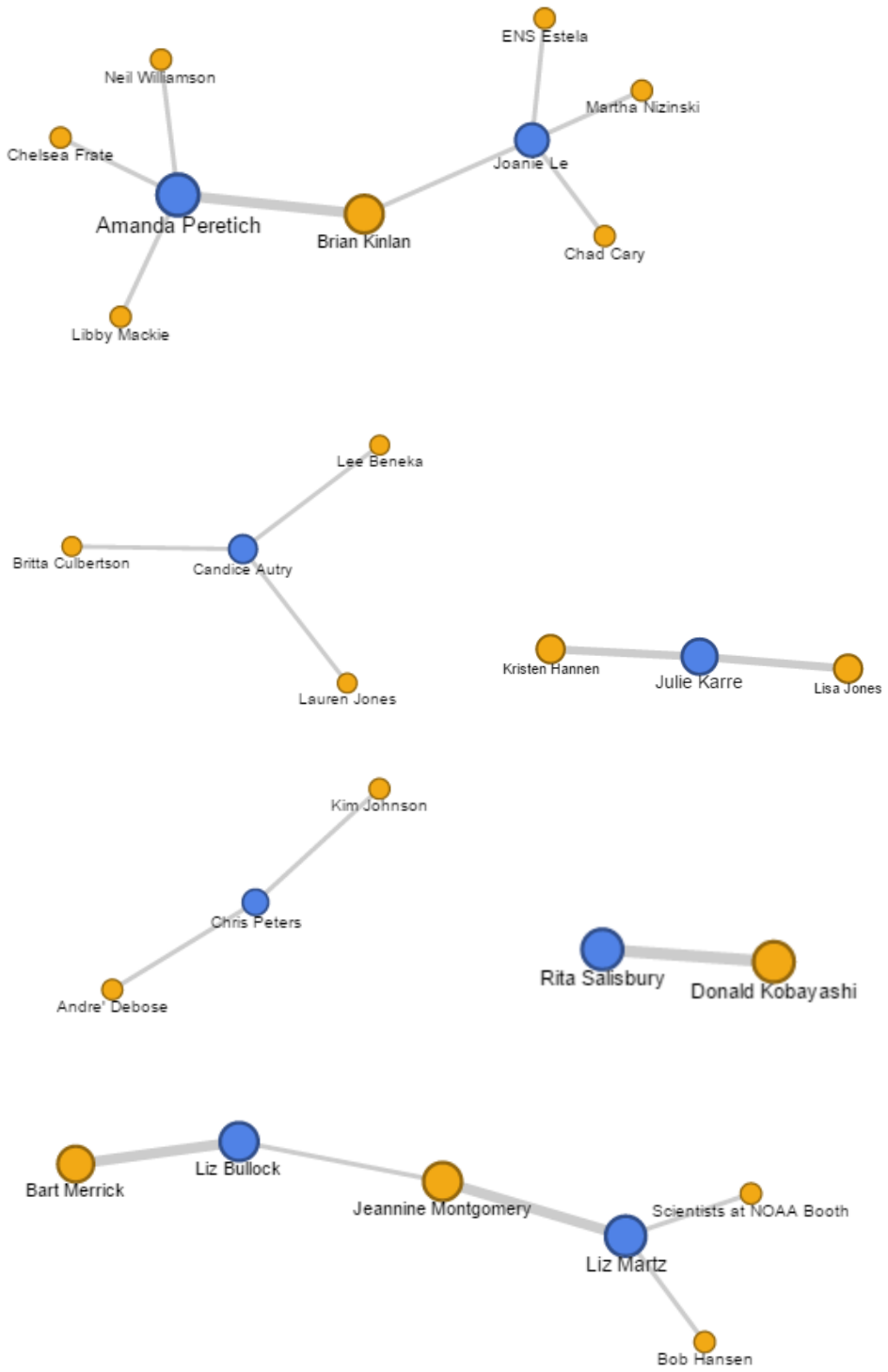
- 90% of participants reported that their experiences with the SERC-ECRC staff were **very conducive** to enriching their classrooms.
- 90% of participants reported that their understanding of how Smithsonian Science content could apply to their teaching requirements was **very improved**.
- 80% of participants reported that the instructional techniques used by SERC-ECRC staff were **very helpful** in facilitating their learning.
- 80% of participants reported that the MOTIVATION EDUCATION instructional methods can **greatly improve** their teaching.
- 80% of participants **strongly agreed** that the SERC-ECRC-Staff can support their teaching and become an excellent resource for future needs.
- 70% of participants reported that SERC-ECRC workshop was **very relevant** to their professional responsibilities.
- 70% of participants reported the information presented will allow them to engage their students **very well** using NGSS performances with integrated Common Core State Standards.
- 50% of participants reported that the confidence in their ability to teach MOTIVATION EDUCATION using the content presented throughout the day was **very improved**.

