

**StreamWebs Student Stewardship Network**

**Final Report**  
**NOAA B-WET Program**  
Oregon Sea Grant Extension, Corvallis Oregon



**Award Number:**

**Recipient Name:** Oregon State University

**Funding Period:** September 1, 2016- October 31, 2017

**PI and Co-PI:** Tracy Crews and Renee O'Neill

**Project Coordinators:** Renee O'Neill and Janice Rosenburg

## **NOAA B-WET Grant Program**

### **Project Progress/Performance Report**

*Mark (X) only one box:*

[ ] Semi-annual Report [X] Final Report

### **General Information:**

Award Number: NA16NOS4290143

Project Title: StreamWebs Student Stewardship Network

Funded Institution: Oregon State University

PI Name(s): Tracy Crews

Authorized Representative: Renee O'Neill

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Dollar amount of the award (federal and non-federal match, if applicable): \$60,000 + \$27,144 non-match

Project Website (if applicable): Streamwebs.org

### **Reporting Period Information:**

Award Period: 09/01/2016 - 08/31/2017

Reporting Period: 09/01/2016 - 10/31/2017

## **PERFORMANCE NARRATIVE**

During the third year of the NOAA BWET funding, the StreamWebs Student Stewardship Network exceeded our program objectives to support identified teachers and project partners in their efforts to connect students to meaningful watershed education experiences. The StreamWebs program provided students, teachers, and project partners with hands-on field and classroom trainings; access to field sampling equipment; curriculum materials and open-source, web-based tools for watershed data analysis. Additionally, our program launched a number of new partnerships and added to our existing cohort of teachers and community partners.

The Objectives of the StreamWebs Student Stewardship Network are to:

1. Increase student awareness and understanding of the interconnectedness of and human impacts on natural systems, with emphasis on watersheds and estuaries, from headwaters to ocean.
2. Increase student skills in gathering, analyzing and reporting scientific data and/or designing, planning, and implementing watershed research and restoration projects.
3. Increase educator skills related to field-based study (including gathering and analyzing data, planning and implementing projects, leading students in field-based settings), and

improve their ability to meet mandated educational benchmarks through field-based learning.

4. Increase agency and organization confidence in utilizing students and educators to gather, analyze, and report scientific data, and increase their propensity to seek opportunities to work with students and educators when designing, planning, and implementing watershed research and restoration projects.
5. Maintain StreamWebs program resources; including the online interface, field gear, monitoring protocols, and curricula matched to Oregon state standards.

To accomplish these objectives, the StreamWebs program provided field and classroom support for teachers and students, conducted professional development events, and collaborated with project partners within watershed councils and watershed education organizations.

## **PARTNERSHIPS**

During the course of this grant proposal, the StreamWebs program was able to work with a number of schools and partner organizations to ensure that our objectives were met. Schools and corresponding partner organizations that were directly supported during the grant period and engaged students in a meaningful watershed education experience include:

- ✓ **Eddyville Charter School** (Eddyville, OR); Oregon Oyster Farm
- ✓ **Taft High School** (Lincoln City, OR); Salmon Drift Creek Watershed Council, U.S. Forest Service, & Oregon Department of Fish & Wildlife
- ✓ **Lebanon High School** (Lebanon, OR); South Santiam Watershed Council
- ✓ **Kings Valley Charter School** (Kings Valley, OR); Institute for Applied Ecology, Luckimute Watershed Council, Marys River Watershed Council & 4H Wildlife Stewards
- ✓ **Timber Ridge School** (Albany, OR); Calapooia Watershed Council, City of Albany & Oregon Department of Fish and Wildlife
- ✓ **Newport Intermediate School** (Newport, OR); City of Newport & US Forest Service
- ✓ **Monroe Grade School** (Monroe, OR); OSU Extension 4-H program, OSU Watershed Invasive Species (WISE) Program
- ✓ **Siuslaw High School** (Florence, OR); City of Florence, Siuslaw Watershed Council, Lane Community College, US Forest Service, Oregon Department of Fish & Wildlife, Siuslaw Salmon & Watershed Studies Program
- ✓ **Muddy Creek Charter School** (Corvallis, OR); Marys River Watershed Council, Trask Design and Construction, City of Corvallis, 4-H Wildlife Stewards
- ✓ **North Salem High School (Salem, OR)**; City of Salem, Soil and Water Conservation District, and Salmon Drift Creek Watershed Council

### **Eddyville Charter School**

Sean Bedell was a returning teacher to the grant who had previously taught at Newport Middle School. Although he was no longer teaching in a coastal community, he continued to focus on ocean acidification as well as incorporating stream surveys from a small creek on school grounds. Bedell introduced ocean acidification concepts to his students by having them complete the activities in the Ocean Acidification kit and by focusing on carbonic acid in his chemistry unit. Bedell's students also did water quality testing and macroinvertebrate sampling at a stream that flowed on school grounds in preparation for a field trip to Clemens County Park on the Alsea River. Students visited the stream twice a week for a month and recorded their data on StreamWebs data sheets. Back in the classroom, they transferred the data to the StreamWebs website. After collecting water samples and learning about ocean acidification, students in Bedell's class visited the Oregon Oyster Farm where they learned about the impacts of acidification on the shellfish industry.

As a culminating activity, students went on a field trip to the coast where they compared water quality samples from Beaver Creek with samples from Ona Beach. Their guiding question was "Is the pH in Beaver Creek different than the pH in the intertidal Yaquina River? Although they did not find an appreciable difference, when the students studied data over the past three years on the StreamWebs website, they found differences in pH, temperature and salinity between the two sites. Students hypothesized that the water quality varied due to the tidal influences.

