

Final Report Form - Oil Spill Recovery Institute

An electronic copy of this report shall be submitted by mail, or e-mail to the OSRI Research Program Manager wspogau@pwssc.org and Financial Office poswalt@pwssc.org
Mailing address: P.O. Box 705 - Cordova, AK 99574 -

Deadline for this report: Submittal within 90 days of grant/award expiration. **Also**, note that a summary Financial Statement shall be submitted **within 45 days** of the grant expiration. The final invoice and financial statement is due within 90 days of the grant/award expiration.

Today's date: September 21, 2014

Name of awardee/grantee: Prince William Sound Science Center

OSRI Contract Number:

Project title: Headwaters to Oceans Education

Dates project began and ended:

PART I - Outline for Final Program or Technical Report

This report must be submitted by all grantees. However, for those whose project work resulted in a peer reviewed publication (whether in draft or final form), this report may be abbreviated and the publication attached as part of the report.

- A. Non-technical Abstract or summary of project work that does not exceed 2 pages and includes an overview of the project. This abstract should describe the nature and significance of the project. It may be provided to the Advisory Board and could be used by OSRI staff to answer inquiries as to the nature and significance of the project.

During the 2013-2014 season, the Prince William Sound Science Center's (PWSSC) education staff directly engaged with over participants and indirectly served another for a total of over people. PWSSC educators coordinated Discovery Room programs for students and facilitated a salmon rearing tank in the Cordova elementary school. We conducted two Discovery Outreach programs in rural Alaskan villages for students and supervised water quality monitoring in local waterways. We coached one team for National Ocean Sciences Bowl (finished 14th and 11th overall at the regional competition) and held Community Lectures for people. All lectures were recorded and uploaded to our website and YouTube station for web distribution. Regional and Science Center research projects were brought to a wide audience in the Prince William Sound and Copper River region through 20,000 copies of our annual *Delta Sound Connections* newspaper publication. Additionally, we hosted our second AmeriCorps member who served as an Education Assistant and engineer for ROV enhancements. We partnered with Alaska Sealife Center, Center for Alaskan Coastal Studies, Kachemak Bay Research Reserve, and Centers for Ocean Science Education Excellence (COSEE) to create an informal education coalition that supports the development of a cohesive, state-wide approach to marine education. **Student pre and post E-STEM Enthusiasm Surveys were conducted and recorded with students.**

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Our programs would not be possible without the support of community partners. Copper River Watershed Project (CRWP) provided staff time to assist with Discovery Room. CRWP and Alaska Department of Fish and Game provided staff time and equipment for the salmon rearing tank, egg collection, and facilitating the weekly monitoring by the elementary students. Alaska Sea Grant Marine Advisory Program and Prince William Sound Audubon Society provided assistance for the community lecture series while PWS Community College supported broadcasting the lecture series to Valdez and outreach trips to Valdez.

- B. Review objectives as described in original proposal and state whether these objectives were achieved.

Objectives for 2013-2014 (FY12)

Fifth Grade: Ocean Science and Fisheries

Funded in part by BP Exploration (Alaska), Inc., ConocoPhillips, Exxon Valdez Oil Spill Trustees Council Herring Research and Monitoring Program and Oil Spill Recovery Institute

Objectives for Ocean Science and Fisheries

- Refined lessons with interactive and hands-on activities and inclusion of past data
- Unit lessons delivered to Cordova 5th graders via *Discovery Room*
- Monthly oceanographic data collected
- Development of evaluation tools
- All lessons in standardized format that includes Objectives, Materials, Implementation, Worksheets and Evaluation
- PWSSC - hosted web page with available lesson plans
- Creation of an online geospatial portal for visualizing data

Cordova's 5th grade (approximately students) participated in seven Discovery Room sessions and four monitoring field trips to increase their understanding of ocean sciences, oceanographic monitoring and fisheries. The Ocean Science and Fisheries program helped students understand the value of long-timeline datasets and honed their data collection skills while they measured temperature, pH, dissolved oxygen, salinity, turbidity and of nitrite, phosphate, and iron. Guest scientists from PWSSC and AK DF&G provided additional expertise.

