



# Finding Team Clean

## Partnering to Restore a Local Riparian Zone

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**S**eventh-grade students, standing in the riparian zone of Marshall creek, a small creek in a wetland area near their school, hover around a washtub. They want to see what came out of the water they just sampled by using a large D-net and gently skimming the surface of a new pond. The middle schoolers seem surprised at how much life is in a small sampling of the water. “Look at all that!” and “What *is* that?” are just a few of their comments. Then the students start using

an identification key to try and identify benthic macroinvertebrates—“Look, a caddisfly,” to which another student yells, “TEAM CLEAN!” This is just an example of one day in an Outdoor Environmental Education Partnership program developed by a university, a local area middle school, The Lands Council (a local conservation organization), and the U.S. Fish and Wildlife Service’s Partners for Fish & Wildlife program—a partnership with major benefits to all partners.

Outdoor environmental education is nothing new. It is difficult, however, to develop and sustain meaningful programs. Washington State's standards mandate environmental and sustainability education (see Resources) in which "students engage in inquiry and systems thinking and use information gained through learning experiences *in, about and for the environment*" (p. 6; italics added).

Research has supported the inclusion of outdoor environmental education in school programs. Theimer and Ernst (2012) studied several U.S. Fish and Wildlife Service education programs and concluded that environmental education can positively impact students' feelings of connectedness to nature. King and Ginns (2015) studied middle school students in Australia and found that weekly visits to a nearby creek supported by classroom lessons led to meaningful learning about science and enjoyment of science compared with other science units. James and Williams (2017) conducted a study of 56 seventh- and eighth-graders in Wyoming who enjoyed a two-day, one-night experiential outdoor event. The authors noted that students who were often disengaged with traditional classroom learning became "motivated and immersed" during their outdoor learning experience (p. 67).

## Project goals

The goals of this project are three-fold. First, all partners wanted to engage young people with their local environment to begin to inculcate values of environmental stewardship. Second, the university wanted to create opportunities for preservice teach-

ers to experience hands-on outdoor environmental education in hopes that one day, when they are in their own classrooms, they will endeavor to engage their students in outdoor environmental education. Third, The Lands Council and the U.S. Fish and Wildlife Service wanted to actively incorporate volunteers, and specifically local students, in restoring riparian areas in the local watershed to improve habitat and water quality. The purpose of this article is to describe how we built a partnership to help meet the goals of all partners (see Figure 1). We hope that by sharing information about this partnership, we can motivate and guide others to do the same.

## Building the partnership

University professors from a teacher preparation program wanted to integrate environmental education and conservation stewardship into a senior year capstone project within the community. After speaking with a local area middle school's administration, we found they too wanted to provide their middle school students with an outdoor environmental education experience.

We knew that partnerships were essential to make the project successful, but the difficulty was finding partners outside the school willing to work with middle school students on a large scale. Through connections in the local education community, we found out about a local conservation organization, The Lands Council. This organization wanted to partner with schools in the watershed of a degraded stream system it was working to rehabilitate, and its people knew of private lands that needed

### CONTENT AREA

Earth Science and Life Science

### GRADE LEVEL

6-8

### BIG IDEA/UNIT

Ecology

### ESSENTIAL PRE-EXISTING KNOWLEDGE

None

### TIME REQUIRED

One 45-minute class period

Two full school days in the field

One 2-hour evening

Plus supplemental preparation and follow-up activities at the middle school.

### COST

Varies. In this case, there was no cost to the school as the partners paid for all equipment and bus transportation.

### SAFETY

Students should receive safety instructions on how to safely work with shovels.

to be restored, landowners interested in the project, and our final partner—the U.S. Fish and Wildlife Service’s Partners for Fish & Wildlife program. Once we all found each other, our partnership was forged and has flourished.

## Planning for the year

While the U.S. Fish and Wildlife Service worked to prepare our site, the university professors, the school’s assistant principal and select teachers, along with The Lands Council’s conservation and education director met twice to discuss the goals of the partnership (see Figure 1). By aligning project goals with the *Next Generation Science Standards* (NGSS Lead States 2013), together we outlined an ecology unit for the year. The second meeting outlined a timeline and lessons to achieve the desired outcomes (see Figure 2). In addition, the school’s teachers developed supporting lessons in science. The language arts teachers, social studies teachers, and art teacher also reported “weaving in” the ecology unit to their subjects to stress the interdisciplinary nature of environmental education.