Bedell's project will continue beyond the scope of this grant. Next year he plans to have his students create interpretive signage for their local creek for the stewardship component of their project. He also plans to partner with the 3<sup>rd</sup> grade teacher, and his students will act as mentors to the elementary students, teaching them about water quality and stewardship.

### **Taft High School**

During the 2016-17 school year the Salmon Drift Creek Watershed Council's Education Coordinator Graham Klag provided project based field, campus and classroom experiences to four high school classes; Andy Bedingfield's, Avery Marvin's, and Noah Lambie's from Taft High School and Emily Parent's class from North Salem High School, as part of the Restoring Ecosystems Educating the Future (REEF) Education Program.

Taft students each visited to the REEF native plant nursery and Taft bioswale multiple times. Here students learned how to use, maintain and collect water quality data using the Venier probs and Lab Quest Screens. The REEF nursery Taft students learned how to propagate, collect and

plant native plant species. In the classroom and Taft bioswale students learned the habitat requirements for native plant species and the important roles native plants play in water quality and quantity throughout their watershed.

Throughout the school year each class took one to three field trips to the various local watershed restoration and enhancement projects implemented by the council and partners. Here students learned about sites, land use history and restoration process. Many trips were assisted by conservation professionals from the U.S. Forest Service, Oregon Department of Fish and Wildlife and other staff, providing students with professional development and career pathway training.

At estuary and riparian restoration sites, students collected water quality monitoring information ranging from stream flow and water chemistry to macroinvertebrates and stream solarization. Here the data was recorded on Stream Webs data sheets, and later entered into the Stream Webs database by students. Additionally, students aided in the restorative process of sites by creating planting plans and planting the native species they propagated from the REEF nursery.

Back in the classroom the data was analyzed and compared to the Council historical water quality data to assess habitat functionality. Here students and teacher were able to empirically observe the restorative change overtime of project sites on track to recover and sites which in need of additional management.

### **Lebanon High School**

Emmett Whitaker is in his 4<sup>th</sup> year of a partnership with StreamWebs and the Santiam Watershed Council, and each year he has assiduously refined his plans to ensure that his students get “real life, hands-on experiences in our own community.” Whitaker and South Santiam Watershed Council Education Coordinator Angela Clegg work together to evaluate strengths and weaknesses of past projects and to create a scope and sequence that builds from what they’ve learned.

This year Whitaker’s students added to their longitudinal data set comparing the Santiam River with an irrigation canal in their community. Over the course of a week, students did water quality testing, sampled macroinvertebrates, and analyzed riparian canopy cover and soils. A former student who is now studying environmental science at Oregon State University assisted with the field trips. The field experiences were part of a month-long unit on watersheds, with a focus on water quality and environmental justice.

Back in the classroom, students entered the data on the StreamWebs website and analyzed it for validity and reliability. They concluded that there was considerably more biodiversity in the free-flowing section of the river, which may have been attributed to lower water temperatures as well

as other factors.

Students presented their findings to the Santiam Watershed Council. Next year, Whitaker hopes to have his students also do a presentation for city officials and possibly involving his students in a data collection project for the Department of Environmental Quality. He feels that the field experiences gave students confidence and that student engagement is enhanced by this confidence.

### **Kings Valley Charter School**

Stacey Zaback incorporated stream studies throughout the year with her 3<sup>rd</sup> graders and carried out numerous stewardship projects. Zaback's students learned about salmon by raising salmon and trout eggs in their classroom through a partnership with Karen Hans, the STEP biologist from the Oregon Department of Fish and Wildlife. After a visit to the salmon research facility in Alsea, during which the students did salmon dissections, learned about rearing salmon at a hatchery, and walked the creek, students released their salmon and trout in a local stream.

In addition to learning about fish, students studied beaver reintroduction to the creek with Dr. Troy Hall from Oregon State University. Students were led in an exercise in which they compared sites with and without beavers. The 3<sup>rd</sup> graders also planned and planted a butterfly garden that included plants for endangered species, created a watershed model to understand how water cycles through a system, and spent a night at the coast at Camp Kiwanalong, an OMSI camp.

Zaback is an accomplished artist, and she incorporated art into all of the student projects.

Students made watercolors of salmon, built salmon tiles for a bench that was auctioned off as a fundraiser, made ceramic salmon bowls and, for a culminating project, created posters showing what they had learned. The students presented the posters to each other and to the other 3<sup>th</sup>/4<sup>th</sup> grade class. They then presented the posters at the 4H Wildlife Stewards Conference, and some were entered in the Benton County Fair. After the presentations, the posters were put on permanent display at the school. Next year Zaback wants to incorporate more data collection and interpretation as part of the project.

### **Monroe Grade School**

Marie-Louise Martinson and Dave Beatley worked together last year to lead students in a watershed project but with Beatley's move to another school, Martinson took the lead on her own. Her middle school students were engaged in watershed activities throughout the year in both her regular classes and in an after-school club. Martinson relied on StreamWebs lesson plans as a foundation for her teaching.

Martinson collaborated with several community partners throughout the year to support their

work on Schaeffer Creek. Their project focused on the identification and removal of invasive species and students mapped the stream and did cross-sections of the riparian area. They also learned to identify plants in the riparian area and removed invasive species with the help of Watershed Invasive Species Education (WISE) Program Coordinator Tania Siemens.

