SALISH SEA EXPEDITIONS' SOUND & SOURCE PROJECT

NOAA B-WET: Pacific Northwest Region

Organizational Background

Organization: Salish Sea Expeditions, Bainbridge Island, WA

Title: Sound & Source Project: Repeating the Cycle of Inquiry, 2008-2010

Priority Area: Meaningful Watershed Educational Experiences for Students & Professional Development for Teachers

Partners to date: NOAA, REI, The Russell Family Foundation, The Weyerhaeuser Company Foundation, Bainbridge High School, Cascade Middle School, Odyssey Middle School, Vista Academy, Duwamish River Cleanup Coalition, Mt. Baker Middle School, Academy of Citizenship & Empowerment, Rainier Beach High School, Seattle Girls School, Mt. Si High School, Taylor Shellfish Farms, Seattle Aquarium, WA Sea Grant, Center for Wooden Boats, People for Puget Sound, Puget Sound Partnership, King County DNR, WA State DNR, City of Bainbridge Island, Suquamish Tribe, WA State Parks "No Child Left Inside", Four Winds* Westward Ho, WSU Beach Watchers

Guiding Precepts:

1) Student Choice and Action
2) Real-World Experience with Science

Target Audience for all Salish programs:

- 5th to12th grade students and teachers, Puget Sound region
- Public (75%) and private (25%) schools, with 25% low-income groups
- Over 6,440 participants served to date, since 1997

Sound & Source Project Scope:

- 8 schools in 2008-09 and 8-10 schools in 2009-2010
- 2008-2009: 485 students (310 low-income/minority) and 17 teachers
- 2009-2010: *TBD*

Figure 1. a. Salish's floating classroom, *Carlyn,* on Puget Sound; b. Students take the helm of their science and sailing expeditions; c. Students design and conduct investigations in local watersheds.

Goals and Objectives

Goals:

1. Diversify field environments in which to apply our inquiry-based teaching approach, building on success of boat-based *Sea Investigators* program
2. Expand reach of programs within participating schools through added depth and involvement of additional, non-*Sea Investigators* students
3. Strengthen students' connections with and deepen their understanding of both local watersheds and the scientific method through student-directed field investigations
4. Facilitate communication of students' research and experiences with school communities, families, educators, local scientists and the public

Objectives:

- *Organization*: 1) Create new onshore program extension, *Sound & Source*, to enhance Meaningful Watershed Educational Experiences (MWEE's) for students and facilitate field opportunities for teachers; and 2) Create venue for students and teachers to share research and experiences with the public.

- *Teachers*: 1) Integrate field science, MWEE's, and community partnerships into classroom curriculum; and 2) Enhance use of inquiry-based teaching methods.

- *Students*: 1) Understand and describe the connection between the condition of their local watershed and the health of Puget Sound; 2) Explain and apply the scientific method with increased comfort; 3) Describe and demonstrate sound research practices, both in Puget Sound and in a local watershed(s), including collection and analysis of water and field samples and documentation and synthesis of results; 4) Communicate results and experiences publicly.

Project Overview

Sound & Source Project (2008-2010) – 8+ schools groups (5th-12th grade) per year:

- Complete *Sea Investigators* program – research design and synthesis in classroom and expedition aboard *S/V Carlyn* (61' yawl)
- Design and conduct additional watershed field investigation(s) using Salish equipment, curriculum, and staff support
- Synthesize research experiences and results in classroom (integrated with science curriculum)
- Participate in Puget Sound Student Science Symposium

Location(s): Puget Sound and surrounding watersheds, e.g. Green-Duwamish River, Issaquah Creek-Lake Sammamish, Bainbridge Island, Samish Bay, etc.

Outdoor Experiences and Pre/Post Classroom Integration:

Sea Investigators (up to 30 participants per school):

- Classroom visits with Salish staff
  - 2-3 two-hour visits, building on science curriculum
  - Ecosystem basics & sampling equipment exploration
  - Student brainstorming & research design
- 3-5 Day Research Expedition: Science and Sailing
  - Equipment deployment & sample collection
  - Initial data analysis & scientific contextualization
  - Students in charge of sailing operations, camping itinerary, etc.
- Classroom synthesis visit(s) with Salish staff
  - Final projects published at www.salish.org
  - *Journal of Student Research on Puget Sound*

Sound & Source (*Sea Investigators* students + up to entire grade level):

- Classroom visits with Salish staff
  - 1-3 extended visits, depending on teachers' capabilities and requests
  - Watershed basics & sampling methodologies discussion
  - Student brainstorming & research design
  - As needed, application to Salish for equipment loans or "mini"-grants
- Local watershed field investigations – with or without Salish staff
  - Multiple site visits (2-5+ additional excursions, depending on school)
  - Sample collections & initial analyses - comparative &/or descriptive
  - Connections to ongoing local professional research
- Classroom Analysis & Synthesis
  - Re-integration with classroom science curriculum
  - Final projects shared within school communities
- *Puget Sound Student Science Symposium*
  - Public presentation & celebration of schools' research

Figure 2. Students explore scientific equipment in classroom with Salish staff; collect and analyze samples onboard *Carlyn;* and prepare final research analysis back in classroom.

