



## NOAA's Teacher at Sea Program Pacific Northwest Region Alumni Workshop Report: November 2016



*L-R (Back row) Kacey Shaffer, Kainoa Higgins, Avery Marvin, Dan Steelquist, Mary Cook, Julia Harvey (Middle row) Lesley Urasky, Anne Mortimer, Karen Rasmussen, Rick Jones, Methea Sapp, Britta Culbertson, Jessie Soder, Amie Ell (Front row) Barney Peterson, Terry Welch (Not pictured) Karen Matsumoto deChadenedes, Heidi Wigman, and Marian Wagner*



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## Workshop Goals and Content

NOAA's Pacific Northwest Region Teacher at Sea Alumni (PNW TASA) Workshop was held on November 4-6, 2016 in Seattle, WA at NOAA's Western Regional Center Sand Point Facility. Eighteen Teacher at Sea Alumni (TASA) from the region (WA, OR, WY, MT, AK, and ID) attended this three-day professional development workshop in order to strengthen oceanographic content knowledge, create relationships with NOAA scientists, gain knowledge about NOAA resources, and build an alumni network in their region.

### Workshop Goals:

The goals of the workshop are aligned with selected NOAA Teacher at Sea Program's goals.

- Increase teachers' understanding of earth system science.
- Build working relationships among teachers, emphasizing collective participation of groups of teachers.
- Build relationships between NOAA scientists and teachers in the Pacific Northwest region.
- Use NOAA data and resources in classroom activities.
- Use NOAA-related career information in classroom activities, when mentoring students and when working with colleagues.

### Workshop Content:

**Poster Presentations** – Teachers created and printed presentation slides prior to the workshop. Upon arrival, slides were mounted on tri-fold boards and TASA presented their posters to each other.

#### **Slide content included:**

**Background Information:** name, address, phone number, url, teaching assignment/experience, reason applied, year sailed, name of ship, where sailed and for how long

**Ship and Research Goals:** description of ship, the type of research that was being conducted on the mission, and teacher's role

**At Sea Experience:** description of people met at sea, daily experiences, science content and lessons learned, unique experiences, and pictures of memorable moments

**Products:** list and description of products created as a result of NOAA's TAS Program (lessons, presentations, student projects, curriculum, new courses, community activities, videos, books, etc.)

**Professional Benefits:** description of how NOAA's TAS Program benefitted the educator

**Highlights:** any additional information regarding the program (Congressional recognition, conferences, improved student test scores, media coverage, etc.)

**Tour of NOAA Alaska Fisheries Science Center (AFSC) Facilities and Hands-On Activities:** The teachers toured NOAA AFSC Offices and met NOAA scientists. Scientists shared background information about their research and facilitated hands-on activities that may be replicated by the TASA in their classrooms.

**Presentations:**

**NOAA National Weather Service (NWS) Seattle Forecast Office –**

Kirby Cook, Science and Operations Officer

<http://www.weather.gov/about> ; <http://www.weather.gov/about>

The NWS Mission involves protection of life and property, as well as, enhancing the economy through flood and weather forecasts, outlooks, watches, warnings and advisories.

Warning and forecast programs include: severe weather, public weather, marine weather, aviation weather, fire weather, and hydrology, as well as, observations in the air, on land and on the water. NWS operations are 24 hours a day and provide decision support services in support of their mission.

**Activities:** atmospheric pressure, wind and waves, and hydrology.

**NOAA National Ocean Service, Office of Coast Survey, Pacific Hydrographic Branch –**

Peter Holmberg, Lead Physical Scientist and Toshi Wozumi, Physical Scientist

<http://www.nauticalcharts.noaa.gov/>

The Pacific Hydrographic Branch (PHB) collects, analyzes, and reviews hydrographic data and creates nautical chart products from this data. They work in the field aboard NOAA hydrographic vessels to assist with collection, processing, and reviewing data which is then delivered to PHB. In the office, they review the delivered survey data to verify that standards and protocols have been met. Products are created which can be downloaded.

**Activities:** hydrography box, latitude/longitude – navigating with nautical charts, and augmented reality sandbox

**NOAA Office of Oceanic and Atmospheric Research, Pacific Marine Environmental Lab (PMEL) –**

Adi Hanein, Research and Outreach Coordinator and Heather Tabisola, Research Coordinator

<http://www.pmel.noaa.gov/about-pmel>

NOAA's Pacific Marine Environmental Laboratory (PMEL) is a federal laboratory that focuses on the global ocean and its interactions with the earth, atmosphere, ecosystems, and climate. Key research areas at PMEL include ocean acidification, tsunami detection and forecasting, hydrothermal vent systems, fisheries and oceanography, and long-term climate monitoring and analysis.