OSU Extension 4-H agents Jody Einerson, Chris Ralston and Maggie Livesay assisted students in collecting water quality and soils data using Vernier probes and iPads. Students then compared the data they collected at their stream with data on stagnant water collected in a local ditch. This added to students' understanding of the parameters necessary for healthy streams to support aquatic organisms. The 4-H staff also led lessons on ocean acidification using the StreamWebs kit, and on erosion using the Enviroscape model.

Students visited Schaeffer Creek four times to collect data and visited a local farm on two occasions to collect soil samples and do soil tests through the Adopt-a-Farmer program. Students took a culminating field trip to Hatfield Marine Science Center to learn about the greater connection of their watershed to the larger ocean ecosystem.

Students created posters illustrating what they had learned about watershed science. They then presented their posters at the Community Health Fair that was held at their school.

Next year, Martinson plans to incorporate StreamWebs data entry and to continue building on the stewardship component of the project.

### **Muddy Creek Charter School**

Chris O'Connell's 3<sup>rd</sup> grade students participated in a comprehensive study of their watershed collecting and comparing data from 4 different streams (Starr Creek, Bull Run Creek, Muddy Creek and Rock Creek). The primary focus of their study was to determine stream health based on water quality data and macroinvertebrate sampling. Students also grew native ash and willows in the school greenhouse, which they planted on school grounds along a seasonal creek.

Several community partners assisted O'Connell and his students. OSU Sea Grant and the Marys River Watershed Council provided background information and photos of the watershed. Graham Trask from Trask Design and Construction showed students how fish-friendly culverts could improve stream health. The Queen Bee Honey Company allowed students to collect water samples on the Muddy Creek where it flowed through their property and Jennifer Ward from the City of Corvallis Watershed Group led a tour of the Rock Creek Water Treatment facility.

O'Connell utilized many StreamWebs resources in his program and relied on StreamWebs lesson plans, borrowed kits, and attended workshops. O'Connell used some of his funding to build his

own classroom water quality and macroinvertebrate kits.

Students shared what they had learned with a broad audience through posters and artwork. Student artwork and writing was submitted to “Honoring our Rivers”, an anthology of student work in partnership with the Willamette Partnership, the Port of Portland, and Eugene Water and Electric Board. At the 4-H Wildlife Stewards Summit, which was held at their school, all students presented posters to over 250 people, including students from other school, parents, volunteers, and the school district superintendent. Students also attended an event promoting science and art at OSU and shared their posters as well as macroinvertebrate sculptures to over 50 community members and OSU student teachers.

O’Connell plans to continue to build on his StreamWebs experiences in the future. In addition to continuing with watershed-monitoring projects and data collection, O’Connell is interested in sharing what he has learned with other educators. He also plans to focus on stewardship projects on local streams.

### **Timber Ridge School**

In collaboration with the Calapooia Watershed Council, the City of Albany, and Oregon Department of Fish and Wildlife, Devlin Brazel’s students monitored the health of the riparian zone along a creek bordering school property. In addition to water quality testing and macroinvertebrate sampling, Brazel’s students undertook a photopoint monitoring project that will enable them to observe long term changes in the riparian area. The students constructed the photo boards that they used as reference scale in the photos, and they entered their data in the StreamWebs database. Students were able to compare their stream with other local waterways on a field trip to Talking Water Gardens, a park created by the City of Albany at the Water Treatment Facility, and to Cox Creek.

Brazel’s project had a strong stewardship component. Students worked hard to remove invasive species, in particular a thicket of blackberries, from the riparian area along the stream. They then planted native species, including willow and ash. They also began construction of a nature trail on the school campus, planting native species alongside a bark mulch path. Students took photos of the plantings and collected data on plant growth. They also installed interpretive signs next to the native vegetation that they planted.

Students shared what they had learned in a variety of ways. They created several videos of their projects, including a video advertising the elective class that will be offered next year. These videos were shown on the school’s TV system during morning announcements, and thus were viewed by all 740+ students as well as over 1,000 parents and guardians who also received the



announcements. Students also wrote news articles about the projects for the school newspaper.

Brazel plans to greatly expand the project next year by offering an elective class focusing on restoration projects in collaboration with the Physical Education teacher at Timber Ridge. They have already received several grants to support their project, which will also receive funding from STEM monies and the school's Dropout Prevention and College Readiness program. They plan to continue working with the Calapooia Watershed Council and ODFW.

### **Newport Middle School**

P.J. Collson used his Habitat Restoration class as an opportunity to engage students in project based learning utilizing nearby Jeffries Creek. Students researched videos on trail maintenance, contacted the private landowners requesting access to their property, and made a presentation to school administrators to get their approval on the project. Once the project began, students cleared the overgrown trail to Jefferies creek and then collected water quality and riparian data which they entered in the StreamWebs database. In collaboration with the City of Newport and the US Forest Service, students removed invasive species, including Scotch broom, from school grounds, and constructed a more extensive trail to Jeffries Creek that tied in with an existing trail that goes to the ocean.

Students created posters and presented their projects to the student government. Their hope is to increase involvement for next year when they continue to improve the trail. They also plan to conduct a fundraiser for a boardwalk or a bridge across the creek, and they plan to share their projects with City of Newport Parks and Recreation administrators.

### **Siuslaw High School**

This was Gina Castro-Brandt's third year engaging students in a project along "Viking Creek", a small creek located on the school campus. Over the past two years, Castro-Brandt's students had focused on removing invasive species along the creek and this year all four of Castro-Brandt's sophomore biology classes participated in the Enhancement project this year. The guiding question for their research was, "Is Viking Creek a healthy stream?" To begin to answer this question, students went out once a month to collect data which they entered in the StreamWebs database. A smaller group of students went to other streams to collect data to use as a comparison. These students presented their findings to the rest of the class.