Topic Areas: Students' questions and research projects typically focus on water and habitat quality, biological productivity, human impacts, and/or species diversity, depending on field site selection(s) and local relevance. Where possible, Salish staff and teachers connect students with ongoing local projects, such as the City of Bainbridge Island's joint multi-year beach seining project with the Suquamish Tribe to monitor juvenile fish populations and spawning habitat.

Professional Development for Teachers: For the pilot year, Salish staff held intensive meetings with participating teachers to customize curriculum, brainstorm community partners, and integrate Salish's programs with classroom teaching goals, culminating in a clock-hours workshop at the 2009 Symposium. In year two, we will continue with these meetings and add more generalized teacher training workshops to review methodologies, curriculum, classroom integration, and community outreach.

Figure 3. Classroom research design, juvenile fish measurements, shellfish exploration, macroinvertebrate collection and analysis, and water quality measurements near industrial outflow.

Evaluation and Project Refinement

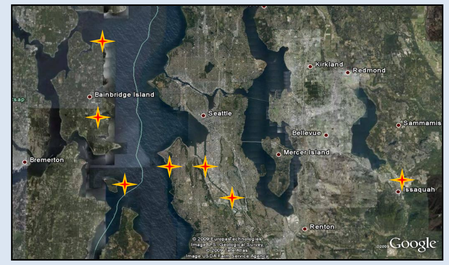
- Year one: Staff and teachers perform formative evaluation of Sound & Source addition (*Refinements in progress- Summer 2009)*
  - Iterative design focus groups and feedback conversations between staff, teachers, and students
  - Identification of program elements to be improved within Salish and with regard to classroom and community integration
- Year two: After initial program refinements, conduct focused pre- and post-experience surveys with students, teachers, and participating scientists and community members to assess meeting of objectives
- Ongoing: Organizational assessment of Sound & Source in conjunction with long-term strategic planning
  - Process evaluation within Salish to document how closely project implementation mirrors initial design
  - Summative evaluation by staff and teachers to inform decisions about future of enhanced Sound & Source program model
- Goals: a) Determine how Sound & Source program leads to increased sustainability of Salish program benefits for teachers and students; b) Determine capacity in which Sound & Source participation leads to increased understanding of connections between health of local watersheds and greater Puget Sound; and c) measure impact of repeated inquiry and re-application of scientific method on students' comfort levels, aptitudes, and attitudes about science.

Sound & Source Products

Organized model for designing, conducting, and integrating field science opportunities at age- & school- appropriate levels. Products include:

- Classroom lesson plans and curriculum integration, including:
  - Watersheds, marine ecosystems and human interactions
  - Inquiry-based teaching approaches
  - Analyzing field data in classroom context
- Tailored field methodologies reflecting local watershed issues
- Partnerships with ongoing professional research and community projects
- Regularly updated website of project ideas, samples of student work, topic & process resources, and Symposium information
- Salish staff training resources and teacher trainings for above curriculum, including methods, equipment, and integration approaches.

Figure 4: Sampling of field locations for 2008-2009 Sound & Source projects in Central Puget Sound.



> "By going on this trip, I now know about how to study and observe things in my community and maybe even how to make them better. What I'm most proud of from this experience would be just having fun while learning about the Puget Sound and learning about my classmates."
> - 8th grade female

Results and Lessons Learned

Diversity in Projects, Access, and Field Environments: As is the case with the variability in our *Sea Investigators* schools, each participating *Sound & Source* school and community has widely different curriculum goals, integration constraints, barriers to field trips, and potential for community partnerships.

Salish's flexible, customized program approach is able to adapt fairly well to such variability as we develop our individual school relationships, but the challenge of maintaining student-choice and regular field access on a broad scale will remain a central focus of further attempts to widen the scope of such inquiry-based field opportunities across environments and school districts.

The greatest integration to date has occurred when a teacher or an entire team of teachers of a grade level or subject area are able to re-design their whole curriculum to reflect the integration of additional field research.

Community Partnerships: The addition of local, land-based, and often extended field-research components to our programs has generated significant excitement among community scientists, agencies, and partnering organizations who are eager to be involved with our students' work. We look forward to continuing the existing relationships and pursuing new connections as we branch more deeply into area communities.

Evaluation Process: We separated evaluation components by year to allow for incorporation of teacher, staff, and student feedback from the pilot year before more rigorous evaluation and assessment of program goals in year two.

Puget Sound Student Science Symposium: Participating schools synthesize research back in the classroom, with Salish staff support as needed, and present findings at end-of-year Puget Sound Student Science Symposium, the first of its kind in the area for such a wide age and topic range.

On June 5th, 2009, over 125 students, teachers, educators, scientists, professionals, and community members gathered to celebrate the inaugural year of Sound & Source and to hear the presentations of 10 student delegations (5th – 12th graders) and professional keynote scientists. Student presentations and agenda available at http://www.salish.org/symposium.

Figure 5. Bainbridge HS students present at Puget Sound Student Science Symposium, June '09. Please visit Symposium website to view full presentations.

> "The most valuable part of the Symposium was having the students present to their peers and scientists," said Annika Mizuta, teacher at Cascade Middle School, a low-income school in Burien, WA. "They thought it was very special that they got asked to present and meet other students. The discussion after each presentation was great! I know that my students felt really challenged and proud that they could answer all the questions."