

**The National Ocean Sciences Bowl in 2015:
A National Competition for High School Ocean Sciences
Education and STEM Career Preparation**

Kristen Yarincik
1201 New York Avenue, NW, Fourth Floor
Washington, DC 20005
phone: (202) 448-1237 fax: (202) 332-8887 email: kyarincik@oceanleadership.org

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LONG-TERM GOALS

- Develop knowledgeable ocean stewards that understand the ocean's impact on daily life and the importance of scientific research;
- Foster the use of the ocean as an interdisciplinary vehicle to teach STEM topics and encourage the inclusion of the ocean sciences in high school curricula;
- Encourage and support the involvement of under-represented and geographically diverse communities in the ocean sciences; and
- Provide students interactive education that develops critical thinking and skills for the workforce and exposes them to ocean science professionals and career opportunities.

OBJECTIVES

- Implement 23 highly interactive, engaging competitions around the country that will reach approximately 1,900 students per year and involve over 1,200 professional science volunteers.
- Coordinate a series of webinars during September-December 2014 that will train 23 Regional Coordinators and discuss best practices on how to attract, engage and retain teams and volunteers.
- Hold the 2015 Finals Competition involving 23 student teams (of 4-5 students each) and 100 professional science volunteers and incorporate interactive regionally-based field trips within Ocean Springs, Mississippi.
- Enhance the Ocean Sciences Quiz, an online game that is available to lifelong learners who want to gain more knowledge about ocean sciences and NOSB teams who wish to practice their skills for the competition, by encouraging NOSB participants to submit questions.
- Provide educational award trips to nationally winning teams, allowing them to gain hands-on experience with ocean scientists.

- Develop and review nearly 2,500 science questions that touch on all ocean science disciplines (biology, chemistry, physics, geology, marine policy, social science and technology) and compile the questions into three competitions.
- Offer online professional development training to educators across the country on the program's theme and incorporate questions from the presentations into the competitions.
- Continue to implement a longitudinal study on program alumni and their higher education and career paths.
- Support and promote the 23 regional sites that host the regional NOSB competitions.
- Incorporate a career event at the NOSB Finals and assist many of the regional competitions that will involve ocean science professionals.
- Circulate more broadly at the regional competition level NOSB's career booklet to help guide students selecting their ideal career and provide them with guidance on how best to take appropriate next steps.
- Actively encourage students from diverse communities to participate in NOSB activities.

APPROACH

The National Ocean Sciences Bowl[®] (NOSB[®]) is a nationally recognized high school academic competition. The NOSB provides a forum for talented students to excel in science and math and introduces team members, their teacher/coaches, schools and communities to ocean sciences as an interdisciplinary field of study and a possible future career path and stimulates broad interest in and excitement about science and the ocean. The overall program operates within a supportive ocean science learning community framework that involves the NOSB national office, managed by the Consortium for Ocean Leadership, 25 regional competition hosts in the research community in pre-college education and approximately 1,200 volunteers per year.

Please note that for a number of reasons, only 23 of our 25 regional competitions were held. More information is provided under Regional Competitions in the Work Completed section.

The NOSB national office: coordinates the development of the competition questions; trains the Regional Coordinators (RCs); manages the competition rules; coordinates and manages the Science Expert Briefing; plans and implements the National Finals Competition, in conjunction with the regional host institution; manages the NOSB communications; organizes the program's evaluation and longitudinal study; and manages the enhancement activities such as the scholarship program for NOSB participants graduating high school and pursuing ocean sciences in college, a professional development series for coaches, a video contest open to any high school students and the online quiz game that simulates the NOSB buzzer rounds.

The regional hosts (see Appendix I; 23 of 25 held competitions in 2015) implement their individual competitions each February and/or March on one of two provided dates. Each host site has at least one designated staff member who serves as the primary coordinator. The RCs are trained by NOSB staff on how to organize and administer a regional competition, but are given flexibility to arrange events that are regionally unique. Some regional competitions include mandatory projects, a poster session, participation in a lecture series, or other activities. Regional hosts are responsible for recruiting at least

eight teams from eight different schools and 50-100 volunteers as competition officials to ensure their competition rooms run smoothly. They are also expected to coordinate speakers, presenters and activities for non-competing students during their regional competitions.