Students studied the potential impacts of climate change on ocean ecosystems, and how ocean conditions, such as pH, affect the ability of marine organisms to survive and reproduce. Students used microscopes to observe herring scales collected in different years by the AK DF&G and correlated varying growth rates of the herring, based on distance between annual rings on the scales, to ocean temperature data. **Pre and Post Assessment Questions for the entire year were developed and administered in September 2013 and April 2014.** During the final session, students completed a Jeopardy! game to test what they learned about marine science. **All lesson plans were standardized with objectives, materials, implementation, worksheets and evaluation and are posted on the PWSSC web page.**

Table 3. 5th Grade Oceanographic Monitoring program activities and products.

Activity/Product	Description
Lesson Plans	Delivered 8 lesson plans relating to oceanography and fisheries: <ol style="list-style-type: none"> 1. Pre-Assessment Questions administered about the 8 upcoming lessons Animals in their Environment/Oceanographic Monitoring Concepts 2. Oceanographic Monitoring Training 3. Oceanographic Monitoring Tools/Tests and Herring Scale Analysis/Growth 4. Climate Change in Alaska 5. Herring Dissection with Dr. Michele Buckhorn 6. Climate Change and the Carbon Cycle Part 1 7. Climate Change and the Carbon Cycle Part 2 8. Ocean Monitoring and Climate Change 9. Post Assessment Questions Administered of school year and Jeopardy game!
Classroom Sessions	Planned and facilitated classroom and lab sessions
Field Trips	Planned and facilitated 4 field trips to conduct oceanographic monitoring
Evaluation Tools	<ol style="list-style-type: none"> 1. Pre (Sept.) and Post (April) Assessment questions. 2. Focus Questions began each classroom session. These questions prompt students to think about the upcoming lesson. 3. Post E-STEM Enthusiasm survey to measure knowledge, interest and stewardship actions 4. Review questions: following each classroom session, educators asked students a series of questions to assess student learning. 5. Student workbook with questions, puzzles, and other activities 6. Jeopardy!: facilitated at the final session as a summative evaluation
Publicity	<ol style="list-style-type: none"> 1. Monthly reports of student activities were published on our blog at www.pwssc.org/blog 2. Lesson plans on PWSSC web page http://pwssc.org/educate/k12-education/curriculum/ocean-monitoring 3. http://pwssc.org/educate/k12-education/h2o/elcmp/monitoring-sites

Sixth Grade: Ocean Technology, Arctic Ecosystems and Oil Spill Response

Funded in part by BP Exploration (Alaska), Inc., ConocoPhillips and Oil Spill Recovery Institute

Objectives for Ocean Technology, Arctic Ecosystems and Oil Spill Response

- Updated lessons that include an opportunity to interact with content experts
- Unit lessons delivered to Cordova 6th graders via *Discovery Room*
- Construction of student-designed and operated ROVs
- Development of refined evaluation tools
- All lessons in standardized format that includes Objectives, Materials, Implementation, Worksheets, and Evaluation
- PWSSC-hosted web page with available lessons
- ROV units will be able to have lights, cameras and variable motors

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Sixth grade students participated in the Ocean Technology, Arctic Ecosystems and Oil Spill Response program through **eight** classroom sessions and **eight** lab sessions. **29** students learned about the technology used to explore and study the ocean, Arctic ecosystems, sources of oil pollution in the ocean, effects of oil spills on the physical and biological aspects of oceans and coasts, and how to build Remotely Operated Vehicles (ROVs). **Four lessons this year included guest experts in the content of Ocean Technology with Rob Campbell Ph.D., and Joides Resolution Ship to Shore Exp. 349 Education Program, Oil Spill Response with Andy Craig, and hands-on ROV drive in the pool with Scott Pegau. Ph.D.**