Castro-Brandt's students also continued their restoration projects. Their goal had been to plant more willows, but they observed that willows and other natives were already beginning to re-colonize the riparian area due to the work they had done in prior years removing invasive species.

Students created four interpretive signs to put by the creek.

Unfortunately, Castro-Brandt's project suffered a set-back this year when the trail camera that the students had installed the previous year was vandalized. The project location was also being used as a homeless encampment and was littered with trash and drug paraphernalia. Castro-Brandt and her students worked with the City of Florence and the police department to prevent further vandalism. Castro-Brandt also received a grant from the PTA to purchase a new trail camera to replace the one that had been vandalized.

Castro-Brandt's project was supported by the Siuslaw Watershed Council as well as faculty from Lane Community College, the US Forest Service, and Oregon Department of Fish and Wildlife.

### **North Salem High School**

First time project leader Emily Parent incorporated a watershed education project in her field biology and environmental science classes at North Salem High School. Through field-based study, her students were actively engaged in data collection and analysis, collaboration with different agencies, and habitat restoration.

To give students the background information they needed on their watershed, facility managers from the City of Salem presented an overview of watershed concepts to Parent's classes and students then visited the Waste Water Treatment Plant. Parent worked with the Marion County Soil and Water Conservation District to involve her students in the local Salmon Watch program where they were able to visit and collect data on the Willamette river. The Willamette Riverkeepers then took Parent's students on a hike at Willamette Mission State Park after they participated in riparian service project that involved cleaning out old tires and other trash. Students also conducted a riparian plant survey and collected water quality and macroinvertebrate data on Mill Creek and were assisted by Oregon Department of Fish and Wildlife officials who helped students with fish identification. As a culminating activity, students went on a field trip to the coast and worked with Graham Klagg from the Salmon Drift Creek Watershed Council who helped students examine the Salmon River Estuary. Students collected water quality and macroinvertebrate data at the estuary and did a plant survey in the riparian area. They compared this data to data they had collected on Mill Creek.

Parent's students participated in the Youth Environmental Conference sponsored by the Salem-Keizer school district. At the conference, they did poster presentations on different aspects of their project, including data collection on Mill Creek and a native plant display. They also created a video on soil conservation that they shared with farm managers at the Youth Farm.

## **ADDITIONAL ACTIVITIES**

### *StreamWebs Educator Workshops*

The StreamWebs program did three professional development workshops over the course of this grant. The first one was in collaboration with Hatfield Marine Science Center and the Science and Math Investigative Learning Experience (SMILE) program held a workshop in Newport, OR on August 9<sup>th</sup>, 2016. A total of 55 teachers attended this workshop and the StreamWebs platform was integrated into 3 sessions: *Oregon Seagrass*, *Aquatic Invaders*, and *Our Changing Oceans*. The second was a 3-day workshop in partnership with the Marys River Watershed Council and the Institute for Applied Ecology in the Willamette valley. This workshop had 17 elementary school teachers and was held during the last week of August. Teachers studied ecosystems from the ground up with activity stations focused around soils and ecological site assessment. They looked at living systems, identified insects and aquatic macroinvertebrates, studied water quality, and learned about current and historical human-land interactions throughout the Willamette Valley.

The final workshop was held at the Coast Learning Symposium in Newport, OR on October 13<sup>th</sup> and had 10 k-12 educators. Teachers modeled how to “prepare” students as part of the MWEE model using the *Field and Classroom Watershed Investigation Guide*, practiced collecting data using Vernier water quality equipment, recorded it onto StreamWebs datasheets and then entered it into the online database. In all of the workshops, participants were introduced to a variety of resources that support MWEE’s including NOAA and Oregon Coast Education Program (OCEP) curriculum.

### *StreamWebs Educational Videos*

The StreamWebs program created two short educational videos in collaboration with with Sea Grant Communications and partners at the South Santiam Watershed Council. These videos demonstrate how to use StreamWebs tools, protocols, and resources to conduct a field investigation with students. These videos are meant to support the Educator Kits which are available for teachers to borrow from the StreamWebs program. The first video shows educators how to teach students to test water quality using a kit with equipment made by LaMotte. The second video shows educators how to teach students to collect and identify aquatic insects using the macroinvertebrate kit and data sheets.

### *Ocean Acidification Webinar*

During a 1 hour webinar 6 participants heard from Oregon State University researcher George

Waldbusser about the ways that humans are altering ocean processes and the impacts of ocean acidification on oyster and mussel shells. The StreamWebs program shared activities from the Ocean Acidification kit that teachers could use to teach about OA with their students. Because it was our first webinar there were some technical difficulties and we were not able to record the session for future views.

#### *Development and Implementation of StreamWebs Sampling Class*

The StreamWebs program worked with Hatfield Marine Science Center education staff to develop and implement a sampling lesson titled: *High Tide: Salinity in the Estuary*. This lesson was used with 15 students during March homeschool field days. As part of this 2-hour lesson students gathered and analyzed water quality data on salinity, created a model of a salt wedge, and developed a hypothesis about how tides and location influence the salinity gradient in an estuary. This lesson plan introduced students to what an estuary is and the concepts of salinity and density and provided students an opportunity to develop an investigative question about a watershed.

#### *Bilingual datasheets*

The StreamWebs program worked with partners from the Marys River Watershed Council and the Corvallis School District to translate our water quality and macroinvertebrate sheets into Spanish. Many of the schools we serve have a high Latino population and/or are bilingual. We have had a number of requests for us to translate our datasheets and these two popular ones have been a good start. They were utilized as part of the Linn/Benton County Salmon Watch Program which serves two bilingual schools in Benton County.

## **NOAA ASSETS**

The following NOAA assets were shared with teachers and as part of our educator workshops.

- **[StreamWebs datasheets](#)**
- **[StreamWebs Field and Classroom Watershed Investigation Guide](#)**
- **[Water Quality and Macroinvertebrate Tutorial Videos](#)**
- **[Oregon Coast Education Program](#)**
- **[NOAA Educator Resources](#)**

## **FINANCIAL REPORTING**

There were no significant discrepancies between the projected and implemented project budget.

## **SUSTAINABILITY**

An additional NOAA BWET grant was secured for the 2017-2018 award cycle that will help support the StreamWebs program. *MWEES by the Sea* will provide an additional two workshops in Oregon coastal communities that will focus on water quality monitoring and the use of the StreamWebs data portal and supporting educational resources. An additional grant proposal has since been submitted which will also help to support future use of the StreamWebs program by educators, students, and community partners.

## **PROJECT RESULTS**

Specific accomplishments of the StreamWebs program over the course of the grant that helped meet stated program objectives include:

- Eleven Watershed Education Projects with 560 students spending 385 hours in the field and 344 hours in the classroom learning about watersheds.
- Eleven Watershed Education Projects with 12 teachers spending 487 hours prepping and teaching about watersheds.
- Direct support to 560 students during field and classroom project support events.
- Three professional development events reaching at least 88 educators.
- Sixty-seven parent or community volunteers engaged with students to support projects.
- StreamWebs Educator Kits loaned to over 42 teachers and project partners providing an estimated 1,263 students access to field sampling equipment that supported field events.
- The creation of two educational videos that support teachers in leading students in the field using water quality and macroinvertebrate equipment to teach about watersheds.
- The design and rebuild of StreamWebs.org as an avenue to make it more user friendly for teachers and students and to take advantage to the increased performance of modern website framework.

### Student Audiences

School	Address	Cumulative number of students reached for this year of project <sup>2</sup>
Lebanon High School	Lebanon, Oregon	70
Timber Ridge School	Albany, Oregon	22
Muddy Creek Charter School	Corvallis, Oregon	24
Eddyville Charter School	Eddyville, Oregon	22
Monroe Grade School	Monroe, Oregon	12
N. Salem High School	Salem, Oregon	50
Siuslaw High School	Florence, Oregon	85
Kings Valley Charter	Kings Valley, Oregon	22
Newport Intermediate	Newport, Oregon	40
Taft High School	Lincoln City, Oregon	90
Salmon Watch Program (Linn & Benton County) 25 schools total from Corvallis, Albany, Sweet Home, Lebanon & Philomath	Trout Creek, Cascadia Wiley Creek, Sweet Home Clemens Park, Alsea	2532
<b>TOTAL</b>		<b>2972</b>

### Educators and Other Audiences

Audience	Cumulative number of individuals reached for this year of project <sup>2</sup>
K-12 In-service Educators in Professional Development Programs	88
Other: training for volunteer educators using StreamWebs during salmon watch field program (5 <sup>th</sup> -6 <sup>th</sup> grade students)	160
<b>TOTAL</b>	<b>248</b>

### **PROJECT OUTCOMES AND EVALUATION**

The evaluation plan for the StreamWebs Student Stewardship Network served to assess our progress toward achieving project objectives and outlined activities, and included a combination of qualitative and quantitative data to determine the effectiveness of the program.

Educators who implemented a StreamWebs watershed education project were asked to complete a self-assessment pre and post evaluation that included both qualitative and quantitative questions to document their own awareness and knowledge of project concepts, as well as their perceptions

of their students' awareness and knowledge (see appendix A). Additionally, questions were asked about educators' and their students' experiences using StreamWebs resources. Educators and program partners receiving a sub-award or other form of program assistance were asked to provide this evaluation information before their full award amount was released. Following all StreamWebs Educator Training Workshops participants were asked to complete a post evaluation survey that includes qualitative and quantitative questions meant to assess learning around implementing watershed education projects.

Program success was also based on the number of program participants (teachers, students, and project coordinators), streamwebs.org, user metrics (tallied quarterly), and the various metrics associated with student field activities (number of new project sites, number of times water quality data is collected, photopoints collected, area mapped etc.) A full program evaluation is included as Appendix A.

### **Changes to Project Implementation**

Due to other obligations, former StreamWebs Coordinator Renee O'Neill decreased her time on the project and focused more on the administration of the program and oversight of the website rebuild. The StreamWebs program hired retired classroom teacher Janice Rosenberg who focused on supporting teachers and students in the classroom and field and leading workshops.

Rosenberg's expertise in the classroom and with leading field based investigations with her own students made her an asset to the program. In addition, StreamWebs partnered with the Salmon Drift Creek Watershed Council (SDCWC) to sub-contract their Education Coordinator Graham Klagg who supported multiple classrooms at Taft High School in Lincoln City.

There were a few changes to the teachers and partners listed in the grant proposal. We did not partner with Marshfield High School in Coos Bay, OR due to the lead teacher moving. We also were not able to partner with Corvallis High School as the lead teacher took on a different assignment in the district and changes within the Marys River Watershed Council that did not allow them to continue supporting teachers at the high school level. In Albany, OR, middle school teacher Mara Burke left Calapooia Middle School and we were not able to identify a new teacher. Lead teacher at Newport Intermediate School (NIS), Sean Bedell, moved back to Eddyville Charter School and was replaced by PJ Collson who was able to complete a project. Bedell was also able to complete a project but at Eddyville Charter School.