## The project

The yearlong project consists of four distinct parts: watershed and pollution education, wetlands restoration, water-quality analysis, and a community ecology night. The watershed and pollution education portion takes place at the middle school. The university preservice teachers provided four tabletop watershed models to discuss the effects of point and nonpoint sources of pollution. Using four models allowed the teachers to break students into groups of about eight, which allowed for engagement in the model for all students. Without access to multiple models, one could use a station approach to keep the numbers interactive.

The watershed restoration portion takes place in the field on private lands and involves planting trees and shrubs in the fall. It is led by The Lands Council and the Partners for Fish & Wildlife program biologist with active support from the university preservice teachers. The water analysis portion finds students returning to the field site in the spring to conduct a variety of tests on the water. One activity (see Resources for Pollution Tolerance Index [PTI] data sheet handout) asks students

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Partners for Fish and Wildlife biologist, Brian Walker, shares macroinvertebrates with curious student [photo by Bridget Mayfield, Pescado Lago Studios].

**FIGURE 1:** Partnership goals

Partner	Goals	How met
Middle school	<ul style="list-style-type: none"> <li>• Provide cross-curricular outdoor education experience for seventh graders studying life science, Washington geography and history, math, language arts, and visual arts</li> <li>• Increase students’ awareness, knowledge, and appreciation of their local environment</li> <li>• Meet Washington state science and environmental and sustainability education standards</li> </ul>	<ul style="list-style-type: none"> <li>• Fall trip to riparian area to plant trees</li> <li>• Spring trip to riparian area to test water</li> <li>• Assessments associated with trips</li> <li>• Spring Community Science Night with student projects</li> </ul>
University preservice program	<ul style="list-style-type: none"> <li>• Improve the environmental literacy of preservice teachers as a result of an outdoor education curriculum</li> <li>• Create and/or increase sense of environmental stewardship of preservice teachers as a result of an outdoor education curriculum</li> <li>• Provide practical experience for preservice teachers in experiential outdoor science education</li> <li>• Provide opportunities to practice classroom management, assessment and science methods with real students</li> <li>• Preservice teachers can take that experience into their careers and be advocates for outdoor education in their schools</li> </ul>	<ul style="list-style-type: none"> <li>• Capstone course featuring content, preparation, practice, and implementation of outdoor education curriculum</li> <li>• Capstone course introduces environmental stewardship and curriculum</li> <li>• Work with middle school students preparing for field trips and during field trips</li> <li>• Prepare and administer assessment for field trips</li> <li>• Manage their own small group of students throughout the day</li> </ul>
The Lands Council	<ul style="list-style-type: none"> <li>• Increase the capacity of environmental educators in the region</li> <li>• Restore and revitalize watersheds in the region</li> <li>• Engage with local schools providing opportunities for outdoor experiences</li> <li>• Expose students to the outdoors</li> <li>• Empower students with relevant knowledge and skills</li> <li>• Encourage students to apply their experiences to become responsible environmental stewards</li> </ul>	<ul style="list-style-type: none"> <li>• Work directly with preservice teachers, training them to teach the middle school students</li> <li>• Over 6,000 trees planted on three sites over three years</li> <li>• Work with students during field trips</li> <li>• Two full school days spent outdoors</li> <li>• Students learn essentials of environmental stewardship through classroom sessions, field trips, and Community Science Night</li> </ul>
Partners for Fish & Wildlife	<ul style="list-style-type: none"> <li>• Reestablish natural biological communities and ecological processes</li> <li>• Promote citizen- and community-based stewardship efforts for fish and wildlife conservation</li> <li>• Protect the integrity of and provide benefits to National Wildlife Refuges</li> </ul>	<ul style="list-style-type: none"> <li>• Over 6,000 trees planted on three sites over three years</li> <li>• Work with students during field trips</li> <li>• Create planting sites and protection for trees. Oversee student planting to ensure trees are properly planted</li> <li>• Riparian sites relieve pressure on adjacent wildlife refuge</li> </ul>

to identify Team Clean indicator species and determine the pollution tolerance index. Finally, under the guidance of middle school science teachers, the year wraps up with an ecology night at the middle school with students presenting ecology projects to their family and the community (see Figure 2 for more details about materials, assessments, etc.; see Online Supplemental Materials for the Ecology Night Rubric).

One concern the partners had was how to make a safe, educational, and fun experience for all students regardless of ability or prior interest. Some schools might make students earn the privilege of participating to keep the project size manageable, keep costs down, and minimize behavior concerns. One potential partner even turned us down because of the large number of students we wanted to involve. The leadership at the middle school, however, was insistent that as many students as possible be included. Each year for three years about 160 middle school students (~90–95%, including all but those who presented a safety concern or did not return parent permission forms) have participated in the project.

## Partnership—key to success

Building a partnership was the key to the project's success. With a large group like this, the partnership allowed everyone to share resources and expertise to help manage students and time, as well as equipment and costs. Including all students might not be possible if this rested on the middle school alone. Partner roles were discussed with all partners at one of the preproject meetings (see Figure 1).

The presence of the preservice teachers allowed us to improve classroom management and safety by utilizing small groups of students (8–10), where all students could be involved and constantly supervised (see NSTA Safety Advisory Board 2015). University preservice teachers applied classroom management, assessment, and science methods coursework on-site. Preservice teachers got to know the students in the classroom setting before taking them outside and set field-trip ground rules before getting off the bus. Preservice teachers could also quickly check for understanding (e.g., what are the three benefits of planting trees?), redirect off-task students, and/or use an inquiry-based approach in the field. In addition, the



Middle school student examines the water for aquatic life [photo by Bridget Mayfield, Pescado Lago Studios].

**FIGURE 2:** Partnership summary

Science lessons	Timeline	Partner	Materials/Financial responsibility	Key assessment
Introduction to Ecology — A single class period introduces the year-long ecology project through a brief PowerPoint presentation and media clips.	September	M	PowerPoint presentation	Ecology preassessment
Watersheds and Pollution* — A single class period examines point and nonpoint sources of pollution on a tabletop watershed model.	September	M, P	Tabletop watershed models, various model pollutants (i.e., food coloring, sprinkles, cocoa powder), spray bottles, sponges, media clips. All materials supplied by university.	Exit note
Stormwater Phenomenon/Water Filter — During 4–5 class periods, a water filter must be made out of easily obtained, recyclable, or free materials.	October	M	Materials are everyday items obtained by middle school students. Examples: sand, gravel, paper, cardboard, sponges, newspaper.	Water filter rubric
Wetland Restoration* — A full-day field trip to a local wetlands is spent identifying and planting native trees and shrubs.	October	M, P, C	All materials — native trees and shrubs, shovels, and gloves — and bus costs all provided by partners. Tree ID photos provided by university partner. Portable toilets provided by middle school.	Marshall Creek field day data sheet
Water Quality Analysis* — A full-day field trip returns to the local wetlands in the spring to perform physical and chemical water quality analysis.	April	M, P, C	Test kits (pH, dissolved oxygen, nitrates, phosphates), thermometers, turbidity tubes, wash tubs, D-nets, field microscopes, table, laminated keys for macroinvertebrate identification, and bus costs all provided by partners. Portable toilets provided by the middle school.	Pollution tolerance index (PTI) data sheet
Ecology Night* — A two-hour event hosted at middle school where middle school students present/defend their ecology to families and the community.	May	M, P, C	Tables provided by the middle school. Seventh-graders provide most materials including posters, media presentations, demonstrations, etc.	Ecology night rubric

\*Focus of this article; M = middle school teachers, P = university preservice teachers, C = community partners



school's side of the project. It would be very difficult to enter a project like this without support from the administration and buy-in from teachers.

In addition to the anecdotal comments about the middle school students' positive attitudes about being outdoors, the middle school teachers indicated a significant increase in content knowledge. On a pre/post style content test, middle school students demonstrated increased vocabulary and ability to answer both true/false and short-answer questions about ecology. For example, while the average pre-test score for the question "Describe the 3 functions of a riparian buffer in a river/stream" was only 12%, posttest averages increased to 78%.

### Community partners

The partnership formed to run and sustain this project has been a "win" for all parties. The conservation organizations are ecstatic about the impact on the middle school students. The long-term outcome is that these students will become conscientious environmental stewards. Each time the partners see each other for another learning event is a time for heartfelt affirmation and encouragement. Finding willing and enthusiastic partners makes the work of all partners easier. We suggest looking for partners who have many of the same goals. One of our partners, the U.S. Fish and Wildlife Service, is a good starting point for a partnership because it offers the Partners for Fish & Wildlife program in every state. Many of those programs have requirements to work annually with school groups on various projects under the Connecting Youth with Nature initiative, Schoolyard Habitats, and Outdoor Classroom programs.

In addition, in most large cities there is usually some type of local environmental organization. Even some of the smaller cities have members from larger groups (Sierra Club, Trout Unlimited, Ducks Unlimited), and those members can usually get teachers or other educators into contact with the main group. Other sources of expertise are conservation districts and local land trusts. Asking around at an Earth Day event or community cleanup can really open doors, as almost all groups are looking for volunteers for some kind of project. When those volunteer activi-

ties line up with what the school is doing, or can be modified to encompass what the school is doing, then all kinds of options open up.

### The university

Preservice teachers are instrumental not only in guiding their groups, but also in taking responsibility for the initial training of students and creation of activities and assessments in the field. For this project, preservice teachers gained experience in working outdoors, and many commented that they were inspired to do some kind of outdoor environmental lesson once they had their own classroom. Many preservice teachers also commented on how they didn't realize that students would be so enthusiastic about being outdoors and the impact on content knowledge. If there is no college or university nearby, parents or volunteers from local conservation organizations can be solicited and trained to help.

### Costs of the project

Without the partnership, the costs would be prohibitive for the middle school. For example, on one site we planted 4,500 trees. The Partners for Fish & Wildlife program biologist estimates that if the trees/shrubs had been purchased by the school, it would have cost roughly \$45,000, just for plants. This amount does not include fencing for the site or site preparation time of the partners. That is where the partnership is crucial. The partners were able to buy things like soil, pots, and fencing in bulk, and plants as bare root seedlings. We were fortunate that our partners provided most materials (trees and shrubs, shovels, gloves, water sampling kits, nets, invertebrate identification cards, magnifying glasses, and site preparation materials). The university preservice teachers provided four tabletop watershed models (~\$600/each). The Lands Council secured and paid for the two school busses for two days in fall and spring (~\$700/fall and ~\$700/spring) using an EPA grant. This made the cost to the middle school almost zero. Another savings in the partnership is time. If The Lands Council or Partners in Fish & Wildlife program had been tasked with planting



4,500 trees alone, the planting portion of the project would have been scaled back or contracted out at considerable expense. Working with the partners, the overall cost of the planting project was reduced, and in some cases planting areas expanded because of the number and enthusiasm of student volunteers.

## Challenges of the project

In three years, we have been on three different properties. Our conservation partners recently found a property to work on next year. The presence of grant money, however, is probably essential to sustaining the project to provide materials and transportation to the site. Another challenge is providing the preservice teachers, who are drawn from elementary education majors. Many of these teachers lack outdoor experience themselves or are used to working only with younger students. The weather is also a challenge at times. Our first year, a forecasted windstorm delayed our initial outing and necessitated taking all 150 students on the same day. This year, steady rain and cold weather shortened one water sampling outing. The keys to handling unforeseen circumstances are flexibility, communication, and resilience. The logistics of monitoring so many students is another challenge. The preservice teachers proved valuable in this regard, keeping close tabs on their groups and applying their knowledge of classroom management, assessment, and science methods in the field. It is essential that the activities are engaging. The time allotted to each activity is important as well. The middle school teachers served as valuable resources as far as understanding how long each activity would engage the students' interest. Over the years we have modified our outings in response to the experiences in prior years.

All groups involved—the middle school, the university, and the local conservation groups—echo the fact that forming the partnership helped to overcome the challenges associated with this type of project.

The conservation groups gained volunteers to restore the wetland. In all, the middle school students have planted about 6,000 trees. The preservice teachers gained experience in an outdoor classroom. Most important, the middle school students gained an understanding and appreciation of local ecology. This partnership is a great way to begin building the next generation of Team Clean stewards of the land. ●

Note: The findings and conclusions in this article are those of the author(s) and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

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## RESOURCES

- Pollution Tolerance Index [PTI] data sheet—<https://www.cdm.org/biosite/assets/pollution-tolerance-index-data-sheet.pdf>
- U.S. Fish and Wildlife Service Partners for Fish & Wildlife Program—<https://www.fws.gov/partners/>
- Washington’s K–12 Integrated Environmental and Sustainability Education Learning Standards—<http://www.k12.wa.us/EnvironmentSustainability/Standards/default.aspx>

## ONLINE SUPPLEMENTAL MATERIALS

Ecology night rubric—[www.nsta.org/scope2004](http://www.nsta.org/scope2004)

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