In lab sessions, students participated in hands on activities and demonstrations to learn basic ocean science concepts including density, pressure, and buoyancy. Students learned about the impacts of climate change on Arctic animals and ecosystems. Students calculated the percent and graphed the sources of oil spills and researched oil spills around the world. Students concluded their year of study by working in teams to build ROVs and operate them in the pool to respond to a number of challenges that represented an under-ice oil spill. **Two ROVs included lights and one ROV included an underwater camera this year. Additionally, the students were able to drive a real ROV under the guidance of Scott Pegau, Ph.D. in the pool.** Several parents and community members attended the event and the event was written up in the local paper.

Our AmeriCorps member worked on enhancing the control box and several prototype control boxes have been created, with the goal of adding variable speed to the ROV motors. Using a potentiometer is a simple solution, but the components heat up very quickly. One prototype relied on a Gamecube controller attached to an Arduino microcontroller. This system requires some programming knowledge, as well as hard to find components to protect the delicate microcontroller from the high voltage in the battery. The third prototype uses an integrated circuit attached to a potentiometer and several heat sinks to handle excess heat. The motor speed is controlled with a simple dial and will work for skimming and for diving.

Table 4. 6th Grade Ocean Technology program activities and products.

Activity/Product	Description
Lesson Plans	Delivered 11 lesson plans relating to Arctic ecology and technologies used in ocean exploration and oil spill response: <ol style="list-style-type: none"> 1. Yearly Pre Assessment Questions administered and Introduction to Ocean Technology with Rob Campbell, Ph.D. 2. Properties of Water (Lab) 3. Arctic Ecosystems 4. Arctic Ecosystems (Lab) 5. Marine Oil Spill Response Methods with Andy Craig 6. Oil Spill Cleanup/Oily Sediments (Lab) 7. Petroleum Products 8. Oil Spill Research/Alaska Oil Spill Game (Lab)JOIDES Resolution Exp. 349 Ship to Shore Education Program 9. Designing and building Remotely Operated Vehicles (ROVs) to respond to a mock oil spill (2 Classes and 1 Lab) 10. ROV Demonstration: response to a mock oil spill (Lab) with Scott Pegau, Ph.D. with cameras and lights.

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	11. Post Assessment Questions Administered of school year and Jeopardy Game!
Classroom Sessions	Planned and facilitated 7 classroom sessions
Lab Sessions	Planned and facilitated 7 lab sessions
Events/Demonstrations	1. Mock Oil Spill , Cordova pool, Cordova’s 6 th grade (April 2013)
Evaluation Tools	<ol style="list-style-type: none"> 1. Pre (Sept.) and Post (April) Assessment questions. 2. Focus Questions began each classroom session. These questions prompt students to think about the upcoming lesson. 3. Post E-STEM Enthusiasm survey to measure knowledge, interest and stewardship actions 4. Workbook with questions, puzzles, and other activities 5. Students built an ROV and operated it to respond to a mock oil spill 6. Jeopardy!: facilitated at the final session as a summative evaluation
Publicity	<ol style="list-style-type: none"> 1. Monthly reports of student activities were published on our blog at www.pwssc.org/blog 2. Articles in PWSSC Newsletter, Delta Sound Connections, the Observer http://pwssc.org/sixth-grade-rov-challenge-a-success/ http://pwssc.org/lights-camera-rovs/ 3. Lesson plans on PWSSC web page http://pwssc.org/educate/k12-education/curriculum/ocean-and-oil-spill-technologies/ 4. Local newspaper coverage of mock oil spill cleanup

Outreach Discovery

Funded in part by Alyeska Pipeline Service Company, BP Exploration (Alaska), Inc., ConocoPhillips, Exxon Valdez Oil Spill Trustees Council Herring Research and Monitoring Program, North Pacific Research Board, Oil Spill Recovery Institute, and PWS Regional Citizens Advisory Council