The rebuild of streamwebs.org working with website specialists at OSU's Open Source Lab took significantly longer than expected which meant that we were not able to incorporate it into our

trainings until the very end of our project period.

A problem that we recognized over the course of this granting period and have observed in the past was how difficult it can be for teachers to ensure that project experiences are cohesive and connected and not just a series of seemingly unrelated field and classroom experiences. Teachers do their best to fit watershed projects into existing curriculum and classroom mandates and it can be difficult to find the stretch of time needed to make projects feel cohesive to students. We heard from a number of teachers during our teachers' workshop events that this was one of the greatest challenges that they faced in doing projects with students. The schools that had the greatest success were ones who had a body of water within walking distance of their schools and those that were charter schools with greater flexibility to focus on project based learning.

### **Proposed Future Improvements**

To help teachers make projects more cohesive for students we recommend a greater focus during trainings on the importance of using a guiding question that students will work to answer over the course of their project and revisit before and after each experience. The [StreamWebs Field and Classroom Watershed Investigation Curriculum](#) provides teachers with guidance for developing an investigative question with students as well as and creating a cohesive project. Working with teachers to further develop and plan their projects post workshops may be necessary as well.

The completion of the new StreamWebs.org website will significantly improve the project in the future. The new website is more modern and user friendly and ultimately, requires less oversight. The improvements that were made on the rebuilt site should reduce the amount of time needed to support individual users and the overall cost of upkeep on the site which makes it less expensive to maintain, host and manage. The new website will help to sustain the program into the future and we are confident that by using a modern platform we will have less bugs and that the site will be more straight forward to users.



# APPENDIX A

## STREAMWEBS STUDENT STEWARDSHIP NETWORK FINAL PROGRAM EVALUATION

PRINCIPAL INVESTIGATOR: TRACY CREWS  
PROJECT COORDINATORS: RENEE O'NEILL AND JANICE ROSENBERG

OREGON SEA GRANT, OREGON STATE UNIVERSITY

## **Executive Summary**

StreamWebs is a student watershed stewardship network that supports students, teachers, and community professional partners in the creation and implementation of Watershed Education Projects using the StreamWebs platform. These projects focus on increasing student awareness about their watershed; understanding human impacts on natural systems; and providing exposure to experiential field-based study with a focus on data collection, interpretation, and presentation. StreamWebs also focuses on increasing educator skills and abilities to connect field-based experiences to standards and educational mandates with a specific focus on the Next Generation Science Standards (NGSS) Practices by offering the necessary professional development training; equipment to carry out field-based projects with students; and the website to foster data entry and follow-up activities in the classroom to make meaning from field data collected. Finally, StreamWebs works with community partners' to connect them with students and teachers in stewardship projects.

This was the third year of funding that StreamWebs had received from the BWET grant and eleven projects were directly supported, both continuing and new, which was an increase from last year. Each project had a lead teacher within the school who worked closely with an identified project partner to implement experiential, watershed field-based stewardship projects with students. Community partners participated in these projects by providing professional support in the field and classroom, access to field study sites, and expert level knowledge of their watershed to students and teachers. In addition to the direct support provided to the identified schools, StreamWebs provided three professional development workshops to additional educators from August 2016 to October of 2017. We held three workshop with the goal of providing educators with content knowledge and resources necessary to conduct watershed investigations with their students.

Our evaluation goals were to measure project successes and to identify areas of improvement needed in relation to our program objectives; to evaluate our professional development workshops and identify future needs of educators; and to measure final program numbers, metrics, and accomplishments.

In order to accomplish our evaluation goals, surveys were created in Qualtrics, an online survey software program, and sent to project teachers and workshop participants. A combination of closed, yes or no questions, and open-ended questions were used to elicit a variety of quantitative and qualitative feedback in order to best evaluate the StreamWebs program. Two surveys were used: The B-WET Teacher Survey and the StreamWebs survey for workshop participants. Data was tallied by number of responses in closed questions, and grouped by similar answers or reoccurring themes in open-ended questions. In addition to these surveys, we conducted in person debrief meetings with each of the teachers who were directly

supported by the BWET grant. BWET survey questions were repeated in various ways with the hope of getting additional qualitative data about projects.

## **Overview**

StreamWebs is a student watershed stewardship network with five components: (1) field and classroom support; (2) an online watershed database that facilitates student data analysis, peer to peer learning, and content sharing; (3) *Watershed Monitoring Kits* that provide access to the tools necessary to conduct a field studies; (4) StreamWebs curriculum materials that provide teachers with guidance for setting up an investigation and following up with field data back in the classroom; (5) hands-on field trainings in water quality, aquatic macroinvertebrates, photopoint monitoring, riparian surveys, etc.

StreamWebs offers predesigned educational kits, data collection tools, and connections to partners that foster teachers' ability to enhance students' learning about their watershed through project based, hands-on activities in the field. StreamWebs strives to support teachers in order to get students out into the field, connected to scientific professionals, and doing real-life applicable data collection in their own watersheds.

This project provided focused, hands-on support for 12 teachers that worked directly with 560 students and at least 15 partner organizations to conduct field based studies that engaged students in meaningful watershed education experiences. Additionally, the project provided professional development for at least 88 other educators, along with maintaining support for the over 850 registered StreamWebs.org users, that conservatively reached an additional 3000 students. The program consisted of field workshops led by the StreamWebs Coordinators and local partners, and focused on emerging and priority watershed issues as well as the education goals of the individual teachers.

The Objectives of the StreamWebs Student Stewardship Network are to:

1. Increase student awareness and understanding of the interconnectedness of and human impacts on natural systems, with emphasis on watersheds and estuaries, from headwaters to ocean
2. Increase student skills in gathering, analyzing and reporting scientific data and/or designing, planning, and implementing watershed investigation and stewardship projects
3. Increase educator skills related to field-based study (including gathering and analyzing data, planning and implementing projects, leading students in field-based settings), and improve their ability to meet mandated educational benchmarks through field-based learning
4. Increase educator skills and confidence related to following up with field data back in the

classroom and sharing results with a broader community

5. Increase agency and organization propensity to seek opportunities to work with students and educators when designing, planning, and implementing watershed research and restoration projects
6. Maintain StreamWebs program resources; including the online interface, field gear, monitoring protocols, and curricula matched to Oregon state standards

To accomplish these objectives, the StreamWebs program provided field and classroom support for teachers and students, conducted professional development events, and collaborated with project partners within watershed councils, and various watershed education organizations.

### **Evaluation Goals**

StreamWebs had three main goals to accomplish through our evaluation: 1) determine the project successes and areas of improvement identified by the select teachers and their corresponding partner agencies that we were able to directly support with this grant; 2) measure the success of our educator professional development workshops throughout the year and learn how we might better serve our educators in the future; and 3) determine overall final numbers and metrics of the StreamWebs Student Stewardship Network.

We tied our evaluation questions back to our objectives by asking teachers about their projects, specifically: what barriers and benefits they found to collecting data in the field with students; what barriers they experienced using data back in the classroom and entering data into streamwebs.org; and through teachers' ratings about their and students' awareness and skills pre and post field work. These teacher ratings included questions that related directly back to our outcomes and asked about increases in teacher and student awareness, skills, and abilities related to their watershed projects. For example, we asked teachers to please rank their skills related to whether they improved their ability to meet mandated educational benchmarks through field-based learning. We asked questions such as: please rank whether or not students' skills in gathering, analyzing, and reporting scientific data and/or designing, planning and implementing a watershed research or restoration project improved.

Our professional development workshops' surveys were designed to measure successes of the workshop, areas of improvement, and to identify areas of educators' interest and needs that we might address in future workshops. Our evaluation data will be used to determine if we are meeting our objectives, and to

determine what resources educators may still need to best utilize StreamWebs as a tool to help connect students to their watershed through field-based educational experiences.

## **Methods**

StreamWebs created two surveys in Qualtrics, an online survey software program, to evaluate the successes and lessons learned throughout the year within the StreamWebs Student Stewardship Network. Surveys were sent to teachers, informal educators, and community partners who participated in StreamWebs' educator workshops and/or used the platform to work with students both in the classroom, and in the field. A combination of simple closed questions that elicit yes, no, or other predetermined answers, and open-ended questions were used to elicit feedback on project effectiveness, accomplishments, constraints, and areas for improvement. In addition to the survey's we asked our project teachers to participate in a one hour in person debrief as an avenue to further evaluate their project.

Both surveys were sent to the entire population of each target audience. The following describes the two surveys and the in person debrief:

1. B-WET Teacher Evaluation Survey: This survey was sent to eleven StreamWebs classroom teachers that engaged their students in a meaningful watershed experience using the StreamWebs platform during the course of the grant. This was an in depth evaluation to learn more about teachers' and students' success and barriers during their Watershed Education Projects. The survey was also designed to measure pre and post project changes in student awareness related to understanding natural systems and human impacts upon those systems, and their abilities and skills to conduct a watershed project, and gather data in the field. Additionally, the survey sought to measure improvements in teachers' abilities to use field-based study as a tool to meet educational standards and mandates. All eleven of the teachers completed the survey and were given an end of project stipend for their participation.
2. In-person Debrief: 9 of the 12 teachers participated in a 1 hour in person debrief as an avenue to better capture details of their projects that might be left out in a survey. Teachers were asked some of the same questions about their project as in the survey with the hope that this would be an opportunity for them to provide greater detail. Additionally, it was meant to serve as a platform for teachers to share about their experiences and help our program better understand how to support them in the future. It proved to be an excellent opportunity to get a lot of in-depth feedback from teachers.

3. StreamWebs Survey: This survey was sent to participants who took part in the August 2016 professional development workshop. The StreamWebs survey was designed to specifically measure participants' learning and the overall success of each particular professional development workshop. The survey was given to 46 participants at the end of the workshop and we had a 100% response rate. Teachers who attended the other two workshops did not receive surveys from our program but rather were surveyed by the organizations that we partnered with.

### **Data Analysis**

Data was tallied by number of responses in closed questions, and grouped by similar answers or reoccurring themes in open-ended questions. Data was summed by category when appropriate to gather information such as number of students that engaged in a stewardship project, or the number of hours educators spent prepping and teaching. No statistical tests were used to make inferences.

### **Results**

#### **1. B-WET Survey and In-person Debrief**

The teachers funded by B-WET implemented projects that got students outside, and engaged in real world science. Students gathered, analyzed, and reported on scientific data, and worked with community partners and experts. Community partnerships exposed students to scientific work done by professionals at watershed councils, state agencies, environmental centers, etc. Teachers reported the best aspects of the project as: getting students outside and spending time in the field, providing hands-on experience, and expert support. 100% of teachers noted that students expressed a desire to conduct STEM studies outdoors vs. in the classroom.