**Activities:** Teachers learned about a variety of topics including: buoys, water quality, and Saldrone research (autonomous, wind- and solar-powered vessel that collects oceanographic data).

#### **NOAA Diving Center –**

Kathleen Mahaffey, Equipment Specialist

<http://www.oma.noaa.gov/learn/diving-program/about/diving-center>;

<http://www.oma.noaa.gov/learn/diving-program>

The NOAA Diving Program (NDP) trains and certifies scientists, engineers and technicians to perform the variety of tasks carried out underwater to support NOAA's mission. With more than 400 divers, NOAA has the largest complement of divers of any civilian federal agency.

**Activities:** hypobaric chamber simulation, NOAA diving tower, and Boyle's Law

#### **NOAA Alaska Fisheries Science Center Marine Mammal Lab –**

Lisa Hiruki-Raring, NOAA AFSC Education Coordinator and

Dr. John Jansen, NOAA AFSC Research Biologist

<http://www.afsc.noaa.gov/nmml/>

The Marine Mammal Laboratory (MML) conducts research on marine mammals important to the mission of the National Marine Fisheries Service (NMFS) and the National Oceanic & Atmospheric Administration (NOAA), with particular attention to issues related to marine mammals off the coasts of Alaska, Washington, Oregon, and California. Research projects focus on ecology and behavior, population dynamics, life history, and status and trends. Information is provided to various domestic and international organizations to assist in developing rational and appropriate management regimes for marine resources under NOAA's jurisdiction.

**Activities:** radio frequency seal tagging and radio-telemetry, marine mammal dry lab, and fish bone, otolith, and cephalopod beak identification

Dr. Jansen spoke to TASA about the Polar Ecosystems Program and harbor seal research.

<http://www.afsc.noaa.gov/nmml/polar/>

The Polar Ecosystems Program conducts research and monitoring on pinnipeds in the Arctic, sub-Arctic, and Antarctic marine ecosystems. The research projects focus primarily on abundance, trends, distribution, and foraging behavior of harbor, bearded, ringed, spotted, and ribbon seals in Alaska. The primary objectives of the program are to support management and assessment of population status under the Marine Mammal Protection Act, and to gain a better understanding of the factors responsible for the dynamics of populations and their roles in the ecosystem.

## **Atlantis STEAM – Remotely Operated Vehicles (ROV's) –**

Ashley McConnaughey and Rob Setlow

<http://www.facebook.com/atlantisrovteam>

**Atlantis STEAM** is a Science, Technology, Engineering, Arts, and Mathematics educational organization and club headquartered on the southern end of Whidbey Island in Washington State. Atlantis STEAM focuses on STEAM education with particular emphasis on inspiring girls and other underrepresented youth to explore STEAM fields; their core strength is underwater robotics training and hands-on outreach.

**Activities:** Atlantis STEAM presenters, Ashley McConnaughey and Rob Setlow, explained the science and engineering process involved in building remotely operated vehicles. TASA split into groups according to grade level, and were tasked with building a ROV that would move through the water and stay upright. Teams were given a motor, propellers and other materials to create an effective and creative ROV. Once each team completed their ROV, they took it outside to test in a large tank of water. The ROV was attached to an underwater camera and TASA were able to view what the ROV filmed on a large TV monitor.

### **Fisheries Science:**

Casey Ralston, NOAA Northwest Fisheries Science Center, Education Coordinator

**Activities:** salmon life cycle, bioaccumulation, populations and habitats, and salmon survival game

### **Marine Mammal Science:**

Lisa Hiruki-Raring, NOAA AFSC, Education Coordinator

**Activities:** beluga whale population assessment and whale identification

### **Watershed Science:**

Kacey Shaffer – NOAA Science Camp Educator/TASA

**Activities:** watershed concepts, build a groundwater model, Enviroscapes watershed model

## **Tour of NMFS AFSC National Marine Mammal Lab: Marine Mammal Osteology Collection –**

Lisa Hiruki-Raring, NOAA AFSC, Education Coordinator

The NMFS AFSC National Marine Mammal Laboratory (NMML) Marine Mammal Osteology Collection consists of approximately 2500 specimens (skulls and post-cranial skeletons) from 43 species of marine mammals from around the world. Specimens have been collected for life history studies over the past 60 years on projects ranging from pelagic sealing in the 1950s, to collections of marine mammals taken incidentally in commercial fisheries, and those found dead on beaches and rookeries from Alaska to the Antarctic.

The NMML Osteology Collection also houses vast numbers of teeth, primarily from northern fur seals taken during the commercial and subsistence harvests on the Pribilof Islands, Steller sea lions taken incidentally in the Alaska fisheries, and sperm whales collected from Pacific coast

whaling stations in the 1950s and 60s. The majority of these teeth were initially collected for aging, but many have been used in recent years in stable isotope, nursing and growth layer\growth index studies.

**Lesson Share –**

Each TASA brought one lesson plan to share with the group related to ocean or atmospheric science. Next Generation Science Standards were included in the lessons, as well as NOAA data and resources.

<b>Participants</b>		
Teacher at Sea Alumnus	<i>Ship</i>	School
<a href="#"><u>Barney Peterson</u></a>	<i>Oregon II - 2016 Rainier - 2006</i>	James Monroe Elementary School WA
<a href="#"><u>Methea Sapp</u></a>	<i>Delaware II 2007</i>	Spokane Community College WA
<a href="#"><u>Teresa Welch</u></a>	<i>Rainier 2008</i>	Coupeville Middle School WA
<a href="#"><u>Dan Steelquist</u></a>	<i>Rainier 2008</i>	Blaine Middle School WA
<a href="#"><u>Karen Matsumoto deChadenedes</u></a>	<i>Oscar Elton Sette 2010</i>	Suquamish Tribe WA
<a href="#"><u>Anne Mortimer</u></a>	<i>Oscar Dyson 2011</i>	Mount Vernon High School WA
<a href="#"><u>Karen Rasmussen</u></a>	<i>R/V Tatoosh 2011</i>	Ocean Shores Elementary School WA
<a href="#"><u>Marian Wagner</u></a>	<i>R/V Savannah 2011</i>	Salmon Bay School WA
<a href="#"><u>Britta Culbertson</u></a>	<i>Oscar Dyson 2013</i>	The Center School WA



<b>Participants</b>		
<a href="#"><u>Kainoa Higgins</u></a>	<i>R/V Ocean Starr</i> 2014	Tacoma School of the Arts WA
<a href="#"><u>Amie Ell</u></a>	<i>Oscar Dyson</i> 2013	White Salmon Valley School District OR
<a href="#"><u>Julia Harvey</u></a>	<i>Hi'ialakai</i> - 2016 <i>Oscar Dyson</i> - 2013	South Eugene High School OR
<a href="#"><u>Avery Marvin</u></a>	<i>Rainier</i> 2013	Taft High School OR
<a href="#"><u>Heidi Wigman</u></a>	<i>Pisces</i> 2015	St. Matthew School OR
<a href="#"><u>Lesley Urasky</u></a>	<i>Pisces</i> 2012	Rawlins High School WY
<a href="#"><u>Jessie Soder</u></a>	<i>Delaware II</i> 2011	Gustavus School AK
<a href="#"><u>Mary Cook</u></a>	<i>Norseman II</i> - 2016 <i>Ronald H. Brown</i> - 2004	Scammon Bay School AK
<a href="#"><u>Richard Jones</u></a>	<i>Ka'imimoana</i> 2010, 1998	Billings Senior High Freshman Academy MT
<a href="#"><u>Kacey Shaffer</u></a> NOAA Science Camp Educator and TASA	<i>Oscar Dyson</i> 2014	Logan Elm High School OH
<b>Other Pacific Northwest TASA Invited but Unable to Attend</b>		
<a href="#"><u>Rebecca Himschoot</u></a>	<i>Oscar Dyson</i> 2007	Gooshi Keen Elementary School AK
<a href="#"><u>Wes Struble</u></a>	<i>Ronald H. Brown</i> – 2012 <i>Ka'imimoana</i> – 2010	Logos School ID

**Other Pacific Northwest TASA Invited but Unable to Attend**

<a href="#"><u>Elizabeth Haggerty</u></a>	<i>Pisces</i> 2010	Stella Schola Middle School WA
<a href="#"><u>Denise Harrington</u></a>	<i>Oregon II</i> - 2016 <i>Rainier</i> - 2014	South Prairie Elementary School OR
<a href="#"><u>Marla Crouch</u></a>	<i>Oscar Dyson</i> 2013	Maywood Middle School WA