Objectives for Outreach Discovery

- Deliver *Outreach Discovery* programs to rural Alaskan students. This year, a focus will be made on engaging with youth from northwest Alaska communities through at least two different avenues (either by going to their community or leading programs with them when they attend events in other parts of Alaska)
- Develop a marketing brochure that explains *Outreach Discovery* programs
- Attend the 2013 Alaska Math and Science Conference and recruit participating teachers
- Travel to 2014 NOSB Tsunami Bowl and deliver ROV program for participating teams
- Develop or revise evaluation tools based on program objective

Two Outreach Discovery programs were conducted during the school year.

We hosted an ROV challenge event at the NOSB regional competition, the Tsunami Bowl; 5 teams (of 4-5 students each and their coaches) from around Alaska participated. We traveled to Nome in May 2014 to conduct ROV builds for 55 7th-12th students and 12 staff members. Lights and cameras were used during the underwater pool challenges. We redesigned our evaluation form for our *Outreach Discovery* ROV event and administered it in Nome. An *Outreach*

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Discovery brochure was developed and Kara Johnson attended the 2013 Alaska Math and Science Conference.

C. Describe problems or roadblocks encountered in project implementation.

Due to reductions in staffing we have not yet been able to complete the creation of an online geospatial portal for visualizing data.

D. Highlight accomplishments, whether or not they were part of the original proposal.

Highlights from 2013-2014 H2O Education Program

Though not directly funded by OSRI, we would like to report on these additional outreach activities:

- Partnership with SAGA to host our second AmeriCorps Member
- Recording of all lecture series presentations and posting on-line (? attendees, ? online viewers)
- NOSB ROV event (140 students and teachers/chaperones from around Alaska)
- Lights and cameras added to ROV construction
- Control box enhanced
- Lesson plans standardized and posted on PWSSC web page
- Experts visiting sixth grade classroom
- E-STEM Enthusiasm Survey Participation
- Continued construction of cabin and wood shed for our campground
- Hosted two work groups (NCCC and SAGA; 27 people)
- Coordinating with marine science education partners to form a state-wide coalition
- Development of videos to advertise/highlight our education programs
- Clean-up of 50 bags of trash from the Cordova harbor for Earth Day (45 people)
- Continuation of environmental monitoring
- Salmon incubation tank

E. Conclusions.

PWSSC educators successfully engaged almost ? students and adults directly or indirectly. We diversified our approach to teaching to include kinesthetic and artistic methodologies to provide greater educational access to students with different learning styles. We continued successful hands-on observational teaching tools such as the salmon tank. We increased our electronic media access to interested constituents through social media channels. We continue to improve and expand our lesson units and assessment materials for each grade.

F. Appendix including copies of all written reports or publications completed or in progress, resulting from the project work. This also includes abstracts of papers presented at conferences. Please note the acknowledgment of OSRI support stated in Section 10.3.4 of the Grant Policy Manual.

Community Lecture Series

<http://pwssc.org/educate/community-2/lecture-series/>

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http://www.youtube.com/playlist?list=PL0Q2XZKI0dBS7miEChFpsbeOM_lshxi9X

Headwaters to Oceans Curriculum

<http://pwssc.org/educate/k12-education/curriculum/ocean-monitoring/>

<http://pwssc.org/educate/k12-education/curriculum/ocean-and-oil-spill-technologies/>

Cordova Times

ROV and National Ocean Sciences Bowl Article (3/21/14)

PWS RCAC The Observer Newsletter

ROV outreach trip (May 2014)

PWSSC Breakwater Newsletter

2014 March and April Posts

Delta Sound Connections

ROV outreach trip (April 2014)

5th Grade Discovery Room (April 2014)

Part II - Final Financial Statement

Please complete the attached Excel spreadsheet (GPM-appendix I – Fin Rpt Form).