When asked about the challenges that they faced with their projects teachers noted a number of ongoing barriers that are similar to those we have heard in the past. Middle and high school teacher described the difficulty of getting all of their students outdoors and on field trips since they have multiple classes a day and some more than 150 students. Elementary teachers struggled with limited access to technology in their schools for following up with data in the classroom. Teachers at all levels had difficulty finding the time for students to identify and investigated an issue of concern. In many cases teachers provided students with an investigative question but field and classroom experiences were pieced together as time allowed and were not as cohesive as teachers would have liked. That said, 100% of teachers reported

engaging their students in hands-on learning and preparing students before taking them into the field. 80% of teachers reported taking students into the field on multiple occasions.

In one question of the survey, teachers were provided three options and asked to mark all that apply to discover future project plans. Teachers were asked if they would: a) Share the information you learned about watershed projects with fellow educators, my students' parents, or other interested parties; b) lead a watershed-monitoring project with students; c) use StreamWebs.org to store student collected data. 100% of teachers indicated that they would do all of the options which suggests that teachers ultimately had positive experiences leading a watershed project.

In order to determine an increase in students' skills, understanding, and knowledge, the survey asked teachers to rate students' experiences and attitudes before and after StreamWebs projects by choosing from 'not at all', 'a little', 'somewhat', and 'a lot'. Ten out of eleven teachers' answers demonstrated a growth in students':

- Concerns and feelings of responsibility for the health of the local environment.
- Competence in analyzing scientific data.
- Interest in taking personal action to improve their environment.

The area of lowest growth that teachers indicated was in students' competence in critical thinking around STEM related questions. This seems to be related to most teachers not doing a student-centered investigation where students develop and investigate a question of interest and environmental concern. The curriculum that was created by the StreamWebs program provides teachers with guidance for doing such an investigation and we will continue providing training and encouragement for teachers to set up their projects in a way that helps students achieve growth in this area. We believe that with continued support, we will begin to see a change in student competency related to critical thinking around STEM related questions.

A total of 560 students engaged in a meaningful watershed experience with a teacher who was directly supported by the B-WET grant and a community partner and was using the StreamWebs platform. These students spent a total of 385 hours outside in the field, and 344 hours in the classroom learning about watersheds. Teachers spent 487 hours prepping and teaching about watersheds. Students and teachers were supported in their work by 67 parent or community volunteers.

## 2. StreamWebs Survey

In post workshop surveys of 46 3<sup>rd</sup>-12<sup>th</sup> grade teachers from multiple, geographically diverse Oregon schools we asked participants to use a scale from disagree to strongly agree to rate whether the resources

provided would help them in teaching about watersheds and the ocean, in leading student field experiences and in using student collected data. Table 1 represents teacher responses.

Table 1.

This workshop contributed positively to my confidence:	Agree-Strongly Agree
Teaching about the ocean and watersheds	82%
Teaching about the issues facing oceans and watersheds	89%
Leading students in the field to teach about oceans and watersheds	74%

Teachers were then asked to rate their likelihood of teaching about watersheds and the ocean, leading field experiences, and going on a field trip as a result of attending the workshop. Table 2 represents teacher responses.

Table 2.

This year I am likely to:	Agree- Strongly Agree
Teach about the ocean and watersheds	87%
Teach about the issues facing oceans and watersheds	89%
Use the resources presented in the workshop	96%
Take my students on a field trip focused on oceans and/or watersheds	59%
Collect and use ocean and/or watershed data	65%

Teachers noted the most effective aspects of the workshops as:

- The knowledge and hands-on experience that I can take back to my class
- Learning about a way to improve a lesson I already do
- Being at the coast, an educational environment that supports learning of the topic (ocean)
- Being outdoors and learning new things
- Learning on site about environmental issues that affect our coast
- Connections to NGSS (Next Generation Science Standards) with cross curriculum/topic studies

## Conclusions

The most useful results were gathered from the teachers who received specific project funding as part of the B-WET grant as they are the only teachers we know to have conducted watershed investigations with



students. Though many of the teachers who attended our workshops indicated that they had plans to lead field based projects with students, in most cases we cannot verify whether this occurred.

Overall the survey results from our BWET teachers indicated that the StreamWebs Student Stewardship Network met our objectives and increased students' and teachers' abilities to conduct field-based projects, including gathering, interpreting, and reporting on data. Educators and partners reported an increase in students' feelings of concern or responsibility toward the local environment, their desire to conduct STEM studies in the outdoors, and their overall interest in taking personal action to benefit their local environment. The area of lowest growth that teachers indicated was in students' competence in critical thinking around STEM related questions. Therefore, we recognize the need to increase StreamWebs' programming ability to build students' skill levels in critical thinking, and understanding around STEM related problems and experiences.

Teachers also reported overall success in preparing students before they went into the field, engaging students in hands-on learning, providing students with field experiences in their local watershed, and having students apply their new knowledge back in the classroom. Teachers indicated that in the upcoming school year they plan to incorporate StreamWebs into their curriculum, and were happy to learn about, and have access to the StreamWebs program, tools, and resources.

### **Recommendations**

To help address students lack of growth related to critical thinking around STEM related questions we recommend a greater focus during trainings on the importance of using a guiding question that students will work to answer over the course of their project and revisit before and after each experience. This includes fostering students' ability to scaffold upon what they learn in the field and classroom, in order to apply STEM based knowledge to real-life questions and issues. These are all critical elements to developing future scientists and STEM professionals. The [StreamWebs Field and Classroom Watershed Investigation Curriculum](#) provides teachers with guidance for developing an investigative question with students as well as and creating a cohesive project. Working with teachers to further develop and plan their projects post workshops may be necessary as well.