



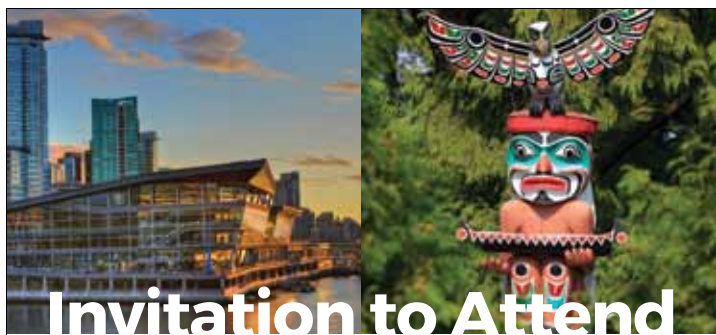
CLEARING

Resources for community-based environmental literacy education

Bringing Nature Back to the Schoolyard
Toolkit for a Farm Field Trip
Eelgrass as Teacher
Developing Community Partnerships
Students for Salmon

Plus... simple environmental education activity ideas by grade and subject area

Spring 2017



CULTUREENVIRONMENT
WEAVING NEW CONNECTIONS

9 TH WORLD ENVIRONMENTAL EDUCATION CONGRESS
SEPTEMBER 9-15, 2017 | VANCOUVER, BC, CANADA

Early Bird Registration Deadline May 31, 2017

Plenary Speakers



David Suzuki
David Suzuki
Foundation, Canada



Wade Davis
University of British
Columbia, Canada



Elizabeth May
Green Party
of Canada, Canada



Guujaaw
Council of the Haida
Nation, Canada

Connect with WEEC2017 www.weec2017.org #weec2017



Sign up for the monthly E-newsletter from CLEARING.
Stay in touch with the latest stories, resources, and
ideas in environmental education!

**EMPOWERING EDUCATORS
TO TEACH REAL-WORLD SCIENCE
OUTDOORS SINCE 2003**



PEI PACIFIC
EDUCATION
INSTITUTE

Join the FieldSTEM Movement at

WWW.PACIFICEDUCATIONINSTITUTE.ORG

360.705.9294

**THE COURSE TO A
SUSTAINABLE FUTURE
BEGINS NOW.**



IslandWood prepares educators to address 21st century
challenges by using the environment as a context for teaching
and learning. Our classrooms are the urban and natural
ecosystems that make up the fabric of our communities.

Discover which path is right for you.

Your masters degree in education awaits.

**SCHOLARSHIPS UP TO \$12,000
AVAILABLE**

LEARN MORE BELOW or
EMAIL gradinfo@islandwood.org TODAY!

Education for Environment and Community

In Partnership with the University of Washington

IslandWood's residency grads explore best practices in
teaching and learning, from forest lab to school gardens.

Urban Environmental Education Graduate Program

In Partnership with Antioch University Seattle

IslandWood's urban grads gain real-world experience working
in schools, community organizations, and government
agencies to learn about how and why urban ecosystems work
the way they do.

Both programs prepare educators to address 21st century
challenges by using the environment as a context for teaching
and learning as they work with a diverse population of children
and young adults. Our classrooms are the urban and natural
ecosystems that make up the fabric of our communities.

To learn more about the IslandWood story or about applying to
one of our programs, please visit our website:

islandwood.org/graduate-programs

To inquire, please email: gradinfo@islandwood.org

ISLANDWOOD

4450 Blakely Ave NE | Bainbridge Island, WA 98110 | T: 205.855.4300

In this issue...

EE News and Events.....	4
Bringing Nature Back to the Schoolyard	8
<i>by Jane Tesner Kleiner</i>	
The Students for Salmon Program	12
<i>by Joan Hong</i>	
Farm Field Trip Toolkit for Teachers	15
<i>by Megan Kemple</i>	
Mt. Baker Snow School: Bringing Students into the Mountains	19
<i>by Abby Sussman</i>	
Eelgrass as Teacher: Integrating Tradition, Science and Learning on the British Columbia Coast	20
<i>by Nikki Wright</i>	
Environmental Education Activities for Monday Morning	28
Share Your Standards to Integrate Your Teaching	29
<i>by Jim Martin, CLEARING Special Contributor</i>	
Environmental Education for Students in Detention	31
<i>by Sadie Gilliom, Sustainability in Prisons Project</i>	
SWEet! Using Cascade Snowpack to Measure Climate Change	32
<i>by Joe Cameron, Beaverton High School</i>	
What Have Students Learned That Is Not On the Test	34
<i>by Janell Simpson and Susan Meyers</i>	
Starting a Community-based Natural Resources Education Program	37
<i>by Pat Willis and Susan Cross</i>	
Sustainability and Justice	40
<i>by Jonathan Bolden, Sustainability in Prisons Project</i>	
EE Resources and Reviews	42

Cascadia Bioregion

From the Editor

The growth and development of CLEARING continues, and this issue makes it clear that the magazine plays a vital role in supporting environmental education in the Cascadia bioregion.

In these difficult times the EE community needs a core—a place of strength and grounding—where our sense of community is affirmed and we draw sustenance from one another. We know that developing environmental literacy, and working to develop engaged and responsible youth, is some of the most important work that we can do.

Where else will you find a publication that ties the entire region together, sharing stories, ideas, inspiration, and tools for creating a more just and sustainable world.

I hope that all of you reading this issue will recognize the importance of supporting and participating in the growth of this publication. The fact of the matter is that the magazine is only as strong as the people who support it.

Some of that support can be seen in this issue, as several university graduate programs around Casadia are actively participating in CLEARING by sharing stories and being part of the distribution network.

Be sure to check out the CLEARING monthly e-newsletter, and share a copy of this print edition with a friend or colleague. There is strength in numbers!
Enjoy the spring!

Larry Beutler

CLEARING

Environmental literacy education in the
Pacific Northwest and Cascadia bioregion

Published by
Creative Educational Networks
PO Box 82954
Portland OR 97282

Clearing Board of Directors

Jessmine Anderson, *Center for Earth Leadership*
Don Atwell, *Pamplin Media Group*
Jan Curry, *EE Catalysts*
Tim DeLano, *Forest and Water Educator*
Joe Tursi, *Ecoliteracy Collaborative*
Anna Wilde, *Honoring Our Rivers*

2017 Regional Advisory Council

Arya Behbehani—Portland General Electric
Laurel Bates—Oregon Green Schools OR
Rose High Bear—Wisdom of the Elders OR
Jonas Cox—Gonzaga University WA
Denise Dumouchel—IslandWood WA
Karla Eitel—University of Idaho, MOSS Outdoor
Science School ID
Sally Hanft—US EPA Region X
Linda Hilligoss—Southern Oregon University OR
Rick Kool—Royal Roads University BC
Jim Martin—Retired science educator
Mike Marxen—US Fish and Wildlife Service PNW
Karen Matsumoto—Suquamish Tribal School WA
Leigh Michael—Washington Green Schools WA
David Zandvliet—Simon Fraser University BC

Clearing Production Staff

Editor/Publisher/Layout and Design:
Larry Beutler

E-Mail: editor@clearingmagazine.org

Printed by



The cover photo was provided by the Oregon
Farm to School and School Garden Network.
See page 15.

Deadline for article
submissions for Fall 2017
edition:
August 15, 2017

2017-2018 editorial calendar

JUNE

Green Schools

JULY

STEM Best Practices

AUGUST

Energy Education

SEPTEMBER

Marine/Aquatic Education

OCTOBER

Place-based Learning

NOVEMBER

Developing Your
Schoolyard

DECEMBER

Forest Education

JANUARY

Urban EE and
Environmental Justice

FEBRUARY

Outdoor Education

MARCH

Food and School
Gardening

APRIL

Art and the Environment

CLEARING

Note: CLEARING encourages and accepts articles across the environmental education spectrum throughout the year. We have created this calendar to help organize contributions into specific themes. Theme articles will be featured on the website and selected articles will appear in the twice-yearly print editions.

How to submit:

Email articles and story ideas to
editor@clearingmagazine.org
Deadline: the 10th of the month.

EE News and Events

*Some of what's happening in environmental education
in and around the Pacific Northwest*



E3 Washington Board of Directors: In front (left to right): Ron Harris-White, Lisa Eschenbach, Kaddee Lawrence, Tom Hulst. Standing: Derek Hoshiko, Jenny Rieke, Roberta McFarland, Gilda Wheeler, Paul Sullivan, Belinda Chin, Stephen Streufert, Courtney Sullivan, Susan Carlson, Claudia Ludwig.



Summary Report of E3 Washington Activities in 2016

E3 Washington has been the cornerstone organization supporting environmental and sustainability education throughout Washington State for the past 26 years.

E3 has hosted collaborative conferences and meetings, penned the State's Environmental Literacy Plan (along with OSPI) and helped develop an Environmental and Sustainability Education teaching endorsement. In the past year E3 Washington:

- continued to operate the Educator to Educator (E2E) grant program in four states including Washington State (thanks to a grant from EPA);
- redesigned our website (<http://www.e3washington.org/>);
- joined many other nonprofit agencies in a ten year watershed initiative in the Puyallup Watershed supported by The Russell Family Foundation;
- undertook a study of curriculum and facilities practices on twenty-three

university campuses in conjunction with Curriculum for the Bioregion (The Evergreen State College);

- partnered with tribes to support increased use of the state's sovereignty curriculum; and
- co-sponsored an action summit on Bainbridge Island in a two-day retreat.

We have been working with the Governor's policy staff to support outdoor recreation for students, provide curriculum and professional development on climate change and ocean acidification, advance Eco-STEM opportunities for middle-school students, and recruit minority candidates to fill positions on state boards and commissions.



NAAEE 2107

The North American Association for Environmental Education (NAAEE) 2017 Conference will take place October 17-21 in San Juan, Puerto Rico. Participants will reflect on the state of EE and progress made since the first International EE conference in Tbilisi in 1977.

<http://www.naaee.org>

Wild Voices for Kids



The Columbia River Basin Environmental Education Network (CBEEN)'s Wild Voices for Kids program offers opportunities for students to learn about their incredible local environment. Wild Voices has been providing environmental education presentations and field trips since 2008. Programs now available in school districts 5, 6, 8, 10, 19 and 20.

Wild Voices for Kids now offers over 100 curriculum-linked presentations delivered by over 50 local experts. These Community Educators (CEs) have a deep understanding of their subject area. Whether they are geologists, foresters, wildlife biologists or organic farmers, these programs are built and delivered by CEs, and tailored to the communities they live in.



Women tend one of the gardens at Washington Corrections Center for Women. Photo by Ricky Osborne.

Sustainability in Prisons

The Sustainability in Prisons Project (SPP) is a partnership founded by The Evergreen State College and Washington State Department of Corrections with a mission to bring science, environmental education, and nature into prisons. SPP conducts ecological research to conserve biodiversity by forging collaborations with scientists, inmates, prison staff, students, and community partners.

Current projects, which include graduate students and community partners, include beekeeping, wetlands ecology, prairie restoration, and Taylor's checkerspot butterfly rearing.

Equally important, SPP helps reduce the environmental, economic, and human costs of prisons by inspiring and informing sustainable practices.

See related articles on pages 31 and 40.

Outdoor School for All



Although Oregon voters passed Measure 99 in 2016 to fund outdoor school for all 5-6th grade students in the state, the battle is not over. Outdoor school proponents now need to fight to assure that funding for the program will remain in the Oregon legislative budget. Supporters of Outdoor School for All are working to communicate with legislators to support the program in their budget.

Note: Oregon's Governor has allocated \$44 million in her proposed budget to fund Outdoor School!

World Environmental Education Congress in Vancouver BC

The World Environmental Education Congress (WEEC) is an international congress addressing education for environment and sustainable development. WEEC 2017 is the 9th congress and will take place September 9-15, 2017 in Vancouver, BC.

The congress is an international meeting point for everyone working with education for environment and sustainable development or which have an interest in the field. WEEC 2017 is an opportunity to learn more about the latest in environmental and sustainability education, to discuss with people from all over the world, to share your own work and to learn from others.

See the advertisement on page 2 of this issue for more information.



2017 SEE Change Environmental Learning Conference

Wolfville, Nova Scotia
May 18-21, 2017

The 25th anniversary conference of the Canadian Network for Environmental Education and Communication (EECOM) will explore and share how innovative learning inspires a deeper connection to nature and more sustainable lifestyles and communities while supporting a life-giving planet.

For more information, visit the website at www.eecom.org/2017-conference.

Puget Sound Renewable Educator Leadership Institute

The Puget Sound Renewable Leadership Institute, sponsored by Boeing and the Bonneville Environmental Foundation, is a 5-day teacher training program focused on renewable energy and electrical systems. This intensive training program frames renewable energy as one element in the increasingly complex system that will be tomorrow's power grid. Teachers will practice Next Generation Science Standards (NGSS) skills through a blend of hands-on activity participation and activity design.

Participating districts will receive \$3,500 in energy education science materials.

The workshop will be held July 24-28 at UW Bothell, and is open to educators in Pierce, Snohomish, and King Counties.



Idaho Master Water Stewards

The IDAH₂O Master Water Stewards program has used an EPA EE Grant to develop a network of 150 trained and certified volunteers who conduct assessments of local water bodies and collect valuable water monitoring data. The program partnered with the Coeur d'Alene Tribal Departments of Education, Natural Resources, and Lake Management to teach volunteers about the best science available for the study of water. The IDAH₂O Master program also created educational, how-to seminars to promote lifelong learning and outreach to schools. This added teachers and students to the network of multi-generational citizen scientists working together on the project.

Sustainability Conference

The Association for the Advancement of Sustainability in Higher Education (AASHE) will hold its annual Conference and Expo October 15-18 in San Antonio. The window for Early Bird Registration is May 8-31, 2017.





SwimTayka

SwimTayka is a global organization with the mission to deliver free swim lessons and environmental education in clean water stewardship to underserved children who live along oceans, rivers and lakes.

We recruit qualified volunteers in swimming instruction and environmental education from around the world. Volunteer programs run from two weeks to two months and include instruction in basic water safety, swimming, first aid, and environmental education.

Last month we completed a successful pilot project in Huanchaco, Peru with an NGO Otra Cosa Network and now we are designing our next projects in Cabarete, Dominican Republic with DREAM Project, and the Columbia River Gorge of Oregon. We will return to Peru again in 2018.

SwimTayka is looking for qualified volunteers who have foreign language skills, inter-cultural awareness, background in environmental education and water stewardship, certification in lifeguarding and/or swim instruction, and love to travel. We are also looking for people or organizations who could sponsor a volunteer. And we are looking for organizations to partner with us, by collaborating on a project or sharing a joint grant opportunity.

For more information, contact Dena Marshall, co-founder of SwimTayka, at dena@swimtayka.org or (971) 678-7043. Or visit the website at swimtayka.org.

EE Week

National Environmental Education Week (EE Week), April 23-29, 2017, is a celebration of environmental education, aimed at inspiring environmental learning and stewardship among K-12 students. Register your events, check out the blogs and news feeds, view archived webinars, and more.

<https://www.neefusa.org/greening-stem/environmental-education-week>



Northern Heights Elementary student Archer Burns, 8, leads Washington Gov. Jay Inslee on a walk in the woods near the school in Bellingham. Inslee was at the school to announce grants for a "No Child Left Inside" program to promote outdoor education. Wild Whatcom received \$20,000 to teach outdoor education for second graders in the Bellingham School District during the next school year.

Photo by Philip A. Dwyer of Bellingham Herald.



Sustainable Forestry High School Summer Tour

The Oregon Forest Resources Institute is offering a tour for high school instructors that provides a hands-on professional development opportunity to learn about the social, economic and ecological aspects of sustainable forestry in the field. The format of the June 19-21 event will be a 2.5-day tour of the forests and mills in Tillamook County. OFRI will partner with Tillamook Bay Community College, the Oregon Department of Forestry, Stimson Lumber, Hampton Lumber, Tillamook High School and other organizations. Connections will be made between the information teachers receive on the tour and application to the classroom using the OFRI forestry curriculum and related resources. For more information, contact Julie Woodward, 503-807-1614.

Registration is available at: <http://ofriteachertour.eventbrite.com>

Changes in Watershed Education Grant Program



Since 2012, the Oregon Watershed Enhancement Board (OWEB) has provided over 100 Outreach grants for Oregon watershed councils and other organizations that engage adults and students in classroom learning and field tours, restoration projects such as native riparian planting and invasive species removal, and monitoring watershed health.

While the passage of Measure 76 (a state measure passed by voters in 2010) provided a source of on-going funding for watershed restoration, it also restricts OWEB's Outreach grants to specifically target landowners and stakeholders who are directly related to projects that are eligible for restoration funding. This means that for the next round of funding, grantees will need to demonstrate how their outreach activities are necessary for accomplishing specific restoration projects; **general watershed education in schools and in communities won't be eligible.** Programs for classroom instruction, field tours, and public events will need to find other ways to be funded or approached in the future.

Because this will affect a significant number of existing grantees, the Network of Oregon Watershed Councils is exploring alternative ways that watershed councils and their partner organizations can accomplish their watershed education goals (thanks to a grant from OWEB). The Network will be convening grantees later this spring to exchange ideas and share what new opportunities have arisen.

Shawn Morford

Executive Director
Network of Oregon Watershed Councils & Oregon Conservation Partnership
1130 Liberty St. SE, Suite 3
Salem, Oregon 97302
971-701-6699



C&NN INTERNATIONAL CONFERENCE & SUMMIT
APRIL 18-21, 2017
VANCOUVER - BRITISH COLUMBIA - CANADA

co-hosted by: children & nature INTERNATIONAL NETWORK OF OREGON WATERSHED COUNCILS FÉDÉRATION CANADIENNE DE LA NATURE



Oxbow Farm and Conservation Center was awarded a 2016 EPA Environmental Education grant.

EPA Region 10 Environmental Education Grants in 2016

The U.S. Environmental Protection Agency has awarded environmental education grants to Oxbow Farm & Conservation Center in Carnation, Washington, Green River College in Auburn, Washington, and the Corvallis Environmental Center in Corvallis, Oregon. The grant funds will be used to provide kindergarteners with hands-on learning about growing and eating healthy food, help train college students in watershed outreach and restoration, and support energy and water science curriculum for middle school students.

Oxbow Farm & Conservation Center was awarded an environmental education grant of \$90,474 to partner with a nearby school to provide 200 low-income minority kindergarteners with environmental science and outdoor learning experiences at Oxbow's Kids' Farm, in the classroom, and at school greenspaces installed with assistance from the project. Learning will focus on the connections between farming, conservation, and nature by teaching critical thinking through hands-on investigation outdoors. To amplify the project's impact, Oxbow will share best practices and a compendium of education materials with environmental educators and stakeholders with

help from University of Idaho McCall Outdoor School master's students. More information about Oxbow Farm & Conservation Center: <http://www.oxbow.org/>.

Green River College was awarded an environmental education grant of \$85,773 to train students to create and share environmental outreach materials about the Soos Creek watershed. Training will be conducted through partnerships with the Green River Coalition, Institute for Commu-

nity Leadership, City of Kent, and Earth Corps. Students will also help to prepare and implement restoration plans with 28 property owners in the Soos Creek watershed. Students will present project data and best practices at environmental education conferences. More information about Green River College: <http://www.greenriver.edu/academics/areas-of-study/details/natural-resources.htm>.

Corvallis Environmental Center was awarded an environmental education grant of \$91,000 to expand its Communities Take Charge online tool (<http://www.communitiestakecharge.org/>) for middle school students with the Carbon Transformations in Matter and Energy or CarbonTIME curriculum. Middle school educators in three



Green River College was awarded an EPA grant to create outreach materials about the Soos Creek watershed.

Oregon counties will be provided with strategies to teach "tracing matter and energy through human energy systems" to over 1,500 middle school students through in-class and online sessions, and service learning with student-led projects. This work builds on the center's previous successful EPA grant-funded project with an expanded curriculum and environmental priorities for energy and water. More information about the Corvallis Environmental Center: <http://www.corvallisenvironmentalcenter.org/>.