The overall coordination and partnership between the NOSB staff, the RCs and the volunteers each year ensure the successful engagement of as many as 2,000 students in ocean science education and STEM career exploration.

WORK COMPLETED

Some of the work described below was completed outside of this award and/or its period of performance (prior to February 2015), but is highlighted in this report as the culmination of all the tasks completed is critical to the overall success of the NOSB program.

Question Development: Competition questions, received from six hired question writers and numerous volunteers, were edited for scientific accuracy and level of difficulty by ocean science professionals, graduate students and educators during the Technical Advisory Panels (held September - October 2014). The NOSB staff then sorted the questions into rounds for each competition date. Overall, 23 individuals from federal agencies, universities, NGOs and Ocean Leadership reviewed nearly 2,400 buzzer questions and 110 TCQs for use in the 2015 regional bowls and National Finals Competition. NOSB national office staff then compiled the approved questions into three unique competition packets for two regional competitions and the National Finals Competition. Question development and review is supported by leveraged funds from The National Aeronautics and Space Administration (NASA), but remains an almost year round activity for the national office.

Regional Competitions: Each bowl receives seed funding from the national office to cover a portion (about 30%, but variable by region) of competition costs and allows the host institution to leverage additional needed financial and in-kind support. In 2015 each regional host received a total of \$10,000 to plan and hold their 2015 competitions. In total \$230,000 was provided to 23 regional hosts through support from NOAA, Deerbrook Charitable Trust, Eric and Wendy Schmidt, Shell Exploration and Company and Wells Fargo.

The 2015 regional competitions took place on February 7 and 28, 2015. While the NOSB has 25 established regional bowls, only 23 bowls took place in 2015. The Grunion Bowl in San Diego requires a new host site as the Birch Aquarium at Scripps Institution of Oceanography at the University of California is no longer able to host due to a change in strategic direction within the aquarium. The Salmon Bowl (Oregon State University, Corvallis, OR) agreed to accept displaced Grunion Bowl teams. The Aloha Bowl also requires a new host site due to competing priorities at the University of Hawaii Manoa School of Ocean and Earth Science and Technology (SOEST). Hawaii Sea Grant at the University of Hawaii Manoa may be interested in hosting in 2016. The NOSB national office was unable to secure new host institutions for these two bowls in time for the 2015 competitions. However, in late February 2015, the University of San Diego informed us that they will host the Grunion Bowl beginning in 2016.

Approximately 1,795 students from 359 teams from 31 states participated in the 2015 regional competitions. The regional winners include:

- Bay Scallop Bowl - Mount Sinai High School (NY)

- Blue Crab Bowl - Bishop Sullivan Catholic High School (VA)
- Blue Heron Bowl - North Carolina School of Science and Math (NC)
- Blue Lobster Bowl - Lexington High School (MA)
- Chesapeake Bay Bowl - Thomas Jefferson High School for Science & Technology (VA)
- Dolphin Challenge - Sanger High School (TX)
- Great Lakes Bowl - Dexter High School (MI)
- Hurricane Bowl - Long Beach High School (MS)
- Lake Sturgeon Bowl - Marshfield High School (WI)
- Loggerhead Challenge - Chaparral Star Academy (TX)
- Los Angeles Surf Bowl - Arcadia High School (CA)
- Manatee Bowl - Maritime & Science Tech (MAST) Academy (FL)
- Nor'easter Bowl - Contoocook Valley Regional High School (NH)
- Orca Bowl - Friday Harbor High School (WA)
- Penguin Bowl - Centerville High School (OH)
- Quahog Bowl - Coginchaug Regional High School (CT)
- Salmon Bowl - Boise High School (ID)
- Sea Lion Bowl - Mission San Jose High School (CA)
- Shore Bowl - West-Windsor Plainsboro High School South (NJ)
- Southern Stingray Bowl - Rockdale Magnet School for Science and Technology (GA)
- Spoonbill Bowl - Eastside High School (FL)
- Trout Bowl - Liberty Common High School (CO)
- Tsunami Bowl - Mat-Su Career and Technical High School (AK)

National Finals Competition: The 18th annual Finals Competition was held in Ocean Springs, MS on April 23-26, 2015 hosted by the University of Southern Mississippi's Gulf Coast Research Laboratory, the host of the regional Hurricane Bowl. The location of Finals allowed the NOSB to highlight the regional scientific research and maritime culture and history of the Mississippi coast as they related to the 2015 competition theme of "the science of oil in the ocean." Students were immersed in questions, presentations and activities related to the competition theme, encouraging increased awareness and understanding of topics such as: 1) the origins of oil in the ocean; 2) transport, breakdown, and remediation of oil in the ocean; 3) the impact of oil on organisms, ecosystems, and humans; and 4) policy related to oil production, spills, and restoration. This was an important and timely theme to the regional host of the National Finals Competition especially as our event occurred close to the fifth anniversary of the Deepwater Horizon disaster. Looking at the bigger picture, the theme was important as the NOSB strives to create science-literate students who will become better informed citizens who can lead our country to more sustainable energy use and resource conservation.

During the four-day event, the students and coaches participated in a number of hands-on, science activities in addition to the actual competition. The activities included a career mentoring event with leaders in the science field; a presentation by Dr. Vernon Asper, a professor at the University of Southern Mississippi, on his scientific work in the Gulf after the Deepwater Horizon oil spill; a dinner at the Maritime & Seafood Industry Museum; and multiple field trips, including a tour of the Point Sur research vessel, trips to West Ship Island and Horn Island, a Pascagoula River tour, and visits to Dauphin Island Sea Lab and Stennis Space Center & Infinity Science Center.

The competition officially began on Saturday with teams competing in round robins. Also on Saturday, in addition to the general competition format, teams at the National Finals Competition participate in a program element called the Science Expert Briefing, which mimics a congressional briefing. Through the SEB, each student represents a different scientific stakeholder (employee of a federal agency, state agency, academia, non-government organization or industry) responding to current Federal legislation on a specific topic. Through a written document (Science Briefing Report) due prior to the competition, the students provide their stakeholders' scientific expertise on the issue, and provide up to five specific scientific recommendations to "Congress" on how the current legislation should be amended or adopted. In developing their recommendations, they identify community, economic and scientific impacts of specific legislation, as well as current data gaps and potential needs in research, development and capacity building. The team members must then work together to come to consensus on three to five recommendations. At the Finals Competition, the students read the abstract of their report (Expert Testimony) and answer detailed questions from the judges during a question-and-answer session.

For the 2015 NOSB Finals competition Science Expert Briefing, the students reviewed the Integrated Coastal and Ocean Observation System Act (ICOOS) of 2009. The teams were asked to consider recommendations for the reauthorization – what should legislators maintain, add, remove, or edit in the current federal program and legislation. While reviewing the Act, the students also considered the overall theme for NOSB 2015 (The Science of Oil in the Ocean) and explore relevant connections with the Act.

Double elimination rounds on Sunday morning determined the top eight teams at the Finals Competition. The top eight teams at the Finals Competition were:

- 1st Place – Boise High School – Boise, Idaho
- 2nd Place – Dexter – Dexter, Michigan
- 3rd Place – Marshfield High School – Marshfield, Wisconsin
- 4th Place – Mission San Jose High School – Fremont, California
- 5th Place – Mount Sinai High School – Mount Sinai, New York
- 6th Place – Lexington High School – Lexington, Massachusetts
- 7th Place – Chaparral Star Academy – Austin, Texas
- 8th Place – Arcadia High School – Arcadia, California

The team from Thomas Jefferson High School for Science and Technology (Alexandria, Virginia) placed first in the SEB. Sanger High School of Sanger, Texas won the James D. Watkins

Sportsmanship Award, which is voted upon by the volunteers for demonstrating the best sportsmanship throughout the weekend-long competition.

Each year, the award for the top winning teams at the National Ocean Sciences Bowl Finals Competition is an experiential trip that provides these teams with unique hands-on field and laboratory experience in the marine sciences. The trips expose students to science professionals and career opportunities, while enriching their understanding and stewardship of the ocean. These trips were made possible through funding from the IEEE Oceanic Engineering Society.

The 2015 NOSB national champions from Boise High School (Idaho) were awarded a week-long trip to Southeast Alaska. The trip started in Juneau, AK where the team kicked off the week with tide pooling on Douglas Island. The students spent the next three days in Juneau visiting the NOAA Auke Bay Lab, touring the DIPAC hatchery and the University of Alaska Fairbanks School of Fisheries and Ocean Sciences. The team boarded NOAA's R/V Sashin to conduct a humpback whale survey. While aboard, they also collected plankton samples and spotted some seals and sea lions. They learned hands-on about the bioenergetics research at Auke Bay and the salmon research at the Auke Creek weir. Next, they learned about Juneau Ice Field ecology and research and got a bird's eye view by helicopter ride to Mendenhall Glacier. The Juneau portion of the trip rounded out with hook and line sampling for pink salmon alongside Auke Bay researchers. The team then headed off to Sitka, where they toured the Sitka Sound Science Center and learned of the aquarium outreach and hatchery research they do. While in Sitka, they also visited the University of Alaska Southeast campus and went snorkeling in Sitka Sound. The trip wrapped up with more tide pooling and hiking amongst Alaska native totem poles.

The team from Dexter High School (Michigan) placed 2nd and received a five-day trip to the coast of Texas. In Corpus Christi, the team was provided a behind the scene tour of the Texas State Aquarium, a meeting with staff of the Port of Corpus Christi and a tour of the USS Lexington. The students spent an entire day with the staff and researchers at the HARTE Research Institute, exploring the labs and learning about marine genomics, fisheries and benthic sampling research. The University of Texas Austin Marine Science Institute in Port Aransas treated the team to a boat ride a morning of snorkeling in grass beds in the bay. Their last day was a relaxing one, spent at Padre Island National Seashore where they spent the majority of the morning and afternoon enjoying the sand and ocean water.

Enhancement Activities: The NOSB is more than just a buzzer competition. Since 2007, the NOSB has continued to heighten coaches' and students' experiences at the regional competitions, National Finals competition and throughout the school year. The NOSB national office provides additional enhancements to the competitions, including: scholarships for NOSB participants; professional development opportunities for NOSB coaches; a video contest tied to the Ocean Literacy Principals; career events; interactive field and award trips; the SEB, our mock congressional briefing; an online game; and enhanced communication of other marine and freshwater opportunities available to high school students and teachers. All of the enhancement activities have a similar objective – to expose students and educators to ocean science information, activities, presentations and interactions with scientists in ways that they do not receive in the traditional classroom setting. These opportunities are extremely important and influential as they provide interactive and hands-on learning opportunities that help shape personal, leadership and professional development skills. The additional enhancement activities described below, although supported by leveraged funds from other federal agencies, remain integral pieces to the overall NOSB program.

To prepare coaches for training and educating their NOSB teams, the NOSB offers a yearly online professional development webinar series on the annual competition topic. Although the training series is used by the NOSB teachers/coaches to prepare for the competition, many other participants view the professional development series because the topics and lectures have broad appeal. The format includes a presentation given by a scientist/researcher in an ocean science field followed by a 30-minute question and answer session. The presentation recording is posted online for later viewing, along with other related articles and materials that can be downloaded. The presenters also submit questions for the competition based on the topics covered in the presentations.

The 2014-2015 competition training series, focused on the current year's competition theme of 'the science of oil in the ocean' took place in January 2015. Approximately 30 educators from across the nation were actively engaged during each of the three live sessions and numerous others watched the recorded presentations at their leisure. The webinar series web pages typically receive 3,000 unique hits within two-three months of the series ending.

The following scientists presented in the 2015 series:

- January 13 – Dr. Christopher Reddy from Woods Hole Oceanographic Institution
Topic: Exploring Oil Spills on a Molecular Basis
- January 21 – Dr. Arthur Mariano from University of Miami, Rosenstiel School of Marine and Atmospheric Science
Topic: Ocean Currents and the 2010 Deep Water Horizon Oil Blowout
- January 27 – Dr. Joseph Montoya, Georgia Institute of Technology
Topic: Impacts of Oil and Gas on Offshore Ecosystems

Recordings of the above presentations are available on our Professional Development Webinar Series page (<http://nosb.org/learn/professional-development/>) and YouTube channel (<https://www.youtube.com/user/theNOSB>).

In addition to the articles and materials provided through the professional development program, the NOSB has an ever expanding general resource guide available on our website (<http://nosb.org/learn/resource-guide/>) to both interested students and their coaches which provides key information on ocean research and related topics that can be invaluable to a team preparing for the competition. We post a [basic resource guide](#) which includes citations to a number of critical sources of information on the oceans, including textbooks, popular guide books, curricula developed by Federal agencies, magazines and journals, and reliable online information sources such as the BRIDGE. There is also a [yearly theme study resources page](#) to help direct students to websites and books that will help them prepare for questions related to the theme (<http://nosb.org/learn/study-resources/>). Also available online are a series of [sample questions](#) for teams new to the competition.

Lastly, the NOSB hosted a Google+ Hangout on Air on January 29th that provided competing students with a special opportunity to "Ask an Expert" their questions on the competition theme of "the science of oil in the ocean." Three experts from the NOAA Office of Response and Restoration, including an environmental scientist, physical oceanographer and policy analyst, provided the responses. Nearly 30 live viewers asked questions of the experts and over 200 viewers watched the recording at a later date.

The recording of the Google+ Hangout is available on the NOSB's YouTube channel (<https://www.youtube.com/watch?v=Hf03PIEKnAY>).

The NOSB, in partnership with the National Marine Educators Association (NMEA), sponsored the 2015 "Living on the Ocean Planet" video contest. Any students enrolled in high school were eligible to submit a 1-3 minute video. All entries were excellent, but the National winner was "Oil in the Oceans" by Michelle Fernandez, Patrick Dolan and Marissa Zaleski from Marshfield High School. Through creative visualization and an educational storyline, "Oil in the Oceans" addresses human reliance on oil trade and consumption and explains the effects of oil spills, runoff and fuel leaks on marine ecosystems. The Fan Favorite winner is "An Ocean of Oil" by Jenny Liu, Anwesha Nandi, and Gracie Lian from East Chapel Hill High School, which also took second place in the National competition. Third place is awarded to "A Crude Awakening" by Rachel Hefner, Sarah Hefner and Matthew Ferris from Eastern Guilford High School. The winning videos, as well as all submissions can be viewed on NOSB's YouTube Channel at <https://www.youtube.com/user/theNOSB/videos>.

The annual National Ocean Scholar Program is part of the NOSB's continuing efforts to recognize and support achievement in science, technology, engineering and mathematics (STEM) education. Each of the five 2015 scholars received \$1,000 to be used during the first year of their respective undergraduate educations. The funds for the 2015 National Ocean Scholar Program were raised through the NOSB's 2015 Get in the Game crowdsourcing fundraiser. The 2015 National Ocean Scholars are:

- Ashley Davis
Dutch Fork High School in Irmo, South Carolina (Southern Stingray Bowl); attending the University of South Carolina, majoring in Marine Science
- Devon Gaynes
Mt. Sinai High School in Mt. Sinai, New York (Bay Scallop Bowl) attending Stony Brook University, majoring in Physical Oceanography
- Jeffrey Keene
Strawberry Crest High School in Dover, Florida (Spoonbill Bowl); attending Florida Atlantic University, majoring in Marine Biology
- Augustus Pendelton
Shorewood High School in Shorewood, Wisconsin (Lake Sturgeon Bowl); attending University of Minnesota, majoring in Microbiology with a minor in Marine Biology
- Noa Randall
Cambridge Rindge and Latin School in Cambridge, Massachusetts (Blue Lobster Bowl); attending Smith College, majoring in Environmental Science

For more information on each of the 2015 Scholars, including photos, visit our scholarship page at <http://nosb.org/opportunities/national-ocean-scholar-program/>.

RESULTS

Regional Competitions: The 2015 regional competitions highlighted how important students and educators around the U.S. find participating in the NOSB and how the program impacts the participants academically, socially and personally. Overall, all 23 of the 2015 regional competitions went smoothly and we received the following comments from the regional surveys:

- *"I developed greatly in my research, proofing, and editing skills by writing the SEB, and learned critical thinking and team work by participating in the general competition. These*

skills will significantly contribute to future career.” – Student from Virginia, Chesapeake Bay Bowl

- *“[The] NOSB has been my favorite activity, both academic and non-academic, for the past two years. I will remember all of the competitions and study sessions and meetings. – Student from New York*
- *“I will remember meeting new people from as far away as Washington State to Wisconsin. The connections that I have made will be shared for a time much longer than the competition.” – Student from Virginia, Chesapeake Bay Bowl*
- *“The decision to join Ocean Bowl solidified my career interest in marine science and allowed me to connect with students who love the ocean as much as I do. I was also able to rapidly expand my knowledge of ocean science, which will greatly help me in college at Oregon State University.” – Student (now Alumnus) from Michigan, Great Lakes Bowl*
- *“Participation in NOSB has enhanced the prestige of our school in the community. Outside organizations such as the American Society of Naval Engineers has been impressed by our participation and success in NOSB. Our participation in NOSB events has resulted in an increased emphasis on science in our school and higher expectations for our students, across the science curriculum.” – Coach from Virginia, Blue Crab Bowl*

National Finals Competition: After the 2015 National Finals Competition in Ocean Springs, MA, it was clear from survey comments of students and coaches that the participants not only find the competition educational, engaging and exciting, but also one of the only ways their students grasp the interdisciplinary nature of ocean, environmental and climate science.

- *“After four years of participating in NOSB, and three years at nationals, I have learned so much and met so many incredible people. Now as I am graduating, I would like to give back to the NOSB community to foster the same supportive environment for all future students. NOSB means so much to me, and it has been such an integral part of my high school experience. Thank you so much - to my coach, my team, and the entire NOSB family!” - Sneha Rao, student, Blue Lobster Bowl*
- *“My students most valuable experience had to be interactions with some of the most incredible future ocean leaders (the PIN EXCHANGE has to be encouraged...my kids LOVE doing it). The overall friendliness and well-organized nature of this VERY INTENSE national competition is to me a fabulous undertaking and I APPRECIATE what you all do at Ocean Leadership. I LOVE NOSB!” – Lorrie Martin, Coach, Quahog Bowl*
- *“For the past 18 years I have had the privilege to coach 18 teams at regionals, and proceed with 8 teams to the Nationals. It has been a great adventure. The Ocean literacy program has been inspiring. I created an Oceanography class for our high school about 10 years ago and have kids dissecting, creating ecology projects, working on labs in ocean chemistry, learning about our ocean technology, history and marine policies. Our school library has enhanced its ocean materials, we have art classes painting ocean murals, and the numbers of graduates selecting ocean related career pathways has increased. – Cheryl Wells, coach, Great Lakes Bowl*
- *“Coaching our school's NOSB team has been one of the most satisfying aspects of my teaching career, as it has provided an opportunity to combine two of my favorite things--love of the*

ocean and joy of working with highly motivated and enthusiastic young people. Working with the team has allowed me to build relationships with students outside of the classroom, throughout the course of their high school careers (I teach freshmen), and to enjoy their company during the national competitions and on the three wonderful award trips we have made together. – Sarah Damassa, coach, Blue Lobster Bowl

- *“Participation in NOSB has opened the door to the ocean sciences. Because of NOSB, the team has learned about major issues affecting the ocean, and therefore the world. This cannot be over stated. It is the students of today that will work to resolve the errors of past generations. For the schools here, there is now focus on these issues. Yes we have general earth science, but that tends to focus on land. I have one team member who is considering marine science as a career; he would never have considered that without NOSB. – Tony Baca, coach, Salmon Bowl*

During the 2015 SEB, focusing on ocean observing policy, students grasped a better understanding of the nature of marine policy, how to better communicate scientific information and stakeholder views and how to collaborate and build consensus as a team:

- *“I think it’s really important that we do the research and communicate it to people who can actually make a change, like the legislators who can take our research and make it into policy that will benefit everyone.” - Kathy Lee, student, student, LA Surf Bowl*
- *“Without the Science Expert Briefing, I honestly wouldn’t have looked at any scientific policy going through Congress. The SEB gave me an opportunity to look through it and really think critically about what’s happening in the political situation regarding the oceans.” - Sean Keeler, student, Southern Stingray Bowl*
- *“[The SEB] is a good introduction to analysis of real legislation and thinking critically.” - Nate Marshall, student, Salmon Bowl*
- *[Students] begin to see it’s not all black and white – that there is a lot of persuasion that has to go into being a scientist. You’ve got to be able to express your ideas, usually to a non-scientist, in a way that you can convince them, in essence, that they need to buy your product.” - Tony Baca, Coach, Salmon Bowl*
- In response to her team members’ difference in views of about the piece of legislation they were addressing, and how they had difficulty in coming to consensus about their recommendations: *“I said, that’s your government at work. You need to find consensus. It was an absolutely eye-opening experience for [my team] to try to bring their disparate views together into one consensus.” - Anne West Valle, Coach, Spoonbill Bowl*

Communication: Ocean Leadership, worked closely with the RCs and NOSB staff to ensure that each regional competition and the National Finals received media coverage. The total media circulation (unique visitors) for 2015 was 26,421,860.

The NOSB staff continued to promote the program through the use of social media. We used our Facebook site to highlight ocean acidification study resources, as well as share team and regional competition media stories from the regional competitions. The Facebook was used at the National Finals Competitions to ensure family and friends back home can stayed up to date on the progress of

their favorite competing team. Also during the 2015 Finals, we also held a photo challenge, providing small prizes for students who captured their experiences as Finals ion Instagram.

IMPACT/APPLICATIONS

To evaluate the long-term impact of the NOSB, the College of Exploration and Ashland University have annually conducted a longitudinal study of the program since 2002. In addition to the ongoing longitudinal study, special focus studies are, on occasion, undertaken by these two organizations, such as on NOSB's impact on secondary tier students and, in 2014, on instructional choices and team preparation. Overall, the ongoing longitudinal study emphasizes that the NOSB is more than an academic competition. It is a community of multiple stakeholder groups—students, educators, scientists, federal agencies, and sponsors—who benefit from interactions with one another.

2014 Past Participant Report: Thirty-four percent of respondents indicated that their career will include an emphasis on marine, aquatic or ocean sciences. When asked if their NOSB preparation and competition activities benefited them in their college career, 96% responded yes, noting specifically that they gained increased content knowledge, enhanced study and self-discipline skills, greater abilities to communicate in public, and heightened career interest and awareness. When asked why they loved learning about marine science in high school, college or graduate school, the responses included: the attraction to exploration; new discoveries and the constant supply of new information; problem solving; and being challenged. The survey results show that the NOSB past participants represent a growing network of ocean science professionals.

Instructional Choices and Team Preparation Report: For this special focus study, two surveys were developed to learn team preparation strategies: one for the team coaches; and a second for students who participated in the two most recent years' competitions. These surveys were particularly focused on the instructional methods used by coaches in their classrooms or in out-of-school activities to prepare the teams for the regional and/or national competitions.

A total of 81 classroom teachers who coach an NOSB school team provided responses to the survey. For 46% of respondents, the students on the NOSB team were members of a larger science or ocean science club organization, and 11% of respondents taught an ocean content science course from which the NOSB team emerged.

When asked numerous questions, all related to the benefits to their students from participating in the NOSB competition, the coaches responded with comments on how NOSB encouraged behavioral change, enhanced ocean science learning, and motivated students to pursue ocean science and STEM careers:

- *“Some of the top science students in our school have commented that they didn't really “get it” about how everything is so co-dependent, until putting it all together through their work and studying with the NOSB team.”*
- *“Without our participation in the NOSB, the students would have almost no exposure to ocean sciences.”*
- *“We have dramatically increased the number of students graduating from our school who intend to major in environmental science, marine science or geology.”*

The 2014 Longitudinal Study and instructional practices reports can be found online at <http://nosb.org/impact/program-evaluation/>. The 2015 Longitudinal Study will be conducted this fall.

RELATED PROJECTS

NONE

APPENDIX I

Regional NOSB bowl names, regional coordinator(s) and host institutions for the 2015 competitions included:

- Aloha Bowl (Hawaii) – this bowl was not held in 2015
- Bay Scallop Bowl (New York) – Dr. Bill Wise and Kim Knolls, Stony Brook University
- Blue Crab Bowl (Virginia) – Dr. Carol Hopper Brill, Virginia Institute of Marine Science at the College of William and Mary and Dr. Victoria Hill, Old Dominion University
- Blue Heron Bowl (North Carolina) – Janelle Fleming, North Carolina State University
- Blue Lobster Bowl (Massachusetts) - Gayle Sherman and Lori Tsuruda, Massachusetts Institute of Technology Sea Grant College Program
- Chesapeake Bay Bowl (DC, Maryland, Northern Virginia & Delaware) – Richard Friesner – George Mason University
- Dolphin Challenge (Galveston, Texas) – Terrie Looney, Texas A&M University – Galveston and Texas Sea Grant
- Great Lakes Bowl (Michigan) –Kevin Keeler and Whitney Conard, University of Michigan and Michigan Sea Grant
- Grunion Bowl (Southern California) – this bowl was not held in 2015
- Hurricane Bowl (Central Gulf Coast) – Aaron Lamey and Sam Clardy, Gulf Coast Research Laboratory, University of Southern Mississippi
- Lake Sturgeon Bowl (Wisconsin) – Elizabeth Sutton, University of Wisconsin, Milwaukee, School of Continuing Education
- Loggerhead Challenge (Corpus Christi, Texas) – Terrie Looney, Texas Sea Grant – held at the University of Texas Marine Science Institute
- Los Angeles Surf Bowl (Los Angeles, California) –Kimberly Lievens, Jet Propulsion Laboratory
- Manatee Bowl (South Florida) – Dennis Hanisak, Florida Atlantic University’s Harbor Branch Oceanographic Institution
- Nor’easter Bowl (Northern New England) – Katie Clegg, University of Maine Orono
- Orca Bowl (Washington) – Maile Sullivan, University of Washington-College of Ocean & Fishery Sciences
- Penguin Bowl (Ohio & Pennsylvania) – Dr. Ray Beiersdorfer, Youngstown State University and Margie Marks, Pittsburgh Zoo & PPG Aquarium

- Quahog Bowl (Rhode Island & Connecticut) – Diane Payne and Thaxter Tewksbury, University of Connecticut at Avery Point, Connecticut Sea Grant Program and Project Oceanology
- Salmon Bowl (Oregon) – Lindsay Carrol, Oregon State University, College of Oceanic and Atmospheric Sciences Conservation Biology Institute
- Sea Lion Bowl (San Francisco Bay Area, California) – Jennifer Saltzman, Stanford University
- Shore Bowl (New Jersey) – Carrie Ferraro, Rutgers, The State University of New Jersey, Institute of Marine and Coastal Sciences
- Southern Stingray Bowl (South Carolina & Georgia) – Dr. Dionne Hoskins and Victoria Young, Savannah State University
- Spoonbill Bowl (West Florida) – Dr. Teresa Greely, University of South Florida, School of Marine Sciences
- Trout Bowl (Colorado & Central States) – Amanda Morton, University of Colorado, Cooperative Institute for Research in Environmental Sciences
- Tsunami Bowl (Alaska) – Phyllis Shoemaker, University of Alaska Fairbanks, Alaska Sealife Center