Results from Social Network Analysis (n=10)

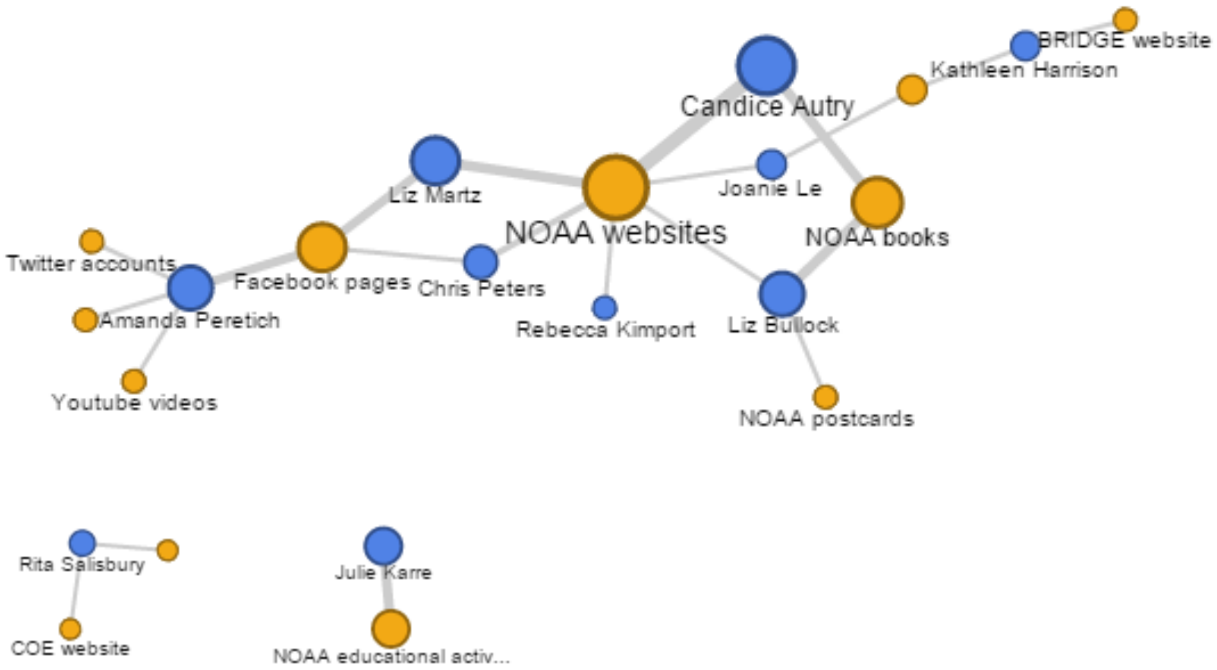
Network of interactions between TAS Alumni within the last year.



Network of interactions between TAS Alumni and NOAA scientists or staff within the last year.



Network of NOAA educational and science resources used by TAS Alumni in the last year.



Next Steps:

The NOAA Teacher at Sea Mid-Atlantic Alumni have attended two, NOAA Teacher at Sea (TAS) staff-coordinated workshops. The workshops gave alumni the opportunity to meet in person to share similar experiences while learning ocean science content through various platforms. They gained exposure to NOAA resources, NOAA scientists and NOAA partnerships. Alumni also shared ways in which to adapt and incorporate workshop content to meet their curricular needs.

Mid-Atlantic Alumni who attended the November 2014 workshop have scheduled field trips to SERC in the spring. written proposals to department heads for money to incorporate the CO2 lab that they learned about during the workshop, and "Climbed Everest" (a motivating activity demonstrated by Bob Keddell).

- Select a Mid-Atlantic Regional Coordinator to communicate with the Mid-Atlantic TAS Alumni, plan events, share information and sustain a network of alumni who will continue to be ocean and environmental stewards.
- A forum for communication and sharing will be developed and utilized by the Mid-Atlantic Regional Coordinator.

Resources:

Smithsonian Environmental Research Center
- K-8 Field Trip Programs
- Ecosystems on the Edge
- Internships
- Citizen Science
- Marine Invasives Lab
- Online Data

Motivation Education

NOAA Teacher at Sea Program Office

About LEED Certification

Appendix: Photos

L-R Amanda Peretich, Kathleen Harrison, Joan Le, Rita Salisbury, Candice Autry, Chris Peters, Julie Karre, and Elizabeth Martz

L-R Amanda Peretich, Rita Salisbury, Kathleen Harrison, Joan Le, and Elizabeth Bullock

Kathleen Harrison (L), Chris Peters and Candice Autry (back) sorting organisms living in an oyster community

Gary Peresta, SERC Environmental Engineer, explains how ecosystems respond to global changes, such as sea-level rise, nitrogen pollution, invasive species and elevated CO_2 at the Smithsonian's Global Change Research Wetland