**Workshop Staff and Support**

Jennifer Hammond	NOAA's Teacher at Sea Program Office
Jennifer Annetta	NOAA's Teacher at Sea Program Office
Emily Susko	NOAA's Teacher at Sea Program Office
Lisa Hiruki-Raring	NOAA National Marine Fisheries Service (NMFS), Alaska Fisheries Science Center (AFSC)
Casey Ralston	NOAA National Marine Fisheries Service, Northwest Fisheries Science Center
Alicia Keefe	NOAA National Marine Fisheries Service, West Coast Region
Judy Sohl	NOAA's Teacher at Sea Program – Former Director
Peter Holmberg	NOAA NMFS, AFSC

### Workshop Staff and Support

Toshi Wozumi	NOAA NMFS, AFSC
Adi Hanein	NOAA NMFS, AFSC
Heather Tabisola	NOAA NMFS, AFSC
Kathleen Mahaffey	NOAA NMFS, AFSC
John Jansen	NOAA NMFS, AFSC
David Withrow	NOAA NMFS, AFSC
Kirby Cook	NOAA National Weather Service
Kacey Shaffer	NOAA Science Camp and OH TASA
Ashley McConnaughey	Atlantis STEAM
Rob Setlow	Atlantis STEAM
Allison Alexander	National Marine Sanctuary Foundation
Lynn Wisniewski	National Marine Sanctuary Foundation

# Agenda and Additional Information



## NOAA Pacific Northwest Teacher at Sea Alumni Workshop

**November 4-6, 2016**

**NOAA Western Regional Center**

**7600 Sand Point Way NE, Seattle WA 98115**

### Day 1 - Friday, November 4, 2016

- |                      |  |
|----------------------|--|
| <b>8:00 – 8:30</b>   | Arrival and Poster Set-Up  |
| <b>8:30 – 9:00</b>   | Welcome and Introductions  |
| <b>9:00 – 11:00</b>  | TASA Poster Session  |
| <b>11:15 – 12:15</b> | <b>NOAA National Weather Service, Seattle Forecast Office</b><br>Kirby Cook, Science and Operations Officer  |
| <b>1:10 – 2:10</b>   | <b>NOAA National Ocean Service, Office of Coast Survey,<br/>Pacific Hydrographic Branch</b><br>Peter Holmberg, Lead Physical Scientist and Toshi Wozumi, Physical Scientist                        |
| <b>2:20 – 3:20</b>   | <b>NOAA Office of Oceanic and Atmospheric Research,<br/>Pacific Marine Environmental Lab (PMEL)</b><br>Adi Hanein, Research and Outreach Coordinator and Heather Tabisola, Research<br>Coordinator |
| <b>3:30 – 4:30</b>   | <b>NOAA Office of Marine and Aviation Operations,<br/>NOAA Diving Center</b><br>Kathleen Mahaffey, Equipment Specialist  |
| <b>4:40 – 5:40</b>   | <b>NOAA Alaska Fisheries Science Center Marine Mammal Lab</b><br>Lisa Hiruki-Raring, NOAA Alaska Fisheries Science Center Education<br>Coordinator   |
| <b>5:40 – 6:00</b>   | Discussion and Wrap-Up   |

**Day 2, Saturday, November 5, 2016**

- 8:15 – 12:00**                    **Atlantis STEAM – Remotely Operated Vehicles (ROV's)**  
Ashley McConnaughey and Rob Setlow
- 1:00 – 2:00**                    **Salmon Activities**  
Casey Ralston, NOAA Northwest Fisheries Science Center, Education  
Coordinator
- 2:10 – 3:10**                    **Marine Mammal Activities**  
Lisa Hiruki-Raring, NOAA Alaska Fisheries Science Center, Education  
Coordinator
- 3:10 – 4:10**                    **Watershed Activities**  
Kacey Shaffer – NOAA Summer Science Camp Lead Educator/TASA
- 4:10 – 4:30**                    **NOAA Science Camp Background/Activities Classroom Application**  
Lisa Hiruki-Raring and Kacey Shaffer
- 4:30 – 5:00**                    Discussion and Wrap-Up

**Day 3, Sunday, November 6, 2016**

- 9:00 – 11:00**                    **National Marine Mammal Lab Marine Mammal Osteology Collection**
- 11:15 – 11:45**                    Lesson Share
- 11:45 – 12:00**                    Pacific Northwest Regional TASA – Discussion and Next Steps

## **Additional Information**

**National Marine Sanctuary Foundation:** <https://marinesanctuary.org/>

The National Marine Sanctuary Foundation (NMSF) is a large source of support for the NOAA Teacher at Sea Alumni Association. A private, non-profit organization, NMSF plays a vital role in the work of the sanctuaries and the goal of a healthy ocean. Across the system, they create opportunities for education, citizen science, outreach, and community engagement. They are also a strong, respected advocate for ocean awareness and protection with policymakers in the US and worldwide.

**NOAA National Marine Fisheries, Alaska Fisheries Science Center:**

<https://www.afsc.noaa.gov/default.htm>

The Alaska Fisheries Science Center (AFSC) is the research branch of NOAA Fisheries responsible for research on living marine resources in the coastal oceans off Alaska and off parts of the west coast of the United States. This region of nearly 3 million square miles includes the [North Pacific Ocean and the eastern Bering Sea](#) which support some of the most important commercial fisheries in the world. These waters are also home to the largest marine mammal populations in the Nation.

The AFSC's mission is to plan, develop, and manage scientific research programs which generate the best scientific data available for understanding, managing, and conserving the region's living marine resources and the environmental quality essential for their existence.

**NOAA National Marine Fisheries, Northwest Fisheries Science Center:**

<https://www.nwfsc.noaa.gov/>

The scientists of the Northwest Fisheries Science Center (NWFSC) conduct leading-edge research and analyses that provide the foundation for management decisions to protect, recover, restore, and sustain ecosystems and living marine resources in the Pacific Northwest.

The Pacific Northwest is home to over 90 species of commercially-managed groundfish along the West Coast and over 30 threatened or endangered fish and marine mammal species-- including iconic Pacific salmon and killer whales. Protecting our region's living marine resources and their habitats is critical to sustaining the environment, our economy, public health, and quality of life.

The NWFSC's mission is to conduct the science necessary to conserve marine and anadromous species and their habitats off the Washington, Oregon, and northern California coasts and in freshwater rivers of Washington, Oregon, and Idaho. Our research provides reliable, relevant, and credible information to help

decision-makers and natural resource managers build sustainable fisheries, recover endangered and threatened species, maintain healthy ecosystems, and protect human health. The Center is also dedicated to enhancing public awareness, education, and stewardship of our marine resources.

**NOAA National Marine Fisheries, West Coast Region:**

<http://www.westcoast.fisheries.noaa.gov/index.html>

The West Coast Region (WCR) of NOAA Fisheries works in Washington, Oregon, California, and Idaho. Their research, fisheries management, enforcement, and habitat restoration helps recover and conserve protected species such as [abalone](#), [salmon](#), [sea turtles](#), [Southern Resident killer whales](#), and [Steller sea lions](#).

The WCR's work is guided by two core mandates—to ensure the productivity and sustainability of fisheries and fishing communities through science-based decision-making and compliance with regulations, and to recover and conserve protected resources including marine mammals, sea turtles, and fish.

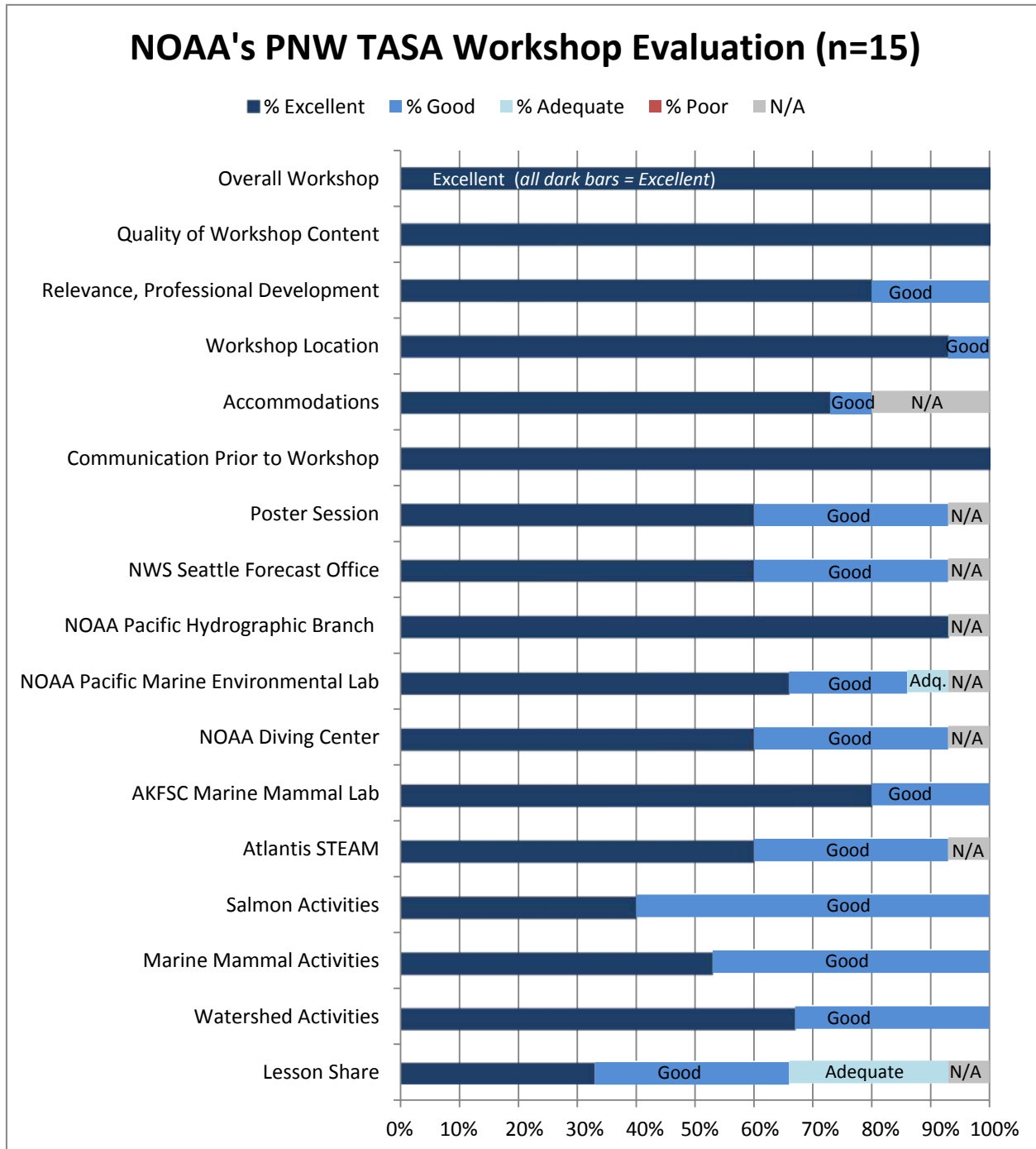
**NOAA Science Camp:** <http://wsg.washington.edu/students-teachers/k-12-activities/noaa-science-camp/>

Held at NOAA's Sand Point facility each July, NOAA Science Camp offers opportunities for middle school students and high school students. NOAA Science Camp's goal is to increase environmental literacy in the Puget Sound area through a one-of-a-kind educational experience involving hands-on activities taught by real scientists from several NOAA offices (fisheries, marine mammals, weather, oceanography, diving, charting, habitat restoration, hazardous material assessment, and coastal restoration/watersheds). The middle school science camp targets students entering 6<sup>th</sup> through 8<sup>th</sup> grade. The Junior Leadership program, for students entering 9<sup>th</sup> through 12<sup>th</sup> grades, builds skills in communicating science concepts, leading activities, creating science investigations and exploring marine science careers.

## Data

### Results from NOAA's PNW TASA Workshop Evaluation (n=15)

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





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

100% said that they plan to incorporate content, activities, and experiences into their curriculum.

**Those alumni who said that they plan to incorporate workshop content into their curriculum explained that they would do so in the following ways:**

- I plan to use several of the forecast office demos immediately. I also plan to use the salmon bioaccumulation activities right away. I learned of other lessons and labs that TAS alumni have developed and used to relate the experiences in their classrooms.
- Lecture enhancement and hands-on activities in lab/science outreach
- The ROV section was quite valuable. I am hoping to contact Atlantis STEAM to get some sort of club going at my school. As our school dives into Next Generation Science Standards, I will be looking for ways to spread NOAA resources through my school.
- Career opportunities in the NW; Considering switching Aquatic Science to Marine Biology in order to focus more on the ocean.
- I have no doubt that I will be using the “sandbox” in the future. I can see numerous ways to use this to teach Geology and oceans. I will be enhancing my ROV curriculum.
- I am working with robotics and a goal is to introduce underwater ROV’s to my students and after school programs. I hope to have speakers from NWS come to my class, and adapt materials from sounding boxes and watershed model. We will share experiences by Skype and email with classes in different parts of the country.
- I would love to incorporate underwater ROV activities.
- I will use the watershed activities in my science lessons. Also, I’ll incorporate some more career studies about NOAA careers in my class.
- Hydrographic box lesson – great to do now!
- Bioaccumulation food web in ecology unit; NOAA careers; Many of the fisheries activities – will use salmon as a case study now; Marine mammals in evolution unit; Share powerpoint of my weekend and what I learned with my students; Use labs and activities that TAS shared.
- We’ll use the salmon activities, ROV lessons, and seal research connections.

**Open-Ended Questions:**

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

- The most valuable things for me were the marine mammal information and connections with scientists doing seal tagging. The salmon activities were useful because we study salmon in the classroom. The Atlantis STEAM was useful because our Ocean Science Teams do ROV competitions.
- The hands-on activities and collaborating with other TAS.
- The poster session and learning from everyone. Visiting different NOAA offices.
- I found it **very** valuable to reconnect with my experience in TAS and all I learned from it. I’m excited to redesign my lessons and share them more thoroughly with students and the community.

- Meeting other educators with similar interests/backgrounds and learning about what they have done with their students. Learning more about NOAA and the variety of research and resources available through NOAA was valuable too!
- I loved getting to see inside of NOAA! It was very valuable to work with my TAS colleagues and to work with hands-on applications of science. I enjoyed how the workshop was broken up into mini-sessions.
- Exposure to NOAA Science Camp activities
- Seeing really inspiring work at NOAA.
- There were so many facets of this workshop that were valuable. Connections, networking with fellow educators and scientists is probably the top spot.
- Time to learn about new ocean related lessons and collaborate with TAS alumni! Teachers never have enough time to talk through new curriculum on shore and this time was so valuable!

**2. How could this workshop have been improved?**

- More emphasis on the lesson share and time to collaborate with TASA.
- Include handouts that outline each of the departments visited.
- More time to share posters.
- One extra day – for more time to share/collaborate with each other.

**Additional Comments:**

- This was awesome and totally worthwhile! Thanks for doing this!
- Awesome workshop! Thank you so much for the heavy dose of NOAA!
- A workshop like this makes me very excited! I can't wait to share what I did this weekend with my students tomorrow.
- This was great! Thank you.
- A great workshop to help me reconnect and recharge as a teacher. Amazing content. The organization was a triumph: bringing us all together; keeping the sharing together. GREAT JOB!
- Thank you so much for this experience. I need time to digest all that I've learned.
- I had an awesome time learning about the different aspects of NOAA that I didn't know existed. I feel very lucky to have been able to be a part of this.
- This has been amazing! To be able to share my TAS experience, see NOAA facilities, meet scientists, learn new activities, and collaborate with some of the most passionate teachers in the country has been invaluable! Thank you so much for your hard work organizing this workshop.
- Thanks for the wonderful workshop! The best and most useful I've ever been to. Kudos to Emily Susko for going the extra mile in taking care of the difficulties of Bush Alaska travel arrangements.

## Appendix: Photos and Video



*Lesley Urasky (L) shares her poster with Barney Peterson, Rick Jones and Anne Mortimer (back to front)*



*Kirby Cook demonstrates atmospheric pressure, wind and waves, and hydrology activities to PNW TASA at the NOAA National Weather Service Office*



*PNW TASA with Adi Hanein at NOAA's Pacific Marine Environmental Lab*



*Lisa Hiruki-Raring with PNW TASA at NOAA's AFSC Marine Mammal Lab*



*Katie Mahaffey demonstrates Boyle's Law at NOAA's Diving Center*



*(L-R) Kainoa Higgins, Mary Cook and Anne Mortimer work together to build a ROV (Remotely Operated Vehicle)*



*(L-R) Avery Marvin, Lesley Urasky, Marian Wagner, and Britta Culbertson work on their groundwater model*



*(L-R) Casey Ralston demonstrates a watershed model to Emily Susko (TAS Staff), Julia Harvey, Heidi Wigman, and Barney Peterson*



*Julia Harvey gains perspective at the AFSC National Marine Mammal Lab Marine Mammal Osteology Collection*