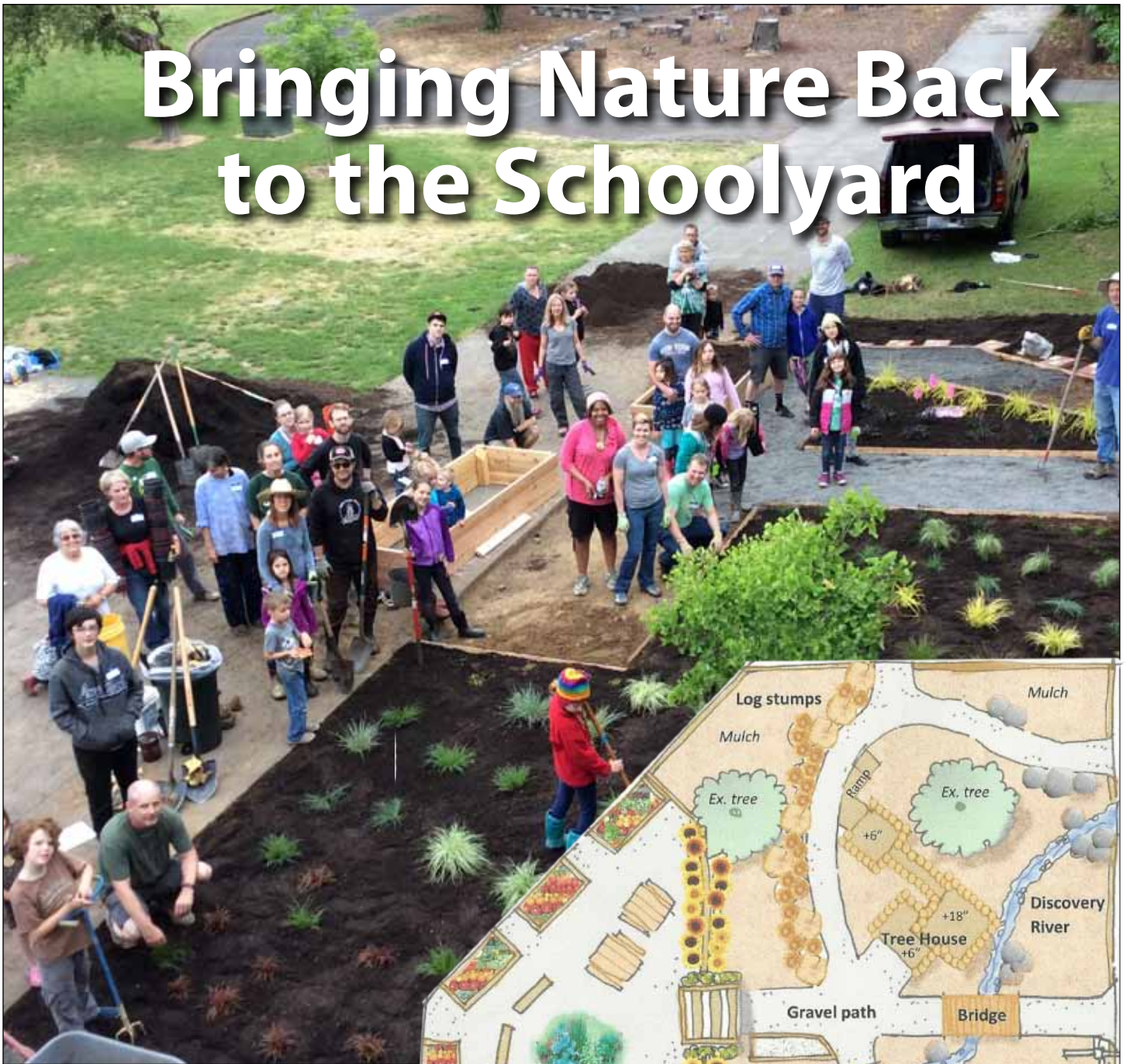
Since 1992, EPA has distributed between \$2 million and \$3.5 million in grant funding per year, for a total of over \$68 million supporting more than 3,600 grant projects. This highly competitive grants program supports environmental education projects that increase public awareness about environmental issues and provide participants with the skills to take responsible actions to protect the environment. The program provides financial support for projects that design, demonstrate or disseminate environmental education practices, methods or techniques.

More about EPA environmental grants: <http://www2.epa.gov/education/environmental-education-ee-grants>.



Photo from Corvallis Environmental Center, winner of a 2016 EPA Environmental Education grant.

Bringing Nature Back to the Schoolyard



*Transforming your
school grounds into
a green learning
environment*

by Jane Tesner Kleiner



Imagine walking out the back door of your school, surrounded by the songs of spring time birds, the soft scents of flowers in bloom, the wind billowing through nearby trees, and (if you are lucky) the croaking of Pacific tree frogs. Sounds great? But... it doesn't sound like your school? What if?

It may sound daunting, the idea of transforming your school grounds into a green, lush learning environment. However, there are great resources out there, to help put your school on-track to having learning and play environments that include lots of nature. It's not only the kids who love and benefit from being in natural spaces; so do the school staff and the neighboring community, too.

So many schools have little more than grassy fields, paved surfaces and fenced areas. They may have a few trees and landscape beds, and hopefully an awesome playground, but most are static and sterile environments. There can be benefits to these school grounds: they are relatively safe, and it's easy to monitor the kids during outside time. They are also seem easy to maintain (although mowing costs are a big pull on a maintenance budget). Yet, they don't provide opportunity for imagination, let alone the creative activity that sparks imagination.

Over the last 30 years, a growing body of research strongly asserts that children experience myriad benefits from daily access to nature. Richard Louv, of the Children and Nature Network, states in an online article that,

*"...including schoolyards with natural play spaces and gardens can help improve physical and mental health, cognitive skills, creativity, and social cohesion. New longitudinal studies also suggest that nature-rich schools can help raise standardized test scores. And children in low-income communities appear to benefit proportionally more from access to green space than those in higher-income communities."*¹

Research also suggests that providing close-to-home, regular, access to nature will help kids overcome fears of the unknown. Adventuring further, they build self-confidence and interest in the broader world.

In a normal M-F week, children spend 41% of their waking hours at school². With that in mind, school grounds are uniquely positioned to provide access to nature for kids. I certainly see benefits in the students that I work with, not to mention my own kids. I have seen students become self-assured, skilled and proud owners of their schools' outdoor spaces.

There is also the matter of agency, of capitalizing on kids' buy-in by involving them in the planning stages. Promoting student voice throughout the planning, design, fundraising, installation and maintenance of school greenspaces gives

them hands-on experiences that they may not get elsewhere. And the ownership? People don't destroy what they built themselves.

To begin, start by listening. Here are some things that I've heard, from schools I work with in the Vancouver area:

- When asked what changes kids would want to see to their school campus, they said two things: more fun play equipment and have the school grounds be their own backyard fieldtrip.
- When staff were asked where they want their school facility to be in 5 years, they want to be able to teach outdoors; this includes garden spaces and a diverse setting of natural elements.
- Teachers want to be able to teach using the whole school campus, making use of all features.
- The process for considering "how" to change the campus, let alone fundraise and maintain the new nature features is daunting.

Where do you start? Luckily, there are professionals who can help every school maximize the opportunity to add more nature to your campus.

It starts with lots of conversations, centered around a few key principles.

In essence, the design will:

- meet multiple goals, including direct ties to curriculum.
- allow for exploration, observation, discovery and fun.
- expand and broaden structured AND self-guided learning and play.
- foster a child's sense of wonder and curiosity.
- build upon what kids love to do: jump & hop; climb & balance; build & take apart; make art; allow for passive quiet time; use all senses. Create! Imagine! Explore!

Now that you're excited to get going and transform your school grounds, here is a short recipe for a successful campus plan:

- Culture. Form a team to build your natural schoolyard. The team will brainstorm, plan, design, build and maintain the spaces. Don't rely on one person, or else it won't be sustainable in years to come. Bring on partners and ask for help! PTO/A's, local businesses, community groups. Local businesses may be a source of funding, but business people have an inherent stake in the health of their nearby schools. Give them a chance to offer their ideas, skills and, yes, money.
- Individuality. Each school is unique. Build upon its existing features and add elements that easily complement the site. If you make it too complicated, it will be hard to maintain in years to come.
- Diversity. Each user group will have different goals for the enhancements, and sometimes they will conflict. By

¹ Louv, R., & Lamar, M. (2016, July 07). GROUNDS FOR CHANGE: Green Schoolyards for all Children. Retrieved March 25, 2017, from <http://www.childrenandnature.org/2016/07/07/grounds-for-change-green-schoolyards-for-all-children/>

² Given a full week of school and, we hope, 8 hours of sleep.

Bringing Nature Back to the Schoolyard

(continued)

discussing the goals and objectives first, with children's well-being the focus of the conversation, the best solution can be refined to meet everyone's needs. Provide something for everyone.

- Community. Every child, every family has something to gain. Tap into your school community. You have a ready-made pool of hundreds of concerned, hard working adults. Learn who has skills, talents, and materials to contribute to the project. This will help build ownership in the project over time.
- Inclusiveness. Make sure all the right people have had a chance to weigh in with their ideas and approvals: district staff (facilities, curriculum leads, risk, etc.), teachers, school staff, maintenance, grounds, and most importantly the students.
- Problem Based Learning. Engage the students in every step, and empower them to meaningfully contribute, create and build a successful set of spaces for the next generation of students. This is learning! Kids will learn important, lasting lessons at every step.
- Partnership. Find local and national organizations to support your project. Possibilities include:
 - certifying for wildlife habitat
 - becoming a Washington Green School
 - supporting the national pollinator project.

(Certification goals are great motivators, rallying stakeholders to, "keep on track and get the plaque!")

- Consultation. Work with a local professional (e.g. landscape architect, school garden coordinator, etc.) to facilitate the discussions. They can capture all of the ideas and put it into one overall master plan for the site and create a report that can be used for approvals, fundraising and keeping the project on track over the years.

In the end, here is the winning equation:

**program needs + site opportunities + available resources
+ curriculum goals = action plan**

What goes into the plan?

Now that you are really excited to get going, consider what type of features to add to your schoolyard.

The physical space.

- Wildlife habitat. Native trees, shrubs, and flowers to attract butterflies, birds and mammals (provide food / water / shelter / place to raise young).
- Outdoor classrooms. For classes and small groups to gather to work, listen and learn.

- Nature play. Use natural materials for kids to actively engage in unstructured and imagination play.
- Gardens. Working spaces to actively plan, plant, grow and manage plants such as vegetables, fruits and flowers.
- Messy areas. Creative spaces to make art, containing moveable elements to build and change.
- Quiet spaces. Beautiful, peaceful settings with small group seating, to listen, slow down, de-stress and regroup.
- Exploration spaces. Unique spaces that support a variety of curricula; might include elements for tactile learning, such as water tables, sand play, learning lab stations, and more.
- Experiment stations. Areas that support the testing of theories, experimentation and active learning. Could include built-in features such as solar equipment, rain harvesting station, or space to create.
- Green infrastructure. Your school district may want to upgrade features to meet sustainability goals, such as stormwater management, energy efficiency, reducing heat island effects, etc. Meet their needs while creating active learning spaces. Welcome these ideas, as they are often tied to grant money.

Using it

Creating the space is one thing, using it is another. Look for the tools that will help your school use the campus successfully:

- When talking to potential partners, emphasize the 4C's of 21st Century learning:
 - collaboration
 - creativity
 - communication
 - critical thinking
- Successfully redesigned schoolyards encourage all of them.
- Provide training to your staff. Help them find the resources and lessons that tie to their curriculum goals. Most school districts will have a specialist available to help.
- Identify agencies that offer programs for outdoor learning, and invite them (repeatedly) to your campus. Look for watershed and conservation groups, environmental education centers, local environmental professionals, and sportsmens organizations.
- Encourage your district to hire a garden or outdoor teacher or coordinator, to works with your teaching staff to coordinate the activities and lessons that are taught outdoors. The lessons can cover all curriculum areas, as well as activities to build social skills, independent learning and team building.
- Meet maintenance goals by creating jobs for students,

classes or small groups to accomplish throughout the year. Create a shared calendar to outline the needs and then divvy up the tasks. Don't leave it to one dedicated or passionate person....they will eventually have to move on.

- Make it the culture of the school to embrace, use, respect and care for your whole campus. The school community spends so much time together on campus, use the entire space to your advantage and care for it as a resource.
- Remember, your space will be used after school (programs and neighborhood use) and during the summer. Embrace the fact that a variety of users will use the space. Finding ways to welcome them will encourage others to care for it and keep an eye on things when school is not in session.

If you need ideas on how to use your campus for outdoor learning, there are lots of great guides and curriculum resources that provide engaging activities for all grade levels (early childhood, pre-K, K-12). A few examples include:

- The BioBlitz. No, this isn't a game or app (check out the National Parks website). In this activity, students look for all living species on your campus. Have them document what they find and identify the species (plants, insects, mammals, birds, etc.). You can make it as simple or complex as you need to, based on the age and curriculum. Include writing, art, science and math.
- Scavenger hunt. Have kids look for a different theme, such as all things that collect and move the rainwater (What happens to rain drops when they land on the various surfaces?); have the kids find different shapes in the natural elements on campus; etc.
- Nature journal. Document the changing seasons on your campus. What are the colors for each season? Temperature changes? Weather patterns? Different animals?
- Art projects. Have kids pick a couple natural elements and sketch them, using a variety of media. Compare and contrast what is different and same about each element.
- Plant flower bulbs. Seek donations for flower bulbs and have the kids plant them in a landscape bed. Learn about the different bulbs, the depths they need to be planted, what are the types and shapes of bulbs. Have the kids develop plant markers for each type. In the spring, monitor the progress of growth for each type, have them sketch the flowers, investigate the flower shape and talk about the parts of the plant, notice if pollinators visit the plants, create a cut flower vase and share with a classroom or community group that would benefit from fresh flowers (senior living facility).

As your school starts its journey toward a more natural schoolyard, know that these projects can take years. That's fine! The program will benefit from starting small and building upon small successes as the project grows and changes over time. Think of a protracted timeline as an opportunity to involve more kids and their families.

Lastly, stay true to your goal. Keep the vision in mind and you will be amazed at the sustaining support you will receive to

keep moving forward. Every step you take is for the health and well-being of the kids. You'll get there.

Here are just a few resources that you can check out online.

Children and Nature Network Green Schoolyards for Healthy Communities – Building a National Movement for Green Schoolyards in Every Community. http://www.childrenandnature.org/wp-content/uploads/2015/03/CNN_GSY_Report2016_Final.pdf

Green Schoolyards America. Sharon Danks. <http://www.greenschoolyards.org/home.html>

Boston Schoolyard Initiative. <http://www.schoolyards.org/projects/overview.html> Active since 1995. Schoolyard and outdoor design guides, as well as planning, maintenance and stewardship resources.

Evergreen Green School Grounds. <https://www.evergreen.ca/our-impact/children/greening-school-grounds/>

National Wildlife Federation. Schoolyard Habitat program. <http://www.nwf.org/Garden-For-Wildlife/Create/Schoolyards.aspx> Attract and support local wildlife.



Jane Tesner Kleiner is a registered landscape architect, ecologist and environmental educator with work in Michigan and Washington. She has spent the past 25 years working with schools, parks and ecological restoration organizations to create habitat, trails and play areas. She passionately advocates for outdoor spaces that inspire kids' curiosity. She wears a few hats in the Vancouver area, and continues encouraging kids of all ages to get outside and explore. Her goal is to make sure every kid has a stick to play with.

TEACHERS: Bring your students for quality education



Vancouver
WASHINGTON

Free
All grade levels
Call for details

9 a.m. to 5 p.m., Monday through Friday
Noon to 5 p.m., Saturday
4600 SE Columbia Way, Vancouver, WA.
www.cityofvancouver.us/watercenter
360-487-7111

Water
RESOURCES
EDUCATION
Center

The Students for Salmon Program – Hands on, Experiential Watershed Learning

By Joan Hong

"It's important to learn about salmon... There are lots of amazing things about salmon that many people don't know. Salmon are a very big part of culture and many people's lives." 4th grade Student, Harmony Elementary, Mt. Baker School District

Students for Salmon (SFS) is a watershed science and stewardship education program that annually engages over 1,500 fourth graders from nearly 80 classrooms across Whatcom County, WA. Implemented by the Nooksack Salmon Enhancement Association (NSEA), it provides students with hands-on classroom and field-based learning opportunities that focuses on fostering young environmental stewards by creating meaningful connections between students and the local streams in their community.

NSEA, one of the 14 Regional Fisheries Enhancement

Groups under the Washington Department of Fish and Wildlife (WDFD), is a community-based nonprofit organization that strives to recover salmon by engaging the local community in restoration, education and stewardship. Since 1999, NSEA has recognized the importance of early exposure to environmental education and has been a leader in providing place-based environmental science programs in Whatcom County schools.

Students for Salmon Program

SFS provides students with a window into the unique life cycle of Pacific salmon and how these species are connected to local watersheds. But while salmon are a major theme of the program, each lesson delves deeper into the issues around clean water, healthy forests, habitat degradation

and restoration. Students are encouraged to make their own observations, come to their own conclusions and take action, encouraging their growth as young scientists and watershed stewards.

"I promise I will help the salmon by not littering and I will encourage other people not to if I see them doing it"

SFS Program components are supported through a supplemental curriculum provided by NSEA (<http://www.n-sea.org/sfs-curriculum>). In 1999, the original SFS curriculum evolved from WA State's Clean Water, Streams and Fish curriculum, and British Columbia's Salmonids in the Classroom



curriculum, which were both developed over 10 years prior. In 2016, the SFS curriculum was updated in order to support the Next Generation Science Standards for the fourth grade. Every participating teacher has access to the SFS online curriculum, which includes five units, a glossary, further teacher resources, and a student science journal. NSEA continues to develop teacher training opportunities and in-service workshops focused on curriculum implementation and classroom adaptation. Teachers use the curriculum to compliment other water cycle, oceans, and climate change curriculums and additional area programs provided to fourth grade students.

For students, the SFS program begins with an NSEA-led, classroom presentation that introduces the salmon life cycle and habitat requirements, emphasizing human impacts on the health of watersheds that support salmon. Students use native salmon as a vehicle to explore themes such as watersheds, riparian zones and factors that contribute to habitat degradation. The goal of this presentation is to get children thinking about the connections between people, salmon and the environment. For example, people live in watersheds and salmon live in the streams within those watersheds; if the people pollute, it degrades the watershed and negatively affects salmon health. This initial presentation sets students up for success as they prepare for their fieldtrip with NSEA.

The Stream Exploration Fieldtrip takes students out of the classroom and introduces them to a nearby creek where they become “stream scientists,” using a field journal and moving through three stations to make observations about habitat quality. At the Water Quality Station, students get to work with chemical reactants to determine the dissolved oxygen content of their stream. Additionally, they measure turbidity and temperature in order to discover the relationship between the three factors they studied. From water quality, they head to the Macroinvertebrate Station where students collect and make observations of the macroinvertebrates from their stream. Based on the collective group of macroinvertebrates, students are able to make a conclusion about water quality using a pollutant tolerance index and compare their outcome with findings from the Water Quality Station. Finally, the



Students at Bernice Vossbeck Elementary strike their best mad scientist poses at the Water Quality Station.

fourth graders rotate to the Native Plant Station, where they learn to distinguish between native species and invasive vegetation. Each student “adopts” a native plant and teaches the larger group about the unique attributes and common uses for the plant. From wearing protective goggles at the Water Quality Station to carefully sketching macroinvertebrates, students are encouraged to see themselves as young scientists every step of the way.

During the final part of the field trip, the class conducts a restoration project, either removing invasive vegetation or planting native trees and shrubs along the creek. They use teamwork to improve salmon habitat and often find this to be the most rewarding part of the field trip. “I liked everything about the field trip, but cleaning up the park was my favorite. I promise I will help the salmon by not littering and I will encourage other people not to if I see them doing it” said SFS fourth grader, Bethany. This hands-on, boots-on-the-ground restoration component is where students get to make a real difference and turn their knowledge into action.

The final component of the SFS program is an in-class workshop that focuses on reinforcing long-term stewardship values. Students work in small groups and discuss positive and negative impacts humans have on their watershed. They then write a

“It’s important to learn about salmon... There are lots of amazing things about salmon that many people don’t know. Salmon are a very big part of culture and many people’s lives.”

(continued)



Students from Blaine Elementary show off their salmon badges.

Students for Salmon Program

(continued)

“Salmon Pledge” to commit to helping salmon and are often eager to share how they plan to protect streams and share their knowledge with family members.

Success of the program is evaluated with “Salmon Trivia” that is administered once before the introduction presentation and again after the post presentation. Trivia tests are scored and recorded, which enables NSEA to measure student comprehension of the topics discussed throughout the program. Additionally, teachers are provided with an evaluation survey to ensure that SFS is evolving to meet their needs.

Partnerships behind a successful program

SFS is made possible through NSEA’s diverse partnerships. While NSEA staff and AmeriCorps members coordinate implementation of the program, trained volunteer interns also play an essential role. Interns assist in facilitating the outdoor fieldtrip, leading education stations and supporting students in restoration work. From retired teachers to college students, interns showcase exceptional education leadership. Additionally, NSEA partners with local parks, landowners and municipalities to secure sites for field trips and restoration activities. SFS is possible because of internal and external partnerships that enable NSEA educators to create an engaging and realistic narrative about salmon and the world they live in. Furthermore, since 1999 NSEA has received funding from various grants and donors, allowing SFS to be offered at no cost to schools. Current financial support comes from Washington Department of Fish and Wildlife, BP Cherry



Retired teacher Joe Nolting teaches students about dissolved oxygen, temperature and turbidity at the Water Quality Station.

increased and NSEA has set a goal to have 100% of Whatcom County fourth grade classrooms participating in the program by 2020, as detailed in their strategic plan.

Stewarding for a better tomorrow

The Students for Salmon Program offers in-depth, scientific, hands-on experiential learning about watersheds and salmon habitat restoration. This strong program continues to provide a valuable opportunity for elementary students to gain awareness, build knowledge, and develop tools to take action on behalf of the environment. Five years from now, the students may not remember all of the details they learned about water quality or the salmon life cycle; what they will remember, however, is that their actions are important and they can make a difference.

Actions taken today that support a healthy and resilient environment will have profound effects on the world tomorrow. NSEA is dedicated to ensuring that future generations, who will deal with the issues left unsolved, are better prepared for the challenges that await them. This is why it is so critical to educate today’s students and why it is so imperative that they learn about the world they live in and the impacts of their actions.



Alderwood Students team up to restore salmon habitat.

Point, the National Oceanic and Atmospheric Administration, the Whatcom Community Foundation and the Lummi Indian Business Council.

Teachers and their commitment to SFS

Each year, returning fourth grade teachers help recruit new teachers to enroll in the SFS program. Participation has steadily

Joan Hong is the Nooksack Salmon Enhancement Association (NSEA) AmeriCorps Education Coordinator.

The curriculum and a video about the program can be accessed online here:

<http://www.n-sea.org/students-for-salmon>



Most of us can probably remember going on our first farm field trip in grade school. Maybe it was a visit to a pumpkin patch or a hay ride. Farm field trips are memorable experiences for kids! Farm field trips can be a great way to help kids understand where their food comes from, how it's grown and why a healthy local food system is important. They can also teach science and social studies concepts, addressing Next Generation Science Standards and Common Core.

In 2016 the Willamette Farm and Food Coalition developed a Farm Field Trip Toolkit for Teachers, a step-by-step guide for implementing successful farm field trips, with associated classroom lessons. Excerpts from that toolkit are included here. **The full toolkit is available at: www.lanefood.org.**

Farm field trips are most effective when they include the following components:

- **Helping task:** A chance for kids to actively help the farmer with some sort of seasonally appropriate farm task. Coordinate with the farmer in advance to find a task that will be helpful and that is age appropriate.
- **Harvest opportunities:** Many kids have only seen fruits and vegetables in the grocery store. It's valuable for them to harvest fruits or vegetables directly from the plants they grow on.
- **Tasting opportunities:** Tasting the produce that was harvested from the farm can take place during the farm tour, during the harvest opportunity, or back in the classroom after the farm visit.



This toolkit was created by Willamette Farm and Food Coalition with funding from the Gray Family Foundation and made available here with support from the Oregon Farm to School and School Garden Network. For more information or support contact Megan Kemple, Director, Oregon Farm to School and School Garden Network at 541-344-4329/megan@oregonfarmtoschool.org

Farm Fieldtrip Toolkit for Teachers

Important Steps

1. Secure funding (*if needed, 3-6 months before the trip*)

- You may need to fundraise to cover some of the costs for the field trip, such as bus transportation for students, field trip supplies, or compensating the farm for hosting students.
- There are a number of small grants available to teachers for field trips. Try Target Field Trip Grants.
- Apply in time to receive funding before your field trip, if possible.

2. Coordinate with the farm (*2-4 months before the trip*)

- Find a host farm. Let the farmer know what kind of activities you are hoping for (see above) and how much time you'd like to spend at the farm.
- Every farm and farmer is unique. It is best to begin communicating with the farmer early about possible dates for field trips. The best dates for field trips in Western Oregon are from September to early November and then again from late April to June. Plan on contacting farms at least 2 months prior to your preferred field trip date. Find a time when the farmer will have a variety of crops available for students to see, harvest and taste.
- Arrange with the farmer for any financial compensation for the trip. Some farmers may offer to host your class for free, but many will charge \$2-\$5/child, or you may want to offer that.

3. Coordinate lunches and buses (*1-2 months before the trip*)

Once the date and times for the field trip are set, order buses and sack lunches (if necessary) and send a note home to parents about the upcoming trip.

4. Recruit volunteers (*2-3 weeks before the trip*)

If you'd like extra support on the trip, request volunteers from your school community or elsewhere and request RSVPs for the trip. Provide a clear explanation of volunteer roles and expectations. As individuals sign up to volunteer, provide them with the volunteer background check form and a due date for returning the form (giving yourself time to submit forms to the district in advance).

5. Plan and deliver in-class lesson (*1-2 weeks before the trip*)

The field trip is a much richer experience when tied to the classroom curriculum. Put the field trip into context by spending some time before the trip talking about where food comes from and what your kids already know about farms. Use Willamette Farm and Food Coalition's Lesson on Where Food Comes From (included in the full Toolkit) or design your own.

6. Create a schedule for the day with activities (*1 week before the trip*)

There is an example schedule in the full Toolkit, that we've found to work well.

7. Confirm with the farmer and finalize plans (*1 week before the trip*)

When planning a trip to a farm, it's important to have clear communication with the farmer. Touch base with the farmer to be sure they remember you are coming and to determine or review the helping task, harvest opportunity, tasting opportunity and the overall schedule for the day.

8. Confirm with volunteers (*1 week before the trip*)

Send an email reminder to volunteers and include volunteer roles, expectations, and the schedule of the day's events. Be sure all volunteers have completed their volunteer background check forms and are cleared to volunteer.

9. Field trip prep (*1-2 days before the trip*)

Remind students to dress appropriately, confirm buses are reserved and sack lunches will be ready. Divide the class into groups (if needed) for field trip activities and check to be sure you have everything you'll need for the trip. You can use the Field Trip Prep Checklist (included in the full Toolkit) to keep all this information organized.

10. Field trip (*day of the trip*)

Remember to take lots of pictures, paying attention to photo restrictions provided by the school. Record good quotes, be safe and have lots of fun. Use the Field Trip Info Sheet (included in the full Toolkit) to keep track of this busy day.

11. Follow-up (*1-3 weeks after the trip*)

Send any Thank You notes (consider saving copies of good ones) and payment to the farmer. You may want to dive a little deeper by providing Willamette Farm and Food Coalition's Food System Lesson (included in the full Toolkit).

12. Reporting & evaluation (*1-3 months after the trip*)

If you received special funding to cover the cost of the trip, your funder may want to hear how it went. Remember to take pictures and notes on the trip and to gather quotes from the kids, which you can record on the Field Trip Info Sheet (included in the full Toolkit). This will make reporting back to funders a breeze.

Farm Fieldtrip Toolkit for Teachers

Pre-Field Trip Lesson

Lesson: Where Food Comes From

1. Introduction:

Tell class about the farm they will be visiting on their upcoming field trip and then have kids brainstorm things they know about farms.

2. Some food comes from gardens:

Gardens are awesome; we can grow our own food and make yummy snacks out of it. Getting food from our garden is cheaper than buying produce and the food is much fresher! Talk about students' experience at their school garden or other gardens they've seen. Farms are like gardens but they are bigger and grow more food.

3. Almost everything else we eat comes from farms:

Can you think of something you eat that comes from a farm? They might guess eggs. Yes, eggs come from chickens and chickens come from farms. They might guess corn. Yes, corn grows on a farm.

What is something you eat that doesn't come from a farm? For example, they might guess pizza.

Actually, all the parts of pizza come from a farm. The crust is made from flour which is made from wheat which grows on a farm. The cheese is made from milk which comes from a cow, which comes from a farm. The tomato sauce comes from tomatoes, which grow on a farm. If there are other veggies on the pizza, they grew on a farm. If there is meat on the pizza, it came from an animal that lived on a farm.

They might guess chocolate: Even chocolate comes from a farm. The cocoa pods grow on a tree that grows on a farm. Almost everything we eat comes from a farm!!

4. Let's talk about tropical foods!

Tropical foods grow in the tropics and need warm weather all year long. (Maybe find a map and point out the equator/tropical locations)

What are some tropical foods? (i.e., Foods that need warm weather all year). For example: Pineapple (Costa Rica), Oranges (FL), Bananas (Ecuador), Avocado (Mexico), mango, etc.

Is the Pacific Northwest Tropical? Does it stay warm all year long?

It does get warm here, but it doesn't stay warm all year long. The Pacific Northwest has a temperate climate which means we can't grow tropical foods, but we can still grow a lot!

What kinds of things grow in Oregon? What have you seen growing in a garden or on a farm?

Blueberries, melons, strawberries, corn,... So many foods grow locally!

Sample Schedule for Farm Field Trip

8:30-9:00 Prep in classroom
9:00 Depart school for farm
9:30-9:45 Arrive at the farm, welcome and ground rules with farmer
10:00-10:35 Split into two groups for first rotation

Group 1: Farm tour, taste food in the fields (arrange with farmer in advance) and plant parts scavenger hunt

Group 2: Helping task and harvest opportunity (arrange with farmer in advance)

10:35-11:15 Groups switch (pick a meeting spot) and second rotation
11:15-11:20 Groups meet near (pick a meeting spot)
11:20-11:30 Kids wash hands and prepare for lunch
11:30-12:00 Lunch at the farm
12:00-12:15 Reflection activity (drawing pictures for the classroom works well)
12:15-12:30 Pack up and load bus
12:30 Leave farm and return to school
1:00-1:15 Recess at school
1:15-1:45 Write Thank You notes to farm and have snack from the farm

Field Trip Info Sheet

Field Trip Info Sheet

Farm: _____
Date/Time: _____
Address of the farm _____
Phone number for farm _____
Phone number for bus company _____

Number of kids on trip: _____

Names of any students with photo restrictions: _____

Allergies/health concerns: _____

Volunteers/Chaperones: _____

Activity schedule (with times for each activity): _____

Good quotes from the day: _____

Notes on day: _____

(continued)

Farm Fieldtrip Toolkit for Teachers



Field Trip Prep Checklist

STUDENT FARM FIELD TRIP to:

Date:

Start time - end time:

Packing List (what to bring):

Teacher/Field Trip Coordinator:

- Name tags (for all adults and students)
- Field Trip Info Sheet(s) (Appendix 7) (enough for all adults)
- Printed copies or supplies for any educational activities
- Camera
- Trash bag (its respectful to take your garbage and recycling away)
- First aid kit
- Directions to the farm

Students:

- Sturdy shoes or boots (no open toes)
- Rain coat
- Sun hat
- Additional layers
- Water bottle
- Bagged lunch (minimize waste)
- Journal/notepaper and pencil (for reflection activity, if planned)

On the day of the Farm to School field trip:

- Students are assigned in _____ different groups
- Every student has a name tag
- Every student has a lunch packed from home or from the cafeteria
- Students are wearing farm-appropriate clothing (closed-toe shoes, raincoats, etc.)
- Someone to take pictures

Post-Field Trip Lesson

Lesson: Food System

Let's talk about our food system (show Food System Poster included in full Toolkit).

A food system is the process of how plants/animals on a farm become food on our plate; growing, processing, transporting, selling, and eating food. Most food starts on the farm. From there it can go from the farmer, to the distributor, to the store and then to the eater. Or... food can go from the farmer to the eater directly.

Why eat local?

For kids who've had some exposure to these ideas already: "Does anyone have any ideas about why we should eat foods from farms nearby?" (Get reasons from kids and affirm good ideas.)

Buying food from local farms can be better for:

1. The environment
2. Our health
3. The farmers

Environment: When food comes from far away it affects the environment.

Using a map show where some tropical foods come from. Point out how far these foods had to travel. When food travels that far it uses lots of fuel which can cause pollution and climate change.

Now let's think about how far food has to travel if we get it locally. What are some foods that grow in the Pacific Northwest?

Using the same map show the short distance these foods had to travel. When food travels a shorter distance it uses less fuel, which is better for the environment.

Health: As we just saw, food can come from very far away and take a long time to get to us or they can come from farms and gardens very close to us and get to us quickly.

Fruits and veggies taste better when they are ripe and picked and eaten right away. And they have more nutrients in them, when they are fresh, too, which is good for our bodies.

Farmers/Community: Buying local foods can also help the farmers who grow the food.

If we buy food that has travelled very far, some money goes to the distributors and truck drivers who brought it here, and some goes to the store where it will be sold.

When we buy food from farmers who live in our community, the money goes straight to them!

You can show food system poster again here.

A kid (on the poster) buys an apple at the store and it costs one dollar. 10 cents might go to the people who sort and box up the apples, 10 cents to people who store the apples in a warehouse, 10 cents to the people who figure out where the apples have to go, 10 cents to the trucker who delivers them, and 10 cents to the store that sells them (show these steps on the food system poster).

The farmer is left with only 50 cents! If the kid buys an apple directly from the farmer, then the whole \$1 goes to the farmer and his farm helpers.



Mt. Baker SnowSchool: Bringing Students Into the Mountains

By Abby Sussman

My life is focused in the mountains, so it is surprising how many local young people have never had the opportunity to visit our neighborhood peaks.

"So many kids in Whatcom County see Mt. Baker from the lowlands, but some never get the chance to experience the mountain environment," says Gwyn Howat, Mt. Baker Ski Area's executive vice president. "We wanted to facilitate the opportunity to do so."

This is exactly why, four years ago, Mt. Baker Ski Area and Northwest Avalanche Center (NWAC) began offering Mt. Baker SnowSchool to local middle and high school students.

In 2015, Mt. Baker Ski Area partnered with the North Cascades Institute (NCI) to expand the audience and broaden the relevancy of the curriculum. Today, Mt. Baker SnowSchool asks students and teachers to consider the greater influence of the snowpack on our everyday lives—from recreation to drinking water, agriculture to fisheries, mountains to bay.

A national program established by Winter Wildlands Alliance, SnowSchool takes place in more than 60 locations in the Western United States. Curriculum is adapted to the needs and interests of participating schools while introducing young people to snowshoeing and field science.

A quarter of the way through the season, we have served 150 local students, the majority have of whom had never visited the Mt. Baker-Snoqualmie National Forest, or taken part in winter recreation at Mt. Baker Ski Area. This season has not only brought an increase in participants, but also in community collaboration. The impact of SnowSchool reaches further than the classroom for both instructors and students.

When Jeff Hambelton, NWAC ambassador and professional observer, invites students into a freshly dug snow profile pit and guides them through a hand hardness test, he is not only demonstrating skills needed to produce avalanche forecasts, but he is also introducing how we might predict summertime Nooksack River flows.

When undergrads from Robin Kodner's biology lab at Western Washington University model how to properly collect samples for snow algae and bacteria research, they are not only illustrating how microbial communities impact our watersheds, but also that science takes place outside institutional walls.

When volunteer instructors ask students to describe the cloud cover or observe shapes of snow crystals, they are not only teaching about weather and snow morphology, but also about how to pay attention to the natural world.

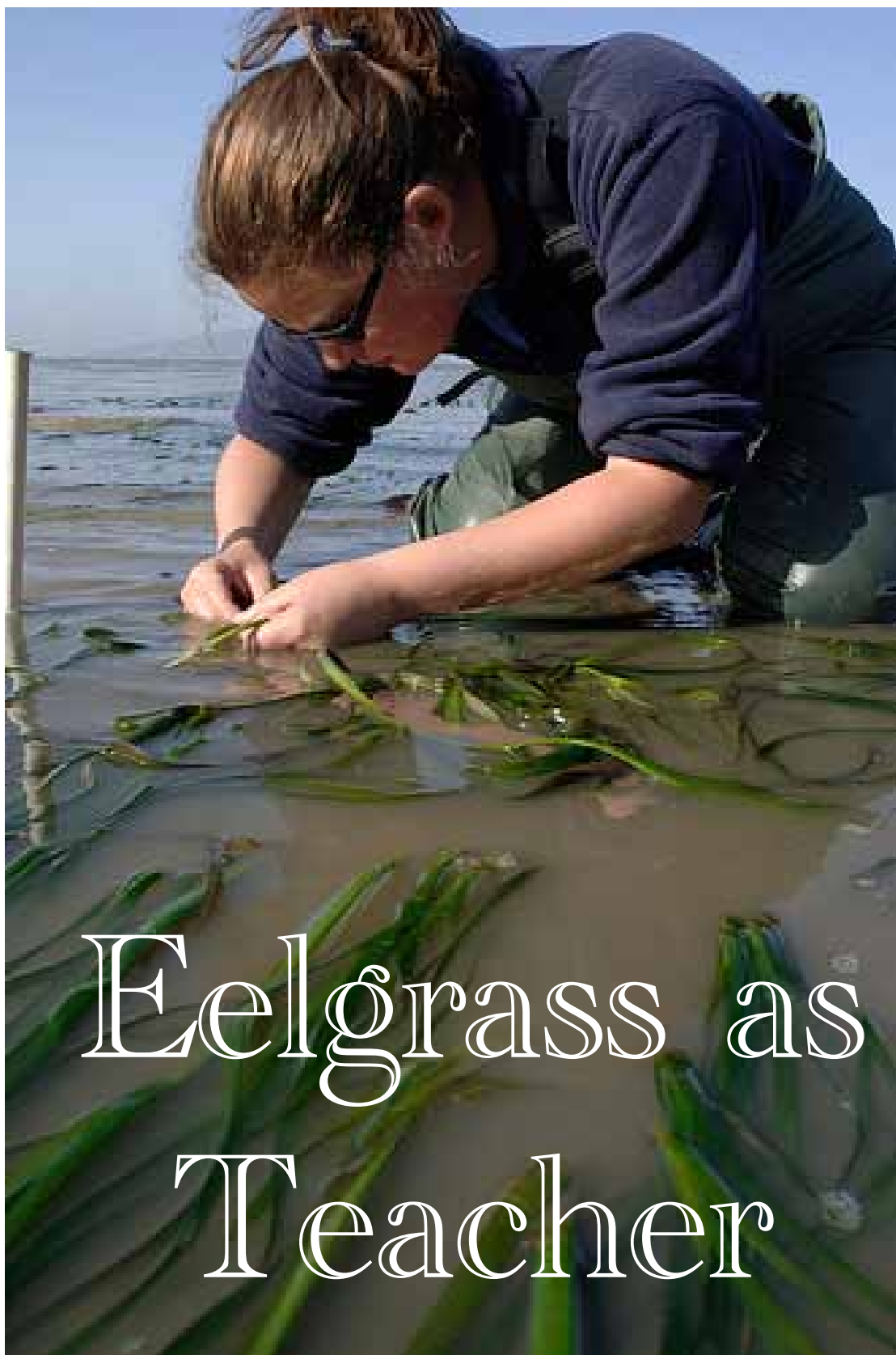
When teachers help load students onto a bus as far away as Bow or as close as Deming, they are not only displaying a willingness to provide new opportunities, but they are also exemplifying the idea that learning takes place everywhere, at every age, in every community.

We hope that by bringing students into the mountains their lives will be uplifted, perhaps slowly, perhaps all at once, by an eruption of inner curiosity.

Abby Sussman is the SnowSchool coordinator and is employed by North Cascades Institute. For more details about SnowSchool, visit <http://ncascades.org/signup/youth/snowschooll>

Originally published in the Cascadia Weekly, 2/1/2017.
Photo by Joe Loviska





Integrating Tradition, Science and Learning on the British Columbia Coast

by Nikki Wright

With a respectful hush, students squat on the sand or sit on logs on the warm beach, listening intently to Trish speaking about the way her indigenous Coast Salish community harvested herring roe in Deep Bay, B.C., Canada when she was ten. You can hear a fir needle drop in the forest behind her as she recollects her memories of watching the shoreward migrating herring, so thick, she says, they were “like little bits of shining glass in the Bay.” The families would collect the roe from cedar boughs placed in the bay and store it in long storage bins, where she would race past and swipe some to eat before Grandmother would find her out.

For younger grade levels, it is fun to explore eelgrass meadows for juvenile creatures - small crabs, seastars, and flounder for example. Because the weaving of the eelgrass blades provides good hiding places from predators, the beds are resplendent with new life.

exploration of the mysteries of sea life so close to the shore would lead them further down the road of revelation and possibly to a lifetime of marine discoveries.

Shortly after I had listened to Trish on that extraordinary beach, I accompanied a grade four class on a beach within the boundaries of Victoria on Vancouver Island. With small class groups alongside me, I walked gingerly in gumboots in an eelgrass community at low tide. Once again, I had a glimpse into these wondrous undersea gardens, watching the small kelp crabs and juvenile seastars creep along the emerald green blades, and witnessed small flounder gliding under the sand. A whole world opened up before us. This is the magic of eelgrass in quiet bays and coves and estuaries.

These high school students were in a very special site, a Gulf Island on the British Columbia coast, learning first hand the traditional stories of Native peoples harvesting and storing the riches of the sea. During their time on this beach, they would explore eelgrass beds, which are also used for herring spawn sites, in the interface between ocean and land. They found myriad critters crawling and scurrying between the blades. This

SeaChange Marine Conservation Society, a community conservation group on Vancouver Island in British Columbia presents these kinds of opportunities in the spring, summer and fall each year to schools at all levels. Many times, eelgrass (*Zostera marina* - one of the two native species of eelgrass on the BC coast) is a gateway of learning during our time on the shore and in the estuary. This is the story of my experience with eelgrass as a teacher. The following are suggestions for exploring a seagrass community for Grades 1-6.



Beach seining is exciting!

When I first started marine naturalist work in Victoria, Canada, I was a SCUBA diver diving for sea creatures and demonstrating their behaviour to elementary and middle students. Most of these young people were more familiar with facts about coral reefs and sharks across the world than with the sea cucumbers, Great Blue Herons and pipefish of their local marine world. This introduction to local sea animals was a first step, but unsatisfying to me as a marine educator. I wanted to teach ecology. I needed to find ways for young people to fall in love with the intricacies of an easily accessible natural system (Capra, 2005). I believed, and do so even more strongly today, that children learn best from the natural world when they are actively engaged in it (Krapfel, 1999). Eelgrass has afforded those opportunities through classroom, field and community activities. Students will observe ecological connections. The underwater blades offer viewing windows into complex food webs close to shore (Phillips, 1994). Students can extend their understanding of ecological relationships by investigating land use activities affecting these food webs. Teachers can help students understand the importance of citizen science in protecting shores with maps of the boundaries of eelgrass meadows made by their students.

(continued)

Eelgrass as Teacher

(continued)

The Biological Diversity within Eelgrass Meadows

Eelgrass is a simple enough looking plant, but it has great importance to living systems, both human and non-human. It evolved from fresh water and migrated to the ocean in relatively recent geological time. Eelgrass shoots act like crab grass or strawberry plants in that they grow most successfully by rhizomes, or underground roots. One plant in a large meadow can be the parent of thousands of shoots, as they clone in muddy sandy substrates in shallow protected bays and estuaries in most temperate marine areas of the world. The intricate weaving of the underwater blades afford shelter for salmon from the hungry foraging of Bald Eagles, and the minute algae on the blades feed the small crustaceans called copepods that swim near the muddy bottom which in turn feed the outcoming salmon fry from freshwater streams. The plants are so popular with salmon that eelgrass meadows have been compared to salmon highways in the Pacific Northwest.

The high biological diversity available in eelgrass systems provides food for a diversity of organisms in several ways. In



Beach specimen press on the beach

the Trent River delta on Vancouver Island, for example, 124 species of birds have been identified and includes over 38,000

individuals. Forty eight per cent were observed using the intertidal eelgrass (*Z. japonica*) of the delta for feeding, foraging or preening at some time during the year (Harrison and Dunn, 2004).

For younger grade levels, it is fun to explore eelgrass meadows for juvenile creatures - small crabs, seastars, and flounder for example. Because the weaving of the eelgrass blades provides good hiding places from predators, the beds are resplendent with new life.

The matted rhizomes help capture sediment and decreases erosion (Phillips, 1984) which is important for shoreline homeowners. All these benefits of this underwater vegetation can be demonstrated to school children in their classroom and outside on their local beach or estuary. It takes little or lots of time, depending on how far and deeply you as an educator would like to extend the lessons. This article assumes that you have the

opportunity to visit your local eelgrass more than once over the school year.

I thought in 1993 I had found a simple way to teach ecological systems to children. Thirteen years later, after all the SCUBA dives, seining, kayaking, tide pooling, and mapping and restoring of eelgrass, I am still entranced with this nearshore plant that makes up underwater emerald forests.

Classroom Activities

A network of eelgrass conservationists along the entire coast of British Columbia maps eelgrass beds and locates potential restoration sites. Many of these individuals come into their local schools to help teachers with exploring the mysteries of eelgrass. They bring resource books with plenty of photographs, maps, stories, colouring books, overhead drawings and graphs of food webs found in eelgrass habitats, and eelgrass plants found along the beach. You can provide library books, web sites, stray eelgrass plants and help students explore ideas on how they would like to investigate their local eelgrass beds.

In preparation for the first field trip, students can formulate questions they wish to answer during their field trip, and discuss their hypotheses in small groups. For example, one group of fifth graders might formulate the following: "If young crabs use eelgrass for shelter, then they will be found in areas hidden from their predators." They then could create a data sheet with spaces to record how many and what kinds, sizes and locations of crabs they observe.

Students should be reminded that they are visiting the living rooms (or habitats, depending upon the age group) of intertidal animals and plants that are already stressed from exposure to the sun. Examples of good beach manners are:

- Turn rocks back gently after lifting them
- Fill in any holes when digging
- Wash hands in the tub of saltwater next to the touch tanks before touching animals and plants
- Handle animals and plants gently.
- Avoid walking on plants and animals
- Do not remove attached animals or plants.
- Leave the plants and animals in their natural homes (habitats).

It is important that students be comfortable and safe and be respectful for the life they will encounter on their field trip. Sunscreen, extra socks, drinking water, towels and gumboots or shoes that can get wet or muddy. They can add their own beach etiquette rules.

Field Trip Activities

Students can become familiar with eelgrass ecology during a preliminary field trip lasting usually an hour and a half. Prior to the actual field trip, the class can be divided into three groups. We usually have three groups of ten students each.

The first beach station is the "Habitat Aquaria." We use two glass 33 gallon aquaria placed within a wooden frame and supported by two wooden supports. We fill the first aquarium with sand and "living rocks," drift eelgrass and crab and chitons,

sea cucumbers, small seastars, sand dollars, clams and the like collected by SCUBA divers. We place rockier substrate in the second aquarium with drift kelp and other seaweeds, urchins, living rocks with tunicates and coral algae living on them, limpets, turban snails, and crabs to demonstrate what lives beyond the shallow eelgrass meadows. Simple rubber tubs can be substituted for glass aquaria. Laminated field guides are distributed so that the students can identify and observe animals on their own before they are told what is in the aquaria. Buckets and tubs surround the aquaria are filled with seaweed and kelp to shade the animals that can be touched by the students under supervision. A hand washing tub full of saltwater ensures that sunscreen on the students' hands will not harm the animals in the touch tubs.

The second station can be a "Detective Game." Using the field guides students are asked to find and observe, without collecting, animals that have hard shells, or live in a community, or plants that have knobs growing on their blades. They convene after 15 minutes or so to share their findings. Detective questions could be ones such as:

Find:

- Two different kinds of edges on seaweeds.
- Evidence of an animal having eaten something.
- Three seaweed leaves with different textures (smooth, prickly, etc.)
- Four different odors/smells.
- Five different sizes of barnacle.
- Six different kinds of birds on the shore or near-by
- Seven human activities on or near the shore.
- Remember eight different sounds and repeat them to the group
- Name nine different ways people are using the shore or waters near-by.

The third station can be a "Making Art" display. On a large tarp, students at all grade levels enjoy as a group making a giant sea animal or an eelgrass or kelp underwater forest.

Beach seining in a protected bay or estuary is another way to acquaint students to the eelgrass community but it is crucial this be done in a very sensitive manner, as juvenile marine animals such as salmon fry and young flounders cannot tolerate exposure out of water or touch. When done under the careful supervision of an experienced leader, however, students are thrilled with the diversity of the collection from seining after they have helped haul the net shoreward. The specimens can be collected carefully and kept in cool seawater tubs for a short duration for observation by all.

Beach specimen presses can be done easily with moist heavy paper and cardboard between the paper. Students collect drift (unattached) eelgrass, seaweeds and flat pieces of kelp and design patterns onto the heavy moist water. The sheets are then placed between two wooden boards and tied together with a belt. The collection should be placed in an area that is well ventilated in the classroom. In just a few days, the students can open the press and discover their dried creations. Cards, posters and other art work can then be taken home or displayed.

Extension of Field Activities

A second field trip can be designed for mapping a local eelgrass bed during the springtime on a very low tide (less than 2 metres in B.C.). The methodology for mapping can be practiced in the classroom. Before that however, it is essential that students

know why this particular habitat is important to map. After they have become familiar with its ecology during their preliminary field trip, students can interview community members, including fishermen, First Nations members and old time residents on what they remember of eelgrass in the local waters. This information can then be brought back to collate into maps.

On southeast Vancouver Island, one of the eelgrass mapping coordinators consulted with First Nation Elders and old time fishermen to find out where the eelgrass "used to be" in a large estuary. She brought that information to a classroom of 5-6th graders, and asked them to map the areas on nine baseline maps. The class then combined the maps to compare where the meadows were historically sited and where they grow presently. They discovered that a large area was impacted by log storage activities, but they also discovered that local community restoration efforts were underway to bring back the meadows where the log leases were no longer used.

Mapping can be as simple as following the upper boundary of an eelgrass bed and noting on a cadastral map where the bed begins and ends. Or students may want to map the upper boundary using a GPS unit and then measure the density of the bed using a transect line and quadrats. The scientific protocol that has been accepted in British Columbia for mapping eelgrass can be found on the Seagrass Conservation Working Group web site (Seagrass Conservation Working Group web site, 2002).

To show students how to measure eelgrass shoots within a meadow, you might try using a demonstration eelgrass grid, which takes little time to make. I suggest you find mesh material (we use the plastic mesh used to protect SCUBA tanks) with



Students mapping on the shore.

small (approximately 1/4 inch) spaces to thread green ribbon in dense patterns. Provide a quadrat (see below) and a ruler so that students can practice measuring the width and length of the blades. Thicker ribbon can be used to represent reproductive flowering plants.

It is important that they know before they map on the beach that reproductive shoots are ephemeral. If flowering shoots are not noted while

(continued on next page)

Eelgrass as Teacher

(continued)

mapping, the class might return the following year and observe that the bed they measured is less dense, and conclude that it has been damaged. *Zostera marina* is a perennial plant (*Z. japonica* is most often annual), but densities can vary from year to year because of the timing of reproduction and the fact that they shed their leaves up to seven times in one year (Durance, 2002). If the class decides to monitor one bed over several growing seasons, these are important factors for accounting for different shoot densities over time.

Considering the worldwide extent of seagrasses is estimated at 44 million acres, but that much of the extent has not been mapped, (Green & Short, 2003) there is a lot of mapping of eelgrass to be done everywhere! It is not difficult for students at all levels to inventory local seagrass beds whether they be *Zostera marina* or *Z. japonica* or another species of seagrass in your area of the world.

On many shores of southern British Columbia, both eelgrass species grow close to each other. We are having fun creating useful and easily memorized limericks to help us decipher the difference between the two species, as on some shores they look remarkably similar. One example of a "limerick in process" is:

Marina, like green onions,
it's sheaths they do tear,
While *japonica*, like celery,
it's sheaths pry open, to bare. (Sanford, 2006)

Students can make up their own rhymes and songs to identify species of eelgrass that they then can pass on to the next class for the following year.

Eelgrass meadows are naturally highly dynamic systems, often changing from year to year or from season to season,

reflecting changes in the environment (Den Hartog, 1971) At one school, fourth graders are monitoring both species (*Z. marina* and *Z. japonica*) growing adjacent to each other over several years, to note competition or changes between the two. They pass on the monitoring data onto the next class before the next mapping expedition during the following spring.

What is needed

One quarter metre and one metre square quadrats can be easily made from aluminum or plastic pipe. These frames are set upon a 60 m transect line (polypropylene rope is easiest to use) at metre points randomly selected. The transect rope can have tape tied securely at one metre marks with the designated metre number marked on each tape. On the way to the site, students can call out numbers from 1-30, a recorder can write them on a data sheet (see illustration). Other equipment needed is GPS units or compass (for triangulation for site location), data sheets and pencils attached to clipboards, field trip supplies (sun screen, drinking water, first aid kit, snacks and hats), and binoculars. Make sure students are wearing gumboots or shoes or sandals that can withstand some saltwater.

Methodology

To ensure success, visit the site yourself before the field trip so that you have a clear idea how to direct the students. Since eelgrass shoots tend to grow at different lengths and widths according to where they are located in the intertidal zone, it is important to place the 60 m transect line parallel to shore well within the range of the zone you may want to select beforehand.

For example, this could be a description of the bed before you:

Zone 1 is a narrow band 8 metres wide, located in the low intertidal and shallow subtidal. The zone is characterized by a sparse population of short eelgrass (length 25 cm, density 32 shoots/m²). Zone 1 blends into Zone 2, at a slightly lower elevation. The bed in Zone 2 is 50 metres in width. The majority of the bed is located in Zone 2.

During your preliminary visit, you may have decided to have the students map only one zone with their 60 m transect. By the end of the exercise, they might feel more confident to map more of an area at a later date. The pressure of the incoming tide dictates how much time is available to map one zone. It is best to arrive with your class at the site about an hour before the tide begins to recede. During this time, the students could identify the zones of eelgrass on the beach. You may have already visited the site at low tide, so you can help direct the discussion.

For a class of 30, you may want to organize students into groups of three: In each group, one student is the recorder, one the counter of shoots, and one measures one shoot in the right hand corner of the quadrat for width and length. Each group will have one third of the 30 numbers they randomly selected before they arrived on the beach.

Date: <i>January 15, 2006</i>		Location: <i>Sidney Beach</i>		
# of zones: <i>3</i>		Zone #: <i>2</i>		
Length of transect: <i>60 m</i>		# of quadrats sampled: <i>30</i>		
Direction of transect: <i>East to West</i>		Size of quadrat: <i>.25 m²</i>		
Quadrat #	# of shoots	# of reproductive shoots	Shoot length (cm)	Shoot width (cm)
1	60	5	25	.25
2	45	2	22	.21
3	53	0	15	.23
4	19	8	14	.24
5 ↓	6	0	12	.25
30	75	14	24	.23
Total:	X # of shoots	X # of shoots		
Mean Density (total/# of quadrats):	Total # of shoots divided by total # quadrats			

Eelgrass Mapping Field Data Sheet (Durance, 2002)

Observing	Inferring	Classifying	Predicting	Communicating	Quantifying	Interpreting Data
Research	Hypothesis Activity	Eelgrass demo grid	Hypothesis Activity	Beach Manners	Eelgrass demo grid	
Habitat Aquarium	Touch tubs	Habitat Aquarium/Touch tubs	Beach seining	Hypothesis Activity	Detective Game	Beach seining
Detective Game	Inquiries with organisms	Mapping/Monitoring	Mapping	Art Display on the Beach	Mapping	Mapping
Beach seining		Detective Game	Monitoring	Mapping	Monitoring	Monitoring
		Beach seining		Beach press		

The recorder in each group makes sure the numbers are located accurately so there are 30 sets of measurements by the end of the mapping exercise. When the tide has returned, the data sheets are collected and returned to the classroom. Over time students will notice changes in the density and width of the eelgrass bed they mapped and will have lively discussions as to why that is.

Synthesizing Classroom Studies with Field Experiences

The classroom activities and field trips can be integrated across curricula. Students can photograph their art displays on the beach tarp and combine them with the pressed plant specimens to include on a wall mural in the classroom. They can write stories about the eelgrass animals they observed on the beach and combine facts about the creatures' biology with fiction about their lives in the meadow. They can use math to calculate Leaf Area Index (mean eelgrass leaf length and width determined from sampling one eelgrass shoot in each of 30 quadrats) for determining the productivity of an eelgrass bed, and research the history and geography while they find local stories about the locations and uses of this seagrass, including Indigenous traditions.

The table on this page illustrates how lessons can focus on science processes (Gough & Griffiths, 1994).

Students at all grade levels can participate in restoration of eelgrass as part of a community effort to restore damaged fish habitat. Since 2000, in Tod Inlet on southeastern Vancouver Island, community members of all ages have completed five eelgrass transplants under the guidance of a local conservation group, a scientific advisor in partnership with provincial and federal agencies. Over the past four years, community conservation groups in 22 communities on the 27,000 km coast have involved students and families on mapping and restoration projects. This level of involvement can start simply with one person committed to a plant in one place, with equipment such as gumboots, an inexpensive tub showing students eelgrass critters, rope and a square of aluminum and pencil and paper.

Maps as Community Connectors

It has been estimated that as much as 80% of the pollution load in the ocean originates from land based activities (NPA, 2007). After researching its history and constructing maps, students might conclude that their local eelgrass meadows are not as dense or as extensive as they were, even as recently as 10-20 years ago. The maps they have created can be used to influence decisions affecting the shoreline, such as the construction of cement seawalls or the creation of riparian set backs to offset the erosion effects of seasonal storm events. Students' maps can be displayed at a local council meeting, at festivals, in brochures and in presentations to other schools or community associations.

On the BC coast, we are making eelgrass a household term, because these maps created by people of all ages have heightened



Eelgrass mapping in a community in British Columbia.

awareness of the importance of this crucial underwater plant community and have been included in regional atlases, official community plans and shellfish aquaculture plans and First Nations treaty negotiations. Knowing that their data collection has far reaching influence, even fourth graders will take special care for accuracy.

(continued on next page)

Eelgrass as Teacher

(continued)

Eelgrass Restoration

It has been estimated that approximately 222,000 acres of seagrasses worldwide have been lost in the last decade (1990-2000) (Green & Short, 2003) because of development, forestry and agricultural practices, dredging and hardening of shorelines (construction of cement seawalls), to name a few.

Further Explorations

As students become more familiar with their local eelgrass meadows, teachers might want to facilitate discussions with their students about why eelgrass habitats are so important on the global scale. Students could establish research teams around such issues as the role of seagrasses in global respiration (amount of carbon and oxygen released and absorbed into the atmosphere), the impact of eelgrass habitat losses with decreasing world fisheries resources, the role of seagrasses and mangroves in conserving shores during extreme weather events, and the connections between land use activities and nearshore environments and about their own responsibility in caring for eelgrass habitats. They might conduct their research through interviews with scientists within the community as well as by using the Internet. As their understanding increases from the local to the global, they can take their information to other classes within their school, and demonstrate their findings through a multi-media event or by taking another class to the beach at low tide to demonstrate their knowledge. The beach then becomes a laboratory to learn about biology, zoology, ecological patterns and ultimately about the responsibility of humanely living in the global biotic community. We as educators can help our students face environmental challenges by encouraging them to take the time to observe, reflect, ask questions and find answers within their community. Eelgrass meadows offer one way into that window of inquiry.

References

- Capra, F. (2005). Speaking nature's language: principles for sustainability. In Stone, M.K. & Barlow, Z. (Eds.), *Ecological Literacy: Educating our children for a sustainable world* (pp.19-29). San Francisco: Sierra Club Books.
- Den Hartog, C. (1971). The dynamic aspect in the ecology of seagrass communities. In *Thalassia Jugoslavica*, 7 (1), 101-112.
- Durance, C. (2002). *Methods for mapping and monitoring eelgrass habitat in British Columbia*. Vancouver: Environment Canada.
- Gough, R.L., & Griffiths, A.K. (1994). *Science for Life*, Toronto, Harcourt Brace & Company.
- Green, E.P. & Short, F. (2003). *World atlas of seagrasses*. Berkeley: University of California Press.
- Harrison, P.G. & Dunn, M. (2004). The Fraser Delta Seagrass Ecosystems: Importance to Migratory Birds and Changes in Distribution. Chapter 15: (pp. 3-4) In B.J. Groulx, D.C. Mosher, J.L. Lutemauer & D.E. Bilderback (Eds), *Fraser River Delta*, British Columbia: Issues of an Urban Estuary, Geological Survey of

Canada Bulletin 567.

Krapfel, P. (1999). Deepening children's participation through local ecological investigations. In G.A. Smith & D.R. Williams (Eds.), *Ecological education in action: On weaving education, culture, and the environment* (pp. 51-53). Albany, New York: State University of New York Press.


Phillips, R.C. (1984). Chapter 4: Components of the eelgrass community-structure and function. In *The ecology of eelgrass meadows in the Pacific Northwest: A community profile* (pp. 34-56). Seattle, Washington: Seattle Pacific University.

Phillips, Ronald. C. (1984). *The ecology of eelgrass meadows in the Pacific Northwest: a community profile*. U.S. Fish & Wildlife Service FWS/OBS-84/24. 85 pp.

Sanford, D. (2006). Personal communication.

The web site for more information on the educational, conservation and restoration activities of the author's organization is: www.seachangelife.net

This article was originally written for the Asia-Pacific Network for Global Change Research, Konan University, Kyoto, Japan. It is reprinted here with permission.



OUR WATERS
Many Streams, One Ocean
NAME 2017 HOMER, ALASKA

2017 Marine Education Conference - Northwest Aquatic and Marine Educators (NAME)

Our Waters: Many Streams, One Ocean
August 7 – 12, 2017 • Homer, Alaska

The NAME-Alaska team is hard at work planning an exciting conference in 2017!

Educators, researchers, students, and resource professionals from Washington, Oregon, Alaska and British Columbia are invited to meet, learn, share, and socialize.

More information will be posted when finalized on the NAME website at www.pacname.org

Environmental Education Activities for Monday Morning

Here are some ideas, separated into grade levels and subject areas, that you can use to instill environmental learning when you are looking for something to do on a Monday morning.

GRADES K-2

Science

Garbage Gardens

Have students bring in an egg carton and empty halved egg shells from six eggs. Pierce the bottom of the egg shells and fill them with composted soil. Place the egg shells in the egg carton to keep upright. Plant various types of seeds in the egg shells. Make sure to label each student's egg carton with their names and the types of seeds they planted. Extend the learning by creating experiments dealing with the effects of natural environmental variations such as light and water as well as "artificial" variations including the application of household hazardous wastes found in the classroom (check out areas around your sink for these products). — TGP

Social Studies

Getting Down to Basics

List all the items below on the chalkboard. Then ask students, one at a time, to erase something that could harm the environment.

Beds, foam cups, what, war, polio shots, oil, atom bomb, pine trees, friends, sneakers, car, hairspray, vegetables, television, plastics, hamburgers, gold, food coloring, love, lawnmower, oxygen, zippers, flowers, aspirin, rockets, ice cream, water, candy bar, computers, grass, chemical fertilizers, jets, school, mosquitoes, boom boxes.

Add to this list. Have students explain their reasoning. — KT

Mathematics

Whale Milk Math

A newborn blue whale gains 200 lbs per day (9 lbs. per hour) by drinking up to 50 gallons of milk each day. In one day, a blue whale calf would drink the amount of milk in 800 school-sized milk cartons! Have students rinse and save milk cartons each day. Count the new ones daily and add the total to the previous day's total until you reach 800.

Language Arts

What Do You See?

Students view several pictures of beach/ocean wildlife, then choose one to study. After examining closely, each student writes a description of his/her animal. Later, teacher reads written description and class guesses which animal picture it was based on.

Fine Arts

Be a Tree

Have students identify characteristics of trees. Visit trees in a back yard, in an orchard, in a park, or in the school yard.

Have the students do tree dramatizations, using their arms as the branches and their legs as the trunk. How does the tree look during a storm? How does a fruit tree look in the spring? How does a young tree look in comparison with an old tree? What would happen to change the tree in different kinds of weather or during the different seasons?

After feeling what it might be like to be a tree, have the students paint pictures of them. — EGO

GRADES 3-5

Science

Living in the Schoolyard

Teacher begins activity by drawing an outline of the classroom on the blackboard. Develop a key to one side of the outline to be used to represent the plants, animals and special features which exist in the classroom. "Let's see if we can make a map of all the living things in our classroom. Does anyone see a plant? Skippy, will you come up and mark the plants on our map for us?"

Then provide a map of the schoolyard for groups of students (or for individual students depending on skills at map making). Take children outside and let them map all the living things that they see. Remind them that they have to look hard to see some of the things that are there.

After students have completed their maps, gather them together for discussion about the roles of the living things they found.

Social Studies

Pick a Package, Any Package

Visit a supermarket and find the following products: cereal, laundry soap, milk, fruit juice, vegetables, soup, cake mixes, spices, candy, and toothpaste. In what different kinds of packages can they be bought? Are they available in the bulk food section? Why are products available in so many different packages? Which packages have the least amount of throw-away packaging? Which packages cost the least for each product? Which one does your family usually buy? Back in class, make a wall chart. Can some of the packages be reduced or avoided, reused or recycled? Circle in green all the reusable items, in yellow all the recyclable items, and in red all the disposables. -NTW

Mathematics

Milk Carton Madness

In an attempt to determine how much potential space milk cartons take up in a landfill, students measure and calculate the volume of one milk carton. Students also determine the volume of their classroom. Using the milk carton volume figures, have the students determine how many cartons it would take to fill up their classroom. Then determine how many milk cartons are generated by the entire school in

(continued on next page)

MONDAY MORNING K-12 ENVIRONMENTAL EDUCATION ACTIVITIES

one day. Determine how long it would take to fill up their classroom. Extend these computations to a volume the size of the school. Follow this by discussing the importance of diversion of materials from the landfill and by exploring the feasibility of milk carton recycling at your school. — TGP

Language Arts

Get Your Story Straight!

Invent or find a story that conveys an environmental message you wish to have your students think about. Divide the story into individual events that have ideas or words that allow the student to sequence them in a particular order.

As a group, or individually, have the students read the passages. Have the students number the passages so that the story can be read in the correct order.

Read the story aloud in the correct sequential order.

Use discussion and questioning to strengthen the story's message. —IEEIC

Fine Arts

Wetlands Animal Masks

Students can create paper mache masks of their favorite wetlands creatures. Creative dramatics can be developed by students using their masks to play a role in a wetlands drama.

Students will need old newspapers, wallpaper paste or liquid starch, water, tempera or acrylic paint, round balloons, and scissors.

Choose a wetlands animal. Tear the newspaper into narrow strips. Blow up the balloon. Mix the wallpaper paste. Use one part wallpaper paste and 10 parts water or straight liquid starch.

Dip the strips of newspaper into the wallpaper and water mixture. Lay the paper over the balloon. Apply two layers to what will be the front of your mask. Let it dry completely.

Repeat procedure, building up the areas that will be noses, beaks, ears, etc. Let it dry completely.

Repeat the procedure, applying one last coat of paper over the entire mask. Let it dry completely.

Put the mask over your face. Feel where your eyes are. Have a friend mark the eye gently with a crayon or marker. Remove the mask and cut eyeholes. Put the mask over your face and check the eyeholes; remove it and make any corrections.

Cut a mouth hole.

Paint the mask and let it dry.

GRADES 6-8

Science

Step Outside Links Nature to Classroom

Step Outside, published two to three times per month, is a website compilation of seasonal happenings that can be used to bring nature into your classroom. The guides detail specific flora, fauna and climate events, which are often taking place just outside your school - though these may happen sooner or later depending on your location.

A project of Education for Learning for a Sustainable Future, Step Outside can be found at <http://resources4rethinking.ca/en/step-outside>

Social Studies

How Did They Do It?

Have students investigate the lifestyles of Native Americans on the prairie or along the coasts or in your local area. How were their needs met by these different environments?

Mathematics

Graph the Tide

Purchase a tide table wherever fishing supplies are sold. Enlarge and photocopy each month's chart on a separate page. Make enough copies so that each student will have one month to chart on graph paper. Post the papers in a line along the wall to see the rise and fall of the tide for the year. Teacher may want to designate a place on the paper for the base point (0.0).

Language Arts

Opposites Attract

Here is a thought-provoking idea: Collect photographs, illustrations and/or paintings from magazines — some that graphically portray a healthy, balanced environment and others that depict a damaged, unhealthy Earth. Hang these on opposite walls in the classroom to stimulate discussion and inspire writing. How does each set of images make students feel? Encourage them to think about how the healthy can be changed into the damaged and how they can help to change the damaged back into the healthy. As students learn about environmental problems and the solutions, they may go to the appropriate sides of the room to record their thoughts and ideas in two separate notebooks. For example, if a student is studying about an extinct animal, that student may record his/her concerns in a notebook located next to the unhealthy Earth artwork. If he/she knows of possible solutions and actions that can be done

to help, they may be recorded on the other side of the room next to the healthy Earth artwork. Eventually, your class will have two useful notebooks filled with concerns and solutions to many environmental problems. Prioritize these and use your computer to record the top ten items that can be posted in the room for reference and distributed to family members. - TPE

Fine Arts

Touch of Color

While visiting a wooded area, pass out paper to the class and have each student, using natural materials (soil, berries, flowers, leaves, moss), draw a picture of the forest setting. Give the class an opportunity to display their work and describe their feelings about the surroundings. Encourage the students to discuss what materials were used to add color. —EGO

GRADES 9-12

Science

What Eats?

For one game, divide the group into teams, with no more than 10 persons on a team. How write a column of numbers one to 10 in three widely separated places in the room. Each team has a piece of chalk or marking device.

At a signal, the first person on each team dashes to the column of numbers and writes the name of a plant or an animal opposite the number "1". Then he dashes back and gives the marker to the second person on his team. This person goes to the column and writes the name of something that eats what is written in number "1". The marker is then passed to the third person, and so on down the line.

If a player writes down an incorrect name, it can be erased only by the next player, who loses his turn to write a name. Winners are determined by the most correct food-chain connections identified by a group.

Once a group has developed some skill at playing, try limiting the habitat to that of the forest, a brook, a marsh, a pond, the ocean, or some biome or community.

Social Studies

Environmental Impact

Create a large mural on butcher paper of a natural area complete with wildlife, trees, mountains, rivers, etc. but no human development. After completing the mural, brainstorm a list of things that would happen if a much needed energy source (e.g., coal,

oil, uranium, water) was discovered in that area. Draw pictures of these activities and facilities and place them in appropriate places on the mural. Discuss the positive and negative impacts the “new development” will have on the environment and wildlife, and create a list of these effects. Now, re-develop the energy source and see if you can come up with ways that the development can have less impact on the environment and still get the energy needed, at an affordable cost.

Mathematics

Differential Absorption

Types of soils differ in the amount of water they can hold. Collect a standard amount of each of five or six soil types. Place each soil sample in a sieve held above a container. Pour a measured amount of water onto the soil and measure how much is collected after 30 seconds, one minute, 10 minutes. The amount of water the soil can hold is total added, minus that which drained out at the bottom.

From the data obtained, determine which of the soils can hold the most or the least water. On what properties of the soil does this depend? Which soils would erode most easily? Which would be best for plant growth? —ECO

Language Arts

Operation: Water

Invite the participants to imagine that they have landed on Earth from another planet. The planet they come from only has minerals and air. They had received word that a substance had been found on Earth that could move or hold its shape. They are here to see if the report is true and discover for themselves what this “water” is like. They are equipped with finely tuned instruments for sound, feel, sight, smell, and taste. They are to split into two search parties, one going to the pond area, one to the stream. They have 15 minute to gather sounds, smells, signs of animal and plant life, observe water clarity, etc. The groups then discuss and compare the two water sightings and make speculations about the role of water on this green planet. Have students write an essay on their exploration of this strange planet and the miracle substance “water.” —JOD

Fine Arts

Environmental Art

Visit a natural history museum. Or, have students look through books with photographs of paintings depicting the environment. They may analyze, discuss, compare, contrast art works and give critiques. Pupils may be inspired to write poems or stories about ideas generated from the special works and they may then create their own works of art.

Share Your Standards to Integrate Your Teaching

by Jim Martin
CLEARING Associate Editor

Let's say you wish to incorporate an activity in the neighborhood of your school into a unit you are planning in science, and have been thinking about asking the math teacher if she would be interested in working with you. Then you learn from a friend that plants on the bank of a stream, when they are in leaf, pull water from the ground to use for photosynthesis. In fact, she tells you, they pull so much water up that the level of the stream drops visibly. This observable change in the height of the stream seems to you to be a door to math, writing, science, and perhaps even art. So, you begin thinking.

There is a creek which runs past the southeast corner of the school grounds, and you decide to use it as the site where your students will make their observations. You check it out, and find a spot where they can set a meter stick on a flat bottom rock to take their measurements. The creek is no more than twenty inches deep at its highest level on the bank, so you don't have to be overly concerned about student safety while they take their measurements, and you decide to plan for doing the work.

Students will work in groups of four, which, for this class, means seven groups. If the creek traveled farther through the school grounds, you could have each group set up its own measuring site. Since that's not the case, you decide to have the groups make quick depth measurements so that you can walk to the creek, take measurements within 15 minutes, and return to the classroom. As they wait their turn, each group estimates the percent leaf cover, based on what they think 100% leaf coverage would look like. You could have had the groups observe different aspects of the creek, but decided that would involve too much planning and confusion. This is your first effort outside the classroom, and you just don't want to make it more complicated than it already is. A wise decision.

Now, you have to work out how the observations they will make tie to more than one curricular area. This is the tricky bit. You decide to have each group hang a data sheet on the classroom walls, depicting the data they have taken in ways they feel best illustrate their observations and interpretations. To enable them to do this, you and a math teacher help them learn to make data tables, how to organize these tables to make best sense of the data, learn to graph the data and how to make decisions about what to place on the x- and y-axes. As the work progresses, you and the math teacher have students review and assess their tabulation and graphing practices. Here's a question for you: Are any of the above activities covered in the math standards?

As students move through this work, you coordinate with their language arts teacher to build in writing and reading activities which are tied to standards that teacher is working on. For instance, you want your students to describe what the project is about, how they are making their observations, what they think these will show them, and how this whole system works from the time rain falls from the clouds until it is either incorporated into carbohydrates, or enters the creek. How many disciplines' standards describe this kind of work?

Thinking about this, you decide to ask their art teacher if there are ways they can use her curricula to communicate student work in this project. She replies that she'll think about it, and may be able to work it into what they will do later in the year. Encouraged by this, and the willingness of the math and language arts teachers to work with you, you decide to start exploring standards to see how they play out in the work as you've visualized and planned it.

What follows are three broad phases of this project, and up to three standards each addresses in each discipline. I chose 6th grade because it is at the middle of the K-12 experience. Note that the standards named in each area were chosen from a myriad of possible standards. Some may involve more than one part of the project, but are mentioned only once. Here they are:

Choosing the location for the project, discussion and decision to estimate leafout and measuring depth of the stream, the processes it will involve, and who will carry them out. Students

(continued on next page)

Share Your Standards

(continued)

perform a preliminary assessment of the site via sketches which will inform an annotated collage/painting produced in the final stages of the project. Together, they involve aspects of these standards:

- **Art** – Make connections between visual arts and other disciplines. Create a work of art, selecting and applying artistic elements and technical skills to achieve desired effect.

- **Language Arts** – Apply more than one strategy for generating ideas and planning writing. Generate ideas prior to organizing them and adjust prewriting strategies accordingly (e.g., brainstorm a list, select relevant ideas/details to include in piece of writing). Delegate parts of writing process to team members (e.g., during prewriting, one team member gathers Internet information while another uses the library periodicals).

- **Mathematics** – Use variables to represent two quantities in a real-world problem that change in relationship to one another. Model with mathematics. Describe the nature of the attribute under investigation, including how it was measured and its units of measurement.

- **Science** – Explain how the boundaries of a system can be drawn to fit the purpose of the study. Generate a question that can be answered through scientific investigation. (This may involve refining or refocusing a broad and ill-defined question.) Describe the water cycle and give local examples of where parts of the water cycle can be seen.

Students make their observations and carry out the plan for their investigation. This involves these standards:

- **Art** – Choose and evaluate a range of subject matter, symbols and ideas. Recognize and describe how technical, organizational and aesthetic elements contribute to the ideas, emotions and overall impact communicated by works of art. Describe how elements of art are used to create balance, unity, emphasis, illusion of space and rhythm-movement.

- **Language Arts** – Maintain a journal or an electronic log to collect and explore ideas; record observations, dialogue, and/or description for later use as a basis for informational or literary writing. Understand and apply new vocabulary. Use multiple resources regularly to identify needed changes (e.g., writing guide, adult, peer, criteria and/or checklist, thesaurus).

- **Mathematics** – Graph ordered pairs of rational numbers and determine the coordinates of a point in the coordinate plane. Represent a problem situation, describe the process used to solve the problem, and verify the reasonableness of the solution. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity).

- **Science** – Plan and conduct a scientific investigation (e.g., field study, systematic observation, controlled experiment, model, or simulation) that is appropriate for the question being asked. Work collaboratively with other students to carry out the investigations. Predict what may happen to an ecosystem if nonliving factors change (e.g., the amount of light, range of temperatures, or availability of water or habitat), or if one or more populations are removed from or added to the ecosystem.

Students are conducting the analysis and synthesis of their data, and constructing, critiquing, and presenting their reports.

This work involves these standards:

- **Art** – Respond to works of art, giving reasons for preferences.

- **Language Arts** – Use a variety of prewriting strategies (e.g., story mapping, listing, webbing, jotting, outlining, free writing, brainstorming). Produce multiple drafts. Publish in a format that is appropriate for specific audiences and purposes.

- **Mathematics** – Construct viable arguments and critique the reasoning of others. Analyze the relationship between the dependent and independent variables using graphs and tables. Determine whether or not a relationship is proportional and explain your reasoning.

- **Science** – Summarize the results from a scientific investigation and use the results to respond to the question or hypothesis being tested. Organize and display

relevant data, construct an evidence-based explanation of the results of an investigation and communicate the conclusions. Recognize and interpret patterns – as well as variations from previously learned or observed patterns – in data, diagrams, symbols, and words.

To me, the project, outside and inside the classroom, appears to act as a vortex, drawing several disciplines into it; integrating them in the process. The effect of this activity in the students' brains must be related to their involvement and investment in the work, and empowerment as persons that teachers and others report when they describe student work in the world about. In most cases, this outcome is also associated with success in passing the annual tests students take to measure their accomplishment of state and national standards.

It takes courage for a teacher in today's schools to attempt something like this. What we need are teachers and environmental educators who have done this kind of work to mentor those who haven't, but would like to. A good place to start that would be at annual state science teacher conferences, and at state and regional environmental educator conferences. I know from my own personal experience teaching and working with teachers that a little help goes a long way.



This is a regular feature by CLEARING "master teacher" Jim Martin that explores how environmental educators can help classroom teachers

get away from the pressure to teach to the standardized tests, and how teachers can gain the confidence to go into the world outside of their classrooms for a substantial piece of their curricula.



Rachel Stendahl talks with a Roots of Success instructor during a graduation celebration for students of the environmental curriculum. Photo by Joslyn Rose Trivett.

Environmental Education for Juveniles in Detention

By Sadie Gilliom, SPP Turtle Rehabilitation Program Coordinator

When Rachel Stendahl started work with the Sustainability in Prisons Project (SPP) in 2013, her dream was to become a marine ecology professor. However, something about her experience as an SPP Roots of Success Coordinator must have stuck: in the years since she left SPP, she figured out how to bring environmental education to juvenile detention centers!

After researching the relationship between paths of whale migration and shipping, Rachel graduated from The Evergreen State College with a Master's degree in Environmental Studies. Rachel was hired by Educational Service District 113 to be their Regional Science Coordinator. She took over the job of running a watershed education program called the Chehalis Basin Education Consortium. That program supports stewardship of

the Chehalis Basin watershed by providing environmental education resources to educators. Through that program, hundreds of youth throughout the Chehalis Basin watershed learn how their watershed works, how to test the water quality of their streams, rivers, and lakes, and how to present their water quality data.

After getting into the swing of things, Rachel realized that not all of the students in the Chehalis Basin were being provided these same hands-on learning opportunities. In particular, she was concerned with the students inside of juvenile detention centers. With the help of another previous SPP employee, Bri Morningred, Rachel successfully completed, submitted, and was awarded a No Child Left Inside grant. Rachel began to implement a new environmental education program at the Lewis County Juvenile Detention Center.

SPP shared Rachel's internship opportunity on their listserv and I applied for the job. We worked together to coordinate the first-ever environmental education program provided to the youth at the detention center. It has been a great success! Rachel plans to continue the program and hopes to expand to Green Hill Juvenile Detention Center. Go Rachel!



Erica Turnbull, an SPP intern from Western Washington University, and Rachel studied reentry together during the summer of 2013. Photo by SPP staff.

Sustainability in Prisons Project (SPP) is a cooperative program of The Evergreen State College and the Washington Department of Corrections that brings science, environmental education, and nature into prisons. In collaboration with local scientists and students, inmates are involved in conservation and sustainability projects including beekeeping, wetland ecology, prairie conservation, and more.

CANOEING+HIKING



LEARNING+LODGING



CLASSES+EXCURSIONS



NORTH CASCADES INSTITUTE

Join us for a day, a weekend or an extended stay in the heart of North Cascades National Park!

Located on HWY 20 at milepost 127.5
3 hours from Seattle or Vancouver
2 hours from Bellingham or Winthrop



NCASCADES.ORG 360.854.2599

SWEet!: Using Cascade Snowpack to Teach Climate Change

Middle school students look at historic snowpack data and gain inquiry, graphing and analysis experience

by Joe Cameron, Beaverton Middle School, joe_cameron@beaverton.k12.or.us

What do you get when you mix researchers, teachers, authentic science opportunities and a group of GREAT people? You get three summers of intense work, reinvigorated teachers, new ideas for the classroom and lots of fun!

For the last three summers I was lucky enough to be involved in the Oregon Natural Resource Education Program's (ONREP) Climate Change Institute where teachers are matched with researchers to bridge the gap between the classroom and field research. The last two years I worked with Oregon State University's Dr. Anne Nolin and Travis Roth examining snow pack changes in the McKenzie River Watershed. Investigating snow collection sites and collecting data led to discussions on how best to get students involved in authentic research and science inquiry investigations.

One of my goals for the year was to get my students involved in authentic data collection and to gain more experience and practice in graphing. From this, SWEet! was born. SWEet is an activity that engages students in using historic snow data to investigate the SWE, or Snow Water Equivalent, and the changes taking place in the Cascade Mountains in Oregon. Students graph and analyze data from SNOTEL sites and compare their findings with others in class to make predictions about future snowpack. In extension activities students choose their own SNOTEL sites in the Western U.S. and monitor snow data monthly throughout the snow year. This type of activity will in turn introduce students to long-term ecological studies in progress and support them to begin studies of their own.

In doing this activity with my students we first investigated their particular sites. I found this helped them personalize the data and they were very involved, especially using this "local" data. Then using their data they were able to create comparative line graphs and look for trends in the data, even with a complex and varied data set. These trends were then used to hypothesize possible effects of changes in the snowpack to **their** world and the economy and ecosystems found in Oregon.

SWEet! Oregon's Snowpack and Water Supply

Author: Joe Cameron

Time: 50+ minutes

Grade Level: 6-12

Background

SNOTEL-The Natural Resources Conservation Service (NRCS) operates and maintains an automated system (SNOWpack TELemetry or SNOTEL) designed to collect snowpack and related climatic data in the Western United States and Alaska in order to develop accurate and reliable water supply forecasts. For over 30 years, data on snow depth and SWE (Snow Water Equivalent) have been collected from SNOTEL sites throughout the western US. This activity will use yearly SWE data from three SNOTEL sites in Oregon to look for changes and relate our snowpack to Oregon's economy and environment.

Introduction

Familiarize students with Snow Water Equivalent (SWE), which is the amount of water contained in the snowpack. A simple reference for background information is http://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/snow/?cid=nrcs142p2_046155. Also, you can do a simple class demonstration by taking a 500ml beaker of snow (or blended ice) and melting it using a hot plate. I have students predict how much water will remain after the 'snow' is melted. Then, we calculate the percent water in the snow to give them an example of one way to analyze this type of data.

After getting the students comfortable with SWE, you can give them the SWEet! Oregon's Snowpack and Water Supply activity page. When I led this activity, we read through the introduction as a class and then directed the students to graph the data provided, make sense of their plot, compare their results with others in class and then draw conclusions. This lesson leads to discussions of our changing climate and possible changes in store for the people, plants and animals of Oregon.

Objectives

Students will access long term ecological data.

Students will graph SWE data.

Students will compare their data with data from their classmates.

Students will identify possible effects of a decrease in snowpack.

Vocabulary

SWE: Snow Water Equivalent; the amount of water found in snow.

SNOTEL: Automated system that records snow depth and related data in the western United States

Trend: A general direction that something is changing

Snowpack-the amount of snow that is found on the ground in the mountains; usually measured at specific sites.

Standards

Next Generation Science Standards (NGSS)

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather.

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Oregon Science Standards

Scientific Inquiry: Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, designing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations.

Interaction and Change: The related parts within a system interact and change.

6.2E.1 Explain the water cycle and the relationship to land-forms and weather.

7.2E.2 Describe the composition of Earth's atmosphere, how it has changed over time, and implications for the future.

7.2E.3 Evaluate natural processes and human activities that affect global environmental change and suggest and evaluate possible solutions to problems.

8.2E.3 Explain the causes of patterns of atmospheric and oceanic movement and the effects on weather and climate.

8.2E.4 Analyze evidence for geologic, climatic, environmental, and life form changes over time.

Materials

For Demonstration:

- 1 500 ml beaker
- 1 50-100 ml graduated cylinder
- snow OR chopped/blended ice
- 1 hot plate

For Activity:

- Copies of SWEet! Oregon's Snowpack and Water Supply activity page
- Graph paper
- Optional: colored pencils/pens

Lesson Procedure

- Give students the SWEet! Activity page.
- As a class, read and review all directions.

Students may choose 1, 2, or 3 sets of data to graph. This option allows the activity to be modified to meet the individual students' abilities. Also, students can create graphs that can be compared to multiple data sets.

Students graph the data in a line graph.

Students analyze the data. This part can be completed through drawing a trend line(s) on the graph, calculating averages, adding totals and/or comparing multiple data sets looking for similarities and differences. Note: having the students do their graphing using Excel spreadsheets is an option that is not always available in our school but from which the students would benefit.

Relate the observed trends in snowpack to possible effects in Oregon. Who/What will be affected? How will/might they be affected?

Students pose one other question OR concern they have after looking at their graphs and trends for possible additional exploration.

Extensions

1. Related current event articles from Science Daily:

Warming Climate Is Affecting Cascades Snowpack In Pacific Northwest (Found at <http://www.sciencedaily.com/releases/2009/05/090512153335.htm>)

Global Warming to Cut Snow Water Storage 56 Percent in Oregon Watershed (Found at <http://www.sciencedaily.com/releases/2013/07/130726092431.htm>)

2. Students can access current snow year data online. They go to SNOTEL website, choose a specific site and collect daily, weekly or monthly data for this site throughout the winter months (the snow year stretches from November to March). Students can also access historic data going back to the late 1970's and early 1980's for their sites.

References

Science expertise was provided by the following Oregon State University Faculty: Dr. Anne Nolin - Professor and Travis Roth-Doctoral Student in the College of Earth, Ocean, and Atmospheric Sciences.

Data are from the National Resources Conservation Service (NRCS) SNOTEL website at: <http://www.wcc.nrcs.usda.gov>

Acknowledgements

These lessons were created using information learned in the Oregon Natural Resources Education Program's Researcher Teacher Partnerships: Making Global Climate Change Relevant in the Classroom project. This project was supported by a NASA Innovations in Climate Education award (NNX10AT82A). Thanks to Dr. Kari O'Connell with the Oregon Natural Resources Education Program at Oregon State University and Dr. Patricia Morrell in the College of Education at University of Portland for their thoughtful review of this article.

What have students learned that is not on the test?

Janell Simpson and Susan Meyers

The intent of this article is to provide tools to the classroom teacher to document the impact of a formal environmental education program on the environmental literacy of students. Although standardized testing provides an objective view of skills and knowledge, integration of data from an evaluation tool will provide a more complete assessment—not only of the individual student learning, but also a larger picture of the classroom learning environment that nurtures the whole student.

Measuring environmental education outcomes is a step forward from anecdotes to reliable measures of student growth. A measurement tool that evaluates student attitudes about the environment will help the teacher design a formal program that includes practical ways that an individual can make a difference based on newly-developed environmental literacy. The tools offered seek to quantify environmental literacy both as observed by the classroom teacher and as self-reported by the student. Standardized testing may provide an effective assessment of knowledge and competencies detailed in a curriculum. However, competencies, knowledge, and dispositions should be expressed in behaviors; and environmentally responsible behavior is the ultimate expression of environmental literacy.

Environmental literacy

An environmentally literate person is someone who, both individually and together with others, makes informed decisions concerning the environment; is willing to act on these decisions to improve the well-being of other individuals, societies, and the global environment; and participates in civic life. Those who are environmentally literate possess, to varying degrees:

- The knowledge and understanding of a wide range of environmental concepts, problems, and issues;
- A set of cognitive and affective dispositions;
- A set of cognitive skills and abilities; and
- The appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts.

This definition treats the primary elements of environmental literacy—the cognitive (knowledge and skills), affective, and behavioral components—as both interactive and developmental in

nature. That is, individuals develop along a continuum of literacy over time—they are not either environmentally literate or illiterate.

There are four interrelated components of environmental literacy: knowledge, dispositions, competencies, and environmentally responsible behavior, all of which are expressed in particular contexts.

Competencies are clusters of skills and abilities that may be called upon and expressed for a specific purpose. Measurement of competencies is the primary objective in large-scale assessments. They include the capacity to:

- Identify environmental issues;
- Ask relevant questions;
- Analyze environmental issues;
- Investigate environmental issues;
- Evaluate and make personal judgments about environmental issues;
- Use evidence and knowledge to defend positions and resolve issues; and
- Create and evaluate plans to resolve environmental issues.

...environmentally responsible behavior is the ultimate expression of environmental literacy

Table 1. Teacher rating tool for measuring environmental literacy (adapted from Murphy, 2011).

Environmental attitude	Rarely	Sometimes	Almost always	Consistently
Student demonstrates appreciation for natural environment.				
Student volunteers for activities such as recycling, gardening, or composting.				
Student initiates conversations about current events centered on environmental issues.				
Student uses classroom learning to support opinions about environmental issues.				

The expression of a competency is influenced by prior knowledge and dispositions (Hollweg, 2011).

Measurement tools

The teacher rating tool (Table 1) can be personalized for different groups. It seeks to quantify both practices, such as recycling and gardening, and connections to larger issues, such as global warming.

Other types of measurement tools to consider include: informal interviews, journal entries written in response to a prompt, surveys, pre- and post-tests, and student projects. Several Likert scale surveys are available examining student connection to nature, sense of place,

and environmental stewardship (EE Outcome Measurement Tools, 2012). Additional outcomes might be observed in a typical environmental education classroom and could be included in such a tool. Do students actively conserve energy, tend a school garden, or participate in composting? Do students show awareness of environmental connections between current events and classroom discussions? Does the student's artwork show an appreciation of the natural environment? Does the student report family dialog about nutrition or food security or visits to a farmers' market?

Susan Meyers administers the Advanced Training for Environmental Education in Georgia (ATEEG) certification program and is an instructor in the education department of Stone Mountain Memorial

Association. She is a certified environmental educator, holds an MS in Environmental Science, and BS in Microbiology.

Janell teaches science at Patrick F. Taylor Science & Technology Academy in Jefferson Parish, Louisiana. She received National Board Certification in Chemistry and trained as a Reader in AP Environmental Science. She holds an MS in Toxicology and a PhD in Biochemistry.

References

- Bennett, D. B. (1984). Evaluating environmental education in schools: a practical guide for teachers: UNESCO.
- Bogan, M., and Kromrey, J. (1996). Measuring the environmental literacy of high school students. Florida journal of educational research, 36 (1).
- EE outcomes measurement tools. (2012). From Cornell University Civic Ecology Lab: <http://civeco.files.wordpress.com/2013/10/2012-meeo-tools.pdf>
- Evaluation glossary. (n.d.). Retrieved from MEERA My Environmental Education
- Evaluation Resource Assistant: <http://meera.snre.umich.edu/links-resources/meera-evaluation-glossary>
- Goldstein, N. J., Cialdini, R. B., and Griskevicius, V. (2008). A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. Journal of Consumer Research, Inc.
- Hollweg, K. S. (2011). Developing a framework for assessing environmental literacy: Executive summary. Washington, D.C.: NAAEE.
- McKenzie-Mohr, D. (2006). Retrieved from fostering sustainable behavior: Community-based social marketing: <http://www.cbsm.com/public/world.lasso>
- Murphy, B. (2011). Assessment and evaluation of outdoor/environmental education. Green Teacher 94, 34-41.
- Orr, D. W. (1992). Ecological literacy: Education and the transition to a postmodern world. Albany, New York: State University of New York Press.
- Prochaska, J., and DiClemente, C. C. (1984). The transtheoretical approach: Crossing the traditional boundaries of therapy. Melbourne, Florida: Krieger Publishing Company.
- Simmons, B. (2004). Designing evaluation for education projects: NOAA Office of Education and Sustainable Development.
- The Transtheoretical Model. (n.d.). Retrieved from pro-change behavior systems, Inc.: <http://www.prochange.com/transtheoretical-model-of-behavior-change>
- Todd, A., Stuart, E., Schiller, S., and Goldman, C. (2012). Evaluation, Measurement, and Verification (EM&V) of residential behavior-based energy efficiency programs: Issues and recommendations. Lawrence Berkeley National Laboratory. <http://behavioranalytics.lbl.gov>



Become a leader in sustainability education

LEADERSHIP FOR SUSTAINABILITY EDUCATION (LSE)



Starting a Community-based Natural Resource Education Program

Strategies for Authentic Community Engagement

Patrick Willis

Oregon State University Extension
Portland, Oregon

Susan Cross

Environmental Educator
Tucson, Arizona

Almost every school has a natural area very nearby. It could be that marshy place behind the school, the little stream or “ditch”, the unmowed field, or the patch of woods beside the parking lot. These natural areas are often overlooked as learning sites, or if they are recognized, they are not acted upon because we do not know exactly how to start using them. The intent of this article is to provide educators with a platform to begin natural resource programming at sites near their school. Philosophical as well as pragmatic information is shared to provide both intrinsic and conceptual connections for educators to engage youth in authentic community involvement in the natural resources. This information is intended to offer support, ideas, encouragement and new ways to think about what we do as educators. It is meant to inspire you and move you to action.

It is our hope that through programs that link schools with natural resource areas, citizen awareness and community involvement will increase. The vision is for schools to become vital resources for their communities and that students, through real world projects, become active participants in their society.

Why connecting students with natural resource areas have educational benefits

A strong connection to the larger world community starts with an intimate local understanding. Children can apply knowledge of systems and concepts learned in a personal experiential world to global problems. Once they grasp the value and function of the forest, wetland, grassland or watershed in their school backyard, it is a short step to awareness about other watersheds or wetlands that they see in their own community, or to a concern about global environmental issues they hear about in the media. A personal stake in the lives of their wood ducks, red-tailed hawks or metamorphosing moths becomes an intrinsic understanding of the richness present in all ecosystems. A program such as this taps the innate desire of children to care for their world and allows them to do just that: to help, to clean up, to make better homes for wildlife, to gather information to guide decision making. It empowers them at the local level and gives us all a much needed assurance that active informed citizens can and DO make a difference.

Students involved in active hands on programs also feel better about

the way they are learning. The students report that they have more fun and feel like they are learning things that they didn't know before. Teachers say that their students really retain more of what they learn and can apply the learning in other situations.

In these times of being overwhelmed by environmental problems on every front, it is easy for people to lose their sense of hope and to feel defeated in the face of such looming concerns. This can be especially hard on young people, who have been inundated since early childhood with the magnitude of our planet's problems. Working with young people in settings where they can impact an area in a positive way is a powerful tool to help them realize the healing potential they have as caring human animals.

Getting Started

Many educators find the idea of starting a program such as this to be intimidating...And it can be!! Teachers already have heavy workloads. It often feels as though there isn't enough time in the day to prepare for classes, grade the day's papers and still get to eat lunch! The extra work required to implement an on-going, in the field/ community program can indeed loom large in the picture and cause many people to give up before they even begin.

Sites and Site Selection

The initial step is to find a site around which to center your program. The site is an integral part of the program because it becomes the focal point for community involvement. Because of time limitations in our schools, the closer the site is to the school door the better. The site doesn't need to be huge or elaborate. It can be the little ditch on the school grounds, it could be the marsh on private land across the street, it could be the little patch of forest left in an urban development, it could even be something that you restore or develop on your own school grounds. The ability to visit the site frequently outweighs any lack of “wildness.” In the reality of today's shrinking school budgets, transportation money is drying up. A site within walking distance solves this problem, and makes all logistics easier.

After you determine what site or sites you may be able to use for your program you will need to find out as much as possible about the site. In an ideal situation, this entire process can be done by your students. You will want to find out who owns the property. Who is in charge of managing it? Can you use the site as a study center? Are there special things about the site? Is it a protected area? How will you minimize the impact of your student's presence at the site? Get maps of the local area. Talk to homeowners associations and neighborhood businesses. Can you do enhancement work there? How could the site be improved for wildlife or educational uses? What kind of information would it be useful to have about the site? Who might best use that information? What is the history of the site? Are there any cultural values?

When you find out who is involved with your site you may be surprised to learn that those people need your student staff to collect information as much as you need them for their expertise. Some sites may be in private ownership and you may have to seek permission to use the land as a study site. This process in itself can be quite a learning experience for your students. Many schools are lucky enough to have natural areas on their own grounds, but you may still need permits to make changes. Each place has its own unique combination of political circumstances just as each place has its own unique natural character. Let the problems you encounter become learning challenges. Help your students learn about how the world outside the classroom operates. The problems you face will lead to the development of valuable life-long learning skills.

Changing Teacher Roles

In this kind of program the teachers may have to recreate the way they interact not only with their students but also with their peers and administrators. You may find yourself much more of a coordinator and learning manager than a deliverer of set curriculum. You may find that the most important function you can serve is finding access for your students to partnership opportunities with other adult instructors. You may spend your time locating project ideas, equipment and funds rather than directly teaching lessons. You may need to spend time on the phone coordinating an event or writing proposals to fund your program's newsletter. It is not the role you are probably most familiar with and it can seem like a leap into the unknown. It can also lead to personal growth and a great deal of fulfillment as your program blossoms.

Changing Educational Models

Everyone involved in education agrees that our current model doesn't seem to be working. Students are not entering the adult world prepared to meet the challenges of a rapidly changing and complex world. Demand for people who can work cooperatively, be self motivated learners and understand complex systems is growing in every field of endeavor. Schools somehow need to provide their students with opportunities to learn the skills of citizen action, exposing them to processes and systems both natural and social. Students need to have real world experiences with real world consequences. Programs such as this can offer those opportunities. Schools could be in the business of finding community needs that aren't being met. Schools could become a resource for the community instead of being viewed as a drain on resources. The school, through a program, could provide opportunities for students to interact with their community and society using meaningful projects that need to be accomplished. A great deal of excitement and motivation builds around an idea when students are producing work for a real world audience with a real world purpose. Think of the schools as a pool of highly educated leaders with a large motivated work force that just needs to be focused and applied to the needs of the community!

The Time Issue

Time, or the feeling of never having enough time, is a stumbling block in the initiation of Community-based programs. How much time should be allocated for activities related to the project? How will the teachers involved find time to organize materials, field work and special events? Is one day each month enough field contact? Perhaps one day each week may be needed. How will this program fit in with music, social studies or math? Is a 45 minute period enough time to get out into the field, do a study, and then get back? All these time questions are quite valid and need to be explored. But our attitudes, those hidden assumptions behind our time feelings also need to be explored. How did our school day come to be fragmented into 40-45 minute blocks? Does it have to be that way? Can our scheduling be more flexible without a loss of quality?

Using a thematic or project based approach to interweave your Community-based program into several subject areas can increase the amount of time spent in the field or community. Math can serve to interpret collected field data. Art could be the designing of logos or signs for the site. Music could involve songs written about the area and performed at a school wide celebration. Pursuing permission to have use of a site, or to make changes at a site, could serve as lessons in political science. Keeping journals or producing an informative newsletter is a natural for writing and language.

You Don't Need to be an Expert

A general fear many educators experience is that they will be asked about something they don't know. When beginning a program that involves a natural resource area there will be tons of things you don't know, and that will be part of the excitement. As teachers we have the feeling that we should always be able to answer every question like an expert; but we may want to consider that the "teacher-as-learner" may be a more powerful model than the "teacher-as-dispenser-of-all-knowledge". Being able (and willing) to say, "I don't know, but let's see if we can find out," is a virtue in an educator, not a sin. Think of the program as an opportunity for you and your students to learn about an ecosystem together. Curiosity, enthusiasm and access to good reference materials are far more important than teachers having all the specific information on a particular environment locked away in their brain.

Program Planning for Administration Support

Having the support of your administrator may allow you to arrange for time to do planning for and coordination of your program. With good administrative support and communication, substitute time may be possible for planning, attending development classes or for special field programming for your students. It is almost impossible for teachers to teach a regular load and to just add on another program. Realistically the teacher who takes on a project of this sort will need time and support from their school. Your formal proposal may give your administrator a powerful tool for acquiring a commitment from your school board or district for that extra time you will need.

Project Plan Outline

Another important part of beginning a program is the time spent early on in the planning phase. If you take the time to examine your hopes and limitations, to determine what your goals are and to commit those to paper, you will have come a very long way toward establishing something concrete to build the program on.

The proposal form (Figure 1) will help you create a document you can use to approach school administrators, fellow staff members, and potential partners. It will help you clarify your group's goals and priorities. Your proposal form, or "white paper" describes the vision and who should participate, the benefits of participation, and the benefits to the community. In addition, the project plan often contains language very useful in future grant proposals. Whether your project is simple or complex, you and your group will benefit from taking the time to ask yourselves the questions contained in the form.

Community-based Program Strategies

You have a program proposal, you have administration support, there is building enthusiasm for the project...what do you do next? The following are tested and well established examples about how to generate and sustain interest in the program as it develops.

Create an Identity

Your students and others involved in the project will have much more ownership if the site you have chosen has a name or an identity. It is probably more powerful to have the students highly involved in the process of creating an image for the site rather than having an image imposed on them. You will want to guide them in coming up with an attractive logo that can be used on your future newsletters, correspondences, signs and t-shirts. You may want to consider letting people know what your purpose is in the construction of the name. Are you a resource center, a study center, a technology center, or something

(continued on next page)

Starting a Community-based Natural Resource Education Program

(continued)

else? Is there some special plant, animal or geographic feature at your site that would make a good symbol or icon?

Increase Community Contact

Support for your program will grow if people know about what you are doing. Cultivate a relationship with your local media. Let them know when your students will be out in the field, when you are putting up a sign to identify your site or have special activities planned. Your students can write and publish a website or a simple, informative newsletter about their involvement and successes. Invite partners and potential donors or other influential people in your community to observe what your students are doing. People often like to jump on the bandwagon of an interesting project and partnerships can develop from public knowledge of the program.

Create a Student Leadership Component in Planning

You can plan yourself silly, but if the project doesn't have student ownership and support your plans will soon sink with apathy or resistance. Students need to feel like it is their program. They need to be active citizens in the process right from the beginning. Having student representation at the planning level will lend legitimacy to tasks proposed for students to accomplish. It can be a powerful growth experience for the students involved.

Spend Some Time on Aesthetics

If you think back to your own interest in the natural world it is usually linked very closely with a sense of place. Allow your students time in their special environment to observe the natural world in a holistic way. Love of the natural world doesn't come from performing pH tests. It comes from watching spiders build their webs or resting in the sun in tall grasses and listening to a killdeer sing. Set up intentional aesthetic activities for your students early on in the program. You'll end up with strong advocates for the site. Emotional responses to the environment are not irrational responses; and emotional ties to place are often the best motivations to action!

Approaching Resource People

Depending on your circumstances you may want to use resource people as special advisors or you may want to form partnerships with one or more of them that includes actually working on projects that they are involved with. Resource people as guest speakers in the classroom probably has limited value. If you can arrange for your students and staff members to work directly with resource people it can lead to much larger rewards for everyone. Because most resource people have many duties in their job descriptions, they are busy people. If you can approach them with detailed specific needs and directions about how they might help you with their expertise, their time will be used much more effectively.

Funding Ideas

Money always seems to be a limiting factor in program development, but don't let a lack of funds discourage you. Many activities can be done without much money. Exploring and getting to know the site, doing plant and animal inventories, making maps, observations of seasonal changes or planning an awareness celebration for the school or community can all be accomplished with a minimum of funds.

Keeping the community and the media aware of your plans and goals can lead to opportunities for donations from businesses

such as volunteers, money, equipment or supplies. Parent/Teacher organizations can be a source of funding as well as a source of volunteer helpers. Motivated students can also be excellent fund raisers using all those time proven school fund raising techniques. You and your students may also be able to come up with a product associated with your site such as t-shirts with a logo, wildlife art or photography from the site, or some other product or service. Cities or counties may be able to donate time or materials. Agencies sometimes have funding for plantings or restoration work. Cities and agencies may be able to provide tools and advice from staff people.

There is always the potential for grant writing as a source for funds. This approach to raising money is often available but comes with the fears of how to get started, who to ask, what to say and, of course, finding the time to write the grant. Another factor to consider is the fear of getting the grant. Most granting organizations require you to do what you promised in the grant! This is where your program plan becomes a valuable resource. A good plan is the first step in approaching a funding source. As for who to ask for funding, the list of possibilities can be overwhelming. Start with a few inquiries with local agencies and ask others who have written grants. Most people are very supportive and helpful. If you stay with a reasonable

Figure 1

Project Plan

Project/Program Name/Title:

(The name of a project gives it a life—spending time on a catchy name is time well spent)

Community-based Program Lead Partner:

(This is usually your school/classroom, etc.)

Mission Statement:

(A mission statement should be 7-10 words in length and fit on t-shirt. This way everyone can remember it)

Program Impact

(What will be the impact of this program—what will be different after it is completed?)

Location(s):

(Name of the site, brief description and accessibility)

Educational Goals and Objectives:

(What key concepts will you evaluate? How does this program help reach local/state education goals such as the Common Core or Next Generation Science Standards?)

Brief Description of the Program:

(Describe how/what the project will benefit and why. What changes or improvements will be the end result?)

Program Specifics

Current leadership or project manager:

Expected / desired partners:

Expected audience:

Your expected role:

Steps for meeting program goals and objectives:

Specific needs (ideas, information, equipment, funds, etc.):

Expected outcomes (be as specific as possible):

Program timeline:

Contact information:

plan, your program will blossom with the assistance of a grant and not degrade into unfulfilled dreams.

Field Techniques

Many teachers feel uncomfortable taking their students outdoors. It is a much less structured setting and chaos can quickly ensue. A bad field experience can leave a leader longing for those wonderful rows of desks back in the building. Field study does require some special skills and planning, but the harvest you and your students reap is rich!

There are some risks being in the natural world, from twisted ankles to bee stings; but the possible rewards far outweigh the risks. Safety is an important concern in the field. Make sure you have a first aid kit with you and know what to do in an emergency. You may want to check on your school's insurance policies for field settings. Many risk factors can be greatly reduced by explaining clearly to your students what your expectations are for behaviors in the field.

Setting the same kind of clear behavior expectations for the field as you have in your regular classroom is essential. Let students know that you have boundaries that they must respect, being sure to be clear about what areas are off limits and why. Have set work areas for each group. It is often easier to explain tasks and rules inside the normal classroom setting before you set off into the outdoors to do your field work.

Spending a bit of time on field ethics is a valuable thing. Students don't automatically know that they need to be quiet, to not disturb plants and animals unnecessarily, or that horseplay is not acceptable. Most of the time when we allow students to be in the out of the classroom is for unstructured play. It takes some training to get the message across that outdoors doesn't always mean recess.

Group size is another important factor in the success of field work. Small groups function much better than large groups. Have a job for everyone. Having tasks that keep the students focused brings the potential for misbehavior down. If you are the only leader, use a "hub" approach. Have a central location from which you disperse and gather your student work groups. It is also important to realize that not all students need to do everything. Often it is better to have students become the "experts" at a certain job or subject area and to share their findings and knowledge with the others.

Minimize Your Impact/Earth Ethics and Etiquette

One of your most important roles in the program is as a role model for student behavior. Your actions speak much louder than your words and children will treat the environment much the same way that you do. This can be an enormous opportunity to teach outdoor ethics without ever saying a word. Your decisions about collecting, the way you treat plants and animals in the environment, and what your expectations are for your student's interaction with the site are all powerful messages about how to treat the planet. Children should be engaged in decisions about when, why and how to collect samples. Is it appropriate? Is it necessary? What valuable thing will we learn from the experience? Examine ways in which your visits impact the natural world. Are there ways that we can reduce those impacts and still learn the things we want to? How long lasting are our disturbances? Bringing these kinds of questions into the consciousness of your students will help them to form and examine their own beliefs on these issues.

Conclusion

Change will only come to our systems through the efforts of individuals. Though change is difficult and frightening, it is also empowering and growth producing. It is up to you to try things out, to experiment with ideas and to not be afraid of failure or of success. BE ALERT! This approach to student/citizen involvement can become a self-perpetuating system...a machine that may be difficult to stop once engaged!! Don't be surprised when you become the center of excited interest emanating from your students, their parents, your colleagues and administrators! We owe it to our students and community to try!



Pat Willis is an Extension Educator for Oregon State University 4-H in Portland.

Susan Cross is an environmental educator currently living in Tucson, Arizona.

Master of Science Environmental Education

Creating Leaders in the Field of Environmental Education

A field-based interdisciplinary program focused on developing, implementing, and managing environmental education programs.

Located in Ashland, Oregon and accredited by the North American Association for Environmental Education.

Additional Certifications

- Master of Arts in Teaching and an Oregon Preliminary Teaching License
- Certificate in Nonprofit Management

Graduate assistantships are available.

Apply Today!
Application deadlines are:
April 17, 2017
January 16 and April 16, 2018

SO Southern OREGON UNIVERSITY

ENVIRONMENTAL EDUCATION
SOUTHERN OREGON UNIVERSITY

www.sou.edu/ee

This essay is from the blog page on the Sustainability in Prisons Project website. It is one of many entries related to the environmental education projects taking place at correctional facilities in Washington and Oregon.

Sustainability & Justice

by Jonathan Bolden, Roots of Success Instructor, Coyote Ridge Corrections Center

Photos by DOC staff

Too often we assume that the concept of sustainability is exclusive to the realm of environmental justice. That somehow the idea of conserving natural resources, protecting endangered species and habitats, or reducing our energy consumption will automatically result in a healed earth.

This assumption overlooks the most important factor in actually employing sustainability approaches and practices to meet the growing demands of environmental justice—the human being.

Transforming our earth requires the transformation of people, more specifically, the transformation of people's attitudes and behavior, as it relates to the environment. The greatest potential and need for this change to occur exists within prisons.

Society has condemned and confined prisoners to prison because of their unsustainable (criminal) behavior. Their behavior has wreaked havoc and devastation within communities similar to the unsustainable human behavior that has led to the environmental crises we currently face. In this sense, the sustainability concept not only applies to radically improving our relationship with the earth and environment but also in our effort to redeem, reform, and rehab[ilitate] prisoners.

Einstein once said that the current dilemmas we face could not be solved at the same intellectual level in which they were created. We are going to have to revolutionize our thinking in how we establish responsible environmental and criminal justice practices. What better way to achieve this goal than to incorporate the solution of one with the other.

The Sustainability in Prisons Project (SPP) and Roots of Success program (Roots) puts this wisdom of Einstein into practice. These types of programs provide prisoners with the necessary skills and experience to successfully reintegrate into society and find employment in the green economy.

At Coyote Ridge Corrections Center (CRCC), SPP creates programs and opportunities for prisoners to engage in



Program supervisors and inmates participate in a western pond turtle release project at Cedar Creek Correctional Facility in Washington.

sustainability activities. For instance, the sagebrush project allows prisoners to acquire experience with the native plants of Washington State. The sagebrush plays an essential role in the eastern Washington landscape, as it provides numerous species with food and shelter. If the sagebrush were to become threatened or even extinct, this would have serious implications for the Washington State wildlife.

In addition, the Roots course empowers prisoners with its environmental literacy curriculum. While it builds environmental understanding, it also focuses on building the individual student. This means students are challenged to assess their attitude and behavior toward the environment and by extension their attitude and behavior toward society. By introducing the green economy and green jobs to students, Roots highlights the opportunity for students to become gainfully employed and be a veritable solution to our environmental problems.

Ultimately, what we do today determines our tomorrow. SPP and Roots are planting seeds that are sure to bear the fruit of sustainability and justice. So let us take a cue from these programs and dig our hands into the dirt to cultivate a better future.



Jonathan Bolden was certified as a Roots of Success instructor in May, 2015. Since then, he has co-taught the environmental curriculum six times.

Sustainability in Prisons Project (SPP) is a cooperative program of The Evergreen State College and the Washington Department of Corrections that brings science, environmental education, and nature into prisons. In collaboration with local scientists and students, inmates are involved in conservation and sustainability projects including beekeeping, wetland ecology, prairie conservation, and more.



NEW RESOURCES FOR THE TRAIL AND CLASSROOM

Acorn Naturalists' catalog features hundreds of new tools for educators, naturalists, and interpreters. Call for a free copy of our latest catalog or visit our website.

180 Prospect, Ste 230
Tustin, CA 92780
(800) 422-8886
(800) 452-2802 FAX
acornnaturalists.com



ACORN NATURALISTS®

RESOURCES FOR THE TRAIL AND CLASSROOM

Dawn Publications

Connecting Children and Nature since 1979

A Moon of My Own

Written by Jennifer Rustgi
Illustrated by Ashley White

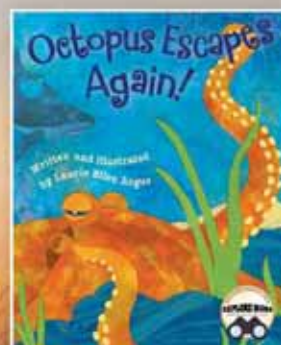
A young girl takes an enchanting adventure with her faithful companion, the Moon. Portrayed in silhouetted art, she visits wonders around the world, while the Moon cycles through its phases.



Octopus Escapes Again!

Written and Illustrated by
Laurie Ellen Angus

An octopus displays a dazzling array of defensive devices as it meets many hazards in its search for food. Additional information highlights the fascinating behaviors of these intelligent animals.



Over in the Grasslands: On an African Savanna

Written by Marianne Berkes
Illustrated by Jill Dubin

The African grasslands teem with classic animals. Children will "stalk" like lions, "squirt" like elephants, and "slurp" like giraffes, as they learn about the animals. Along the way they count the babies, one to ten.



Phone (800) 545-7475  www.dawnpub.com

E.E. Resource Guide

A selection of environmental education materials, resources and opportunities that you should know about



New Roots of Success instructors and staff sponsors at Airway Heights Corrections Center pose with Master Trainer Eugene Youngblood, far left.

Roots of Success Environmental Literacy Curriculum

Roots of Success is an empowering educational program that prepares youth and adults who come from communities heavily impacted by poverty, unemployment, and environmental injustice for environmental careers and to improve conditions in their communities.

The program is used in high schools, youth programs, job training programs, prisons, jails, juvenile facilities, reentry programs, community-based organizations, and government agencies. Most notably, it is currently being used in the Sustainability in Prisons Program co-founded by The Evergreen State College and the Washington Department of Corrections.

Programs use Roots of Success because the teaching approach and materials engage youth and adults that have struggled in school, strengthens their academic and professional skills, increases their environmental literacy, prepares them for over 150 careers that can provide them and their families with economic security, and inspires them to become activists and leaders who can improve conditions in their communities and in society more broadly.

A mere glimpse of the success of this program can be seen in two essays from the

Sustainability in Prisons Program website on pages 31 and 40 of this CLEARING.

Learn more at <https://rootsofsuccess.org>.

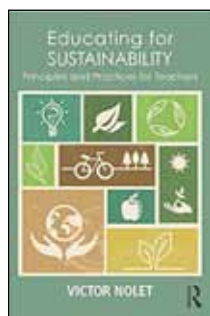
Educating for Sustainability

Written by Victor Nolet, professor in Secondary Education at Western Washington University, *Educating for Sustainability* presents fundamental principles, theoretical foundations, and practical suggestions for integrating education for sustainability into existing schoolwide systems and programs.

Designed for teachers and teachers-to-be at all grade levels and across the content areas, the focus is on professional practices and pedagogical approaches rather than specific topics often associated with sustainability. Directly grounded in K-12 classroom practice, this book presents useful and realistic information for teachers looking to reorient their work toward

sustainability and help their students develop new thinking and problem-solving abilities.

You can find it on Amazon.com.



Grades 6-8

The Nature of Water Power

The Foundation for Water and Energy Education (FWEE) offers a hands-on science curriculum for grades 6-8 that explores the scientific and social links between the hydrologic cycle, rivers, and electricity.

Broken into six units, students begin by inquiring into the nature of water and the hydrologic cycle. They then explore the

physics of how moving water can be used to generate electricity, the environmental impacts of harnessing this energy source, and comparing the costs and benefits of hydropower to other energy sources.

As a thematic and inquiry based curriculum, certain process skills are woven throughout. These include making hypothesis, observing, drawing, creating and testing models, experimenting, recording and graphing data, making inferences, and forming conclusions.

For additional information about the Nature of Water Power or other materials available from FWEE, checkout the website at <http://fwee.org/education/the-nature-of-water-power/>



Citizen Climate Lesson Plan: Grades 9-12

This thoughtful and thought-provoking curriculum provides a vast array of information, teaching activities, and resources for learning about and understanding the issues related to climate disruption.

Produced by the Will Steger Foundation, the curriculum is available for free download from http://www.gci.org.uk/Documents/Steger_Foundation.pdf

High school forestry curriculum updated and available

The Oregon Forest Resources Institute (OFRI) high school curriculum,

Inside Oregon's Forests, has been updated to include additional lessons on forest history, and is available to order or download on LearnForests.org. Created for natural resources classes, it includes 12 weeks of lessons covering the history of Oregon forests; tree biology and forest types; the environmental, social and economic importance of forests; forest management; wildfire; and more.

The curriculum comes as a 316-page, spiral-bound book. The package includes lesson plans, labs and other activities, plus a variety of related documents and videos. It was assembled by a professional curriculum writer and conforms to standards for math, science and literacy

For more information, contact Julie Woodward, 503-807-1614.



Across the Spectrum: Resources for Environmental Educators

This downloadable collection of resources, perspectives, and examples will help nonformal environmental educators learn more about the field of EE, access resources, and gain skills to improve their practice and, over time, build a community of practitioners to advance the field. The document covers the foundations of EE, strategies, trends, and tools.

http://www.naaee.net/sites/default/files/publications/eebook/EEbook_download.pdf

Drown Your Town

Through Southern Fried Science, you can explore sea level rise and the impact it could have on cities around the world utilizing real-time interactive GPS modeling.

Want to see what Seattle, Vancouver or Portland, would look like with a 3 meter (or more!) rise in sea level? A step-by-step do-it-yourself guide is available at <http://www.southernfriedscience.com/how-to-drownyourtown-a-step-by-step-guide-to-modelling-sea-level-rise-in-google-earth/>

Mitigating Microplastics: A Middle School Curriculum

A new middle school science curriculum from Oregon Sea Grant guides teachers and their 6th- through 8th-grade students through the growing threat to our oceans posed by microplastics – tiny particles of plastic which wind up in the sea.

The new, 70-page curriculum, compiled by Marie Kowalski, a recent graduate of OSU's Marine Resource Management program in collaboration with Oregon Sea Grant's marine program manager, Tracy Crews, includes three lessons designed to engage students with the issue by analyzing the problem and investigating possible solutions.

The lessons include opportunities for student inquiry, as well as collaboration and engagement with real data collected by researchers working in the field. Each lesson includes an estimated length, which will vary by classroom. The entire curriculum is designed to take about one week, but may be extended by including a project at the end of the curriculum.

The curriculum is available, free of charge, as an accessible .pdf download from the Oregon Sea Grant Website.

The Garden of Wisdom

As professionals who care passionately about the world around us, environmental educators are living through some challenging times. Now there is good news about something real that you can do to help bring about positive change in a troubled region while fostering a deep connection between children and nature. In recognition of its promise to transform the lives of many people, this project has been awarded the National Storytelling Network's prestigious Brimstone Award for Applied Storytelling.

For the past ten years, environmental educator Michael J. Caduto—co-author of the award-winning *Keepers of the Earth*® series of books and author of *Earth Tales from Around the World* and *Catch the Wind Harness the Sun*—has been directing an environmental education and storytelling project in the Middle East. The Stories for Environmental Stewardship Program involves more than 50 individuals and

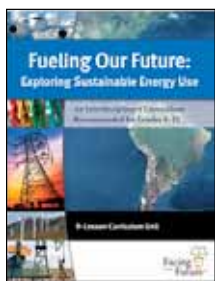
20 organizations from Egypt, Israel, Jordan, Lebanon and Palestine. This courageous community of professionals shares a passion for conservation and for encouraging children to understand and cherish the natural world.

The Stories for Environmental Stewardship Program is now ready to publish its first book: *The Garden of Wisdom: Middle Eastern Stories for Environmental Stewardship*. Artists and photographers from the Middle East are illustrating this anthology of children's stories. This book will also become a steppingstone to an environmental education curriculum that reveals how nature is the root of a shared connection to the land that binds all peoples as one.

The author is currently raising funds through ShineFund to publish the book. When published, proceeds from sales of the book will be used to offer books and small grants that support the work of environmental education and conservation organizations from throughout the region.



Visit the Garden of Wisdom campaign at <https://shinefund.org/funds/96> to watch the video and find out how you can help to make it possible to publish these inspiring stories.



Fueling our Future: Exploring Sustainable Energy Use.

Boost students' energy literacy through Facing the Future's *Fueling*

Our Future: Exploring Sustainable Energy Use. Consisting of nine lessons and one performance-based assessment, the book is aligned with the U.S. Department of Energy's essential concepts for energy education.

EE Guidelines for Excellence

In 1993, the North American Association for Environmental Education (NAAEE) developed a series of guidelines that set the standards for high-quality environmental education. Each of these publications was developed by a diverse team of professionals, and each has gone through a substantive review by thousands of professionals prior to its publication.

Each publication establishes guidelines for the development of balanced, scientifically accurate, and comprehensive environmental education programs.

These and other NAAEE publications are available to order from the NAAEE website at www.naaee.org.

Adapting to a Changing World

In the module *Climate of Change* from Carleton College's InTeGrate (Interdisciplinary Teaching about Earth for a Sustainable Future) program, students explore differences between climate change and climate variability, examine the ENSO system as a pattern in time and space, and examine glacial climate records as part of a role-playing game. In the activity, *Adapting to a Changing World*, students assess individual and national opinions on climate change and explore strategies that communities are employing to adapt to aspects of climate change already affecting them in addition to those likely to affect them in the future.

http://serc.carleton.edu/integrate/teaching_materials/climate_change/unit6_cover.html

NatureBridge

NatureBridge provides hands-on environmental field science education for children and teens through National Park-based overnight field science programs. Parks include Channel Islands, Olympic, and others. NatureBridge provide scholarships to more than 35% of their participating schools in order to reach more students from underserved communities. Sign up for email updates, download lesson plans, and more.

<http://www.naturebridge.org/>



Reaching Out to Latino Audiences

Educators are working to find ways to reach youth and adults in the U.S. from diverse backgrounds. Check out this program from Environment for the Americas, using an Outreach Toolkit and multilingual activities for teaching about birds.

www.birdday.org/connectingcultures/connecting-cultures-study

Southern Fried Science

Southern Fried Science is a website designed by scientists to discuss marine science and conservation as they explore the oceans. Writers are practicing marine scientists at many different career stages, whose specialties range from local fishing communities to the deepest hydrothermal vents and everything in between. Topics include the greatest threats facing our ocean and our planet as well as the latest scientific discoveries and the most frightening, fascinating, and bizarre creatures that call the ocean home.

www.southernfriedscience.com

Stepping Stone Grant

These grants for Grades K–5 help fund teacher-initiated projects that foster an arts-infused approach to inquiry-based learning and emphasize a holistic methodology that addresses all learners through creativity and the incorporation of the arts as a fundamental tool for learning. The deadline for application is April 30, 2017.

<http://lilysarahgrace.org/grants>



Wisdom of the Elders Climate Change Documentaries

Wisdom of the Elders has completed several climate change films with Tribes. The first in their series is the "The People of the Whale," featuring the Inupiaq people of Alaska.

The Climate and Native Wisdom Documentary Film Festival will be held April 16, 2017 in Portland, Oregon.

<https://vimeo.com/122569798>

<http://www.wisdomoftheelders.org/>



Increasing Inclusion in School Gardens

The garden education team at the School Garden Project of Lane County (Eugene, OR) set out on a mission to increase inclusion in school garden settings. With the financial support from the Coeta and Donald Barker Foundation, they met with local special education teachers, received training in inclusion practices and Universal Design, and worked collaboratively to re-think and revise teaching practices, curriculum, materials, and garden designs to help push the edges of school garden education. The resource packet is a compilation of the information learned through this 12-month project. This is a free resource and you are invited to read, download and share it within your community.

Download the complete packet: *Increasing Inclusion in School Gardens Resource Packet* at <https://www.schoolgardenproject.org/resources/>



Marine Debris STEAMSS

Marine Debris is a complex, real-world problem which can be addressed through the lenses of several

different academic subjects. This curriculum integrates the subject areas of Science, Technology, Engineering, Art, Math, and Social Studies (STEAMSS), and focuses on experiential hands-on activities for students in grades 4 through 12. The collected teacher-tested resources enable educators to create in-depth, project based learning (PBL) units, work with teaching partners across disciplines, and find classroom and field experiences that will help students explore the issue and impacts of marine debris and engage in stewardship actions.

<http://oregoncoaststem.oregonstate.edu/marine-debris-steamss>

Anecdata

Anecdata is a free online portal for environmental citizen science projects. Researchers can share data from Excel, Google Earth, or ArcGIS and invite others to create online profiles and help with data

collection. Check out the projects section, which

features current Anecdata projects from around the globe, including king tide projects, phytoplankton monitoring, and more.

<https://www.anecdata.org>

Wild Voices for Kids

Wild Voices for Kids (WVFK) is a curriculum-linked environmental education program engaging local experts in the education of K-12 students on the land, history and culture of the Columbia Basin region.

Via an online database, teachers from six school districts across the Columbia Basin can choose from 113 educational experiences based on their grade level, subject and learning goals.

Whether it's an in-class presentation or field-based activity, WVFK works with Community Educators to support the design and delivery of place-based programs inspiring a deeper interest in environmental science. In facilitating these interactive, hands-on learning opportunities, WVFK motivates youth to become engaged with regional and global conservation issues, and to become stewards of the natural world around them.



Ocean Literacy Webinars

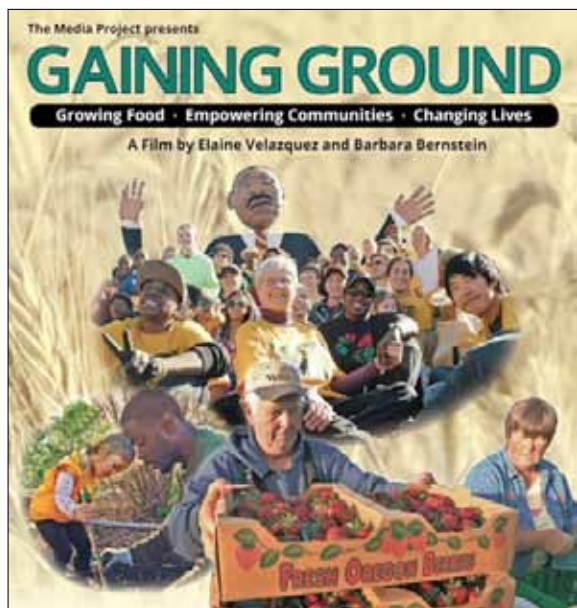
Three webinars from NMEA's Ocean Literacy Committee have been archived for viewing online: Organizing for Ocean Literacy - Implementation at Different Scales; Exploring and Applying the Ocean Literacy Scope and Sequence for Grades K-12; and Aligning the Ocean Literacy Framework to the Next Generation Science Standards.

<http://www.marine-ed.org/blogpost/1067768/262768/Guest-Blog-by-the-Ocean-Literacy-Committee-Join-our-winter-ocean-literacy-webinar-series>

NGSS Climate Education with the CLEAN Collection

The Climate Literacy and Energy Awareness Network (CLEAN) Collection is a digital library of free climate and energy learning resources, including activities, videos, short demonstrations, and guidance for teaching.

http://nagt.org/nagt/profdev/workshops/ngss_summit/CLEAN_res/index.html



Film: Gaining Ground

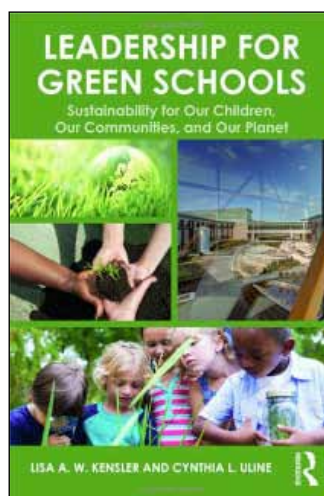
The negative impacts of industrial agriculture are everywhere. The increasing threat of genetically engineered food and the destruction of local communities can make us feel powerless to effect change. GAINING GROUND, a new documentary film by Elaine Velazquez and Barbara Bernstein, is an intimate view of rural and urban farmers embracing this challenge.

GAINING GROUND presents the personal stories of farmers and activists confronting the challenges of feeding their local communities sustainably grown food. The documentary interweaves experiences of Urban Tilth's farmer-activists transforming corners of Richmond, California's inner city food desert into vibrant community gardens; Sun Gold Farm, a small family farm in rural Oregon converting from commodity dairy to sustainably grown produce and Stalford Seed Farms in the Willamette Valley transitioning from growing grass seed to organic grains. As the film explores these paradigm shifts, it personalizes class, gender, race and environmental justice issues by rooting them within narratives of compelling individuals. While the film is sober about the obstacles to creating change, it points the way toward hope.

View the GAINING GROUND trailer: <http://www.gainingground-movie.org>

"Gaining Ground is a warm and wonderful film that journeys into the future of food and agriculture. Hopeful, critical, poetic." —Bill Bigelow, Curriculum Editor, Rethinking Schools

BOOK REVIEW



Leadership for Green Schools

Kensler, L. A. W., & Uline, C. L. (2017). *Leadership for green schools: Sustainability for our children, our communities, and our planet*. New York: Routledge.

Reviewed by William Sterrett

In their new groundbreaking book, *Leadership for Green Schools: Sustainability for Our Children, Our Communities, and Our Planet*, authors Lisa Kensler and Cynthia Uline (2017) offer a compelling case for re-thinking student and educator success in a powerful manner that can bolster learning, collaboration, engagement, and success through an emphasis on whole school sustainability. By clearly articulating for current and aspiring school leaders what it means to “go green” in the school setting, Kensler and Uline encourage the reader to gain a deeper understanding of the vital role of leadership in sustainability efforts, and how such a role will transform the way we define our vision and mission, design and care for our school grounds, plan for teaching and learning, manage budgets, develop our teachers, and involve the greater school community. In an era where test scores and budgets often serve as markers for the well-being of a school, *Leadership for Green Schools* offers a larger, more dynamic approach in, as the authors offer, “bringing education into the 21st century to meet our students’ needs, our communities’ needs, and our planet’s needs” (p. 40). Leadership is imperative in this work, and this book strategically ap-

proaches this, laying the groundwork with a comprehensive approach focused on sustainability, learning, and engagement.

Part One examines the notion of whole school sustainability in terms of underlying values and principles that guide learning and leading in green school communities. Part Two explores the importance of school-community relationships, particularly the “complex interdependencies” that hold human and natural systems, such as the school building and grounds, together in a meaningful way that can impact students and teachers. Finally, Part Three offers guidance for purposeful and engaged learning that provides insights regarding the work of principals and teachers in educating for sustainability. This book, while serving as an extensive resource and guide, also provides the reader with multiple perspectives from the field and reflective questions that could ignite a book study or faculty staff development session.

For example, the reader might relate to Angela, a K-8 principal who is seeking to integrate outdoor gardening and the arts by fostering critical thinking and creative problem solving skills for her students. Perhaps the reader will sympathize with Tom, the learning leader of a large comprehensive high school grappling with conservation and innovation priorities despite working in a typical 1960’s-era building. Or maybe the reader will identify with the example set by Hood River Middle School in Oregon, where students in this diverse school learn from their building (where the structural and mechanical inner workings of the school are readily visible to students) and their community (growing their own produce and working with the local farmers market). Throughout the book, the reader will find reflective discussion questions and resources at the end of each chapter that challenge the reader to consider how, for example, “would you plot your classroom, school, and/or district” in light of ecological and democratic principles? Or, after seeing an embedded video clip of exemplars such as the Green School of Bali in Indonesia, the reader will reflect on his or her own learning community, vision, mission, and potential areas for growth and innovation.

This timely book is certain to jumpstart much-needed discussion—and action—in principal book studies. Learn about the Green Schools National Network and their guide for greening schools; the Green Schools Alliance which serves as a coalition of educators and schools; and the U.S. Department of Education Green Ribbon School (ED-GRS) recognition that has highlighted the successes of schools, districts, and universities who have successfully promoted sustainability, health and wellness, and environmental education. The authors clearly understand the current state of educational leadership and the challenges real-world principals across the educational spectrum face in doing this work. *Leadership for Green Schools* is not just tantalizing theory that will cause the reader to wistfully think of far-off “dream schools,” but it will allow the reader to realistically impact their own learning communities by gaining new insights and tools to apply in an ever-changing world of innovation and change. Teachers, principals, superintendents, and aspiring educators at all levels will benefit from this work. *Leadership for Green Schools* will serve as a tremendous addition to leadership preparation programs seeking to empower the next generation of school leaders. And it will be a guide for educators seeking to transform their learning communities by integrating new habits and strengthening sustainability efforts in teaching, learning, and leading.

*William Sterrett is a former elementary principal and middle school science teacher and now serves as associate professor and program coordinator at the University of North Carolina Wilmington. Sterrett is the author of the ASCD book *Insights into Action: Successful School Leaders Share What Works*. He can be reached at sterrettw@uncw.edu.*

This review was reprinted from *Green Schools Catalyst*, a new online publication from the Green Schools National Network that focuses on green schools, and is geared toward making healthy, sustainable K-12 institutions the rule and not the exception.

<http://greenschoolsnationalnetwork.org/gscq/>



naaee
North American Association
for Environmental Education

In partnership with

para la
Naturaleza

SAN JUAN
PUERTO RICO

naaee.org

46TH ANNUAL CONFERENCE

October 18-21

14TH ANNUAL RESEARCH SYMPOSIUM

October 17-18



Call for Presentations

Deadline: April 10, 2017

**Make the CLEARING
website a part of your
online resources!**

The site contains articles from past issues, additional resources and links to information found in the printed articles, and opportunities for you to participate in discussions of environmental education teaching topics and issues.

Check it out at <http://www.clearingmagazine.org>

GRADUATE POSITIONS AVAILABLE



McCALL OUTDOOR SCIENCE SCHOOL

University of Idaho
College of Natural Resources

**LIVE, LEARN
AND TEACH**
on Payette Lake in the
Idaho Rockies

**EARN A MASTER'S
DEGREE**
in 12 months

**GAIN 13 WEEKS
OF EXPERIENCE**
teaching STEM education
to northwest K-12 students

**BECOME A
LEADER**
in the field and in
the classroom

www.uidaho.edu/moss

For more information contact Leslie Dorsey | ldorsey@uidaho.edu | (208) 310-7087

Thank you to our sponsors and advertisers!



We would like to thank the many organizations and individuals who have supported the publication of CLEARING over the years.

They have helped to create a community of educators throughout the Pacific Northwest who share their passion, creativity, and knowledge through the pages of this journal.

Share this issue with a friend or colleague!

See more articles and back issues on our website!

www.clearingmagazine.org