ECOS
Ecologists, Educators, and Schools: Partners in GK-12 Education

Winter Newsletter

ECOS (406) 243-6016 www.bioed.org/ecos **Winter Newsletter February 2005**

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Upcoming Events

March 8-PhD Fellowships for the 2005-2006 school year will be announced

March 31-Teachers' applications are due (See ECOS website for more info)

April 13-ECOS reception for new fellows and teachers

April 3-5-MT Science Fair

April 22-Earth Day

May 16-ECOS In Service Workshop at UM

The ECOS program is sponsored by the University of Montana's Division of Biological Sciences & the College of Forestry and Conservation.

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From the Director: No Child Left Indoors

In 2004, we began an expedition into our own schoolyards. On board were graduate students, undergraduate students, and faculty from the University of Montana, along with K-12 educators from area schools. Our mission: to use ecological research based in our local schoolyards to improve the teaching and learning of science.

…LEARNERS TEACHING

The Ecologists, Educators and Schools (ECOS) program is a journey of discovery. Ten PhD candidates are showing school children and their teachers how to use their local schoolyards and open spaces as laboratories filled with interesting adaptations and interactions, gradients and microhabitats, dynamic populations, patterns of disturbance, and successional changes. New worlds are opening for children and their teachers as they immerse themselves as collaborators on research projects such as habitat restoration, nutrient cycling, sustainable gardens, and biodiversity. For university students, the journey forges new experiences in teaching; experiences they will express as a unique component of their dissertation. Five undergraduate fellows also have begun a voyage into both teaching and learning about ecological research.

…AND TEACHERS LEARNING

For teachers, ECOS is a source to discover new opportunities. K-12 teachers have new channels for collaboration with faculty, graduate students, and undergraduate students at the University of Montana. The schoolyard expeditions lead them into new worlds of data collection and analyses, new teaching pedagogies, and curriculum development linked to the National Science Education Standards. And we are developing new tools for their exploration, like the soon to be unveiled "Guide to the Ecology of the Northern Rockies"!

The ECOS project is a life-time learning adventure; forging new partnerships and educational opportunities for students and teachers. The expedition truly is both the team and their journey.

Carol Brewer, ECOS Director

Botswana to the Bitterroot – Connecting Children to an ECOS Research Fellow by "Bushmail"

While doing field work in Africa, I kept in touch with Florence Carlton School through a radio-linked email service we have in Africa, called "bushmail". I wrote missives once or twice a week, as I was running transects and collecting data on rainfall, animal species (snakes in particular due to a specific request), trees, and leaf shapes for classes that were running parallel experiments. We had discussed experimental protocols before I left, and the kids chose variables to measure. We spent time every week in open inquiry and discussion about everything that linked Africa to the Bitterroots, from weather and water to ungulate and carnivore interactions. In Joyce Shroeder's 4th grade class, I used the "mystery scat" whirl pack with the class, so they could examine the scat and guess what made it. We dissected the scats, and they gave guesses like: "It's lion!" "Moose!" "Mouse" "Elephant"…nope, they were giraffe scat. A group of committed kids gathered around and started really looking closely at how they formed and discovered what they eat. Lots and lots of little acacia leaves, thorn parts, and un-identifiable vegetation. The quality of the questions these guys had always amazed me….everything from life-cycles of acacia trees and leaf formation to blood pressure in foraging giraffes. I believe we grossed out the substitute teacher, but we had a great hour. And one student got to take an intact giraffe scat home for his brother's birthday.

Megan Parker - ECOS Fellow

Megan doing research in Africa

All Season Teaching – Ecology in the Winter

Andrew Harris, Tucker Schmidt, and Rachelle Robertson pull weeds as part of Target Range School's ECOS Demonstration Project

The long Montana winter is usually viewed as a big challenge for outdoor ecology projects, especially for plants. But for weeds there is a lot going on in the winter. Surviving through the winter is important to weeds because it gives them extra time to disperse their seeds, and get an early start on the short Montana growing season. Even though the blossoms may be dead, these weeds continue standing and dispersing. Weeds often have hardy adaptations to help them survive: ability to live in poor soil conditions, modest nutrient and climate needs, drought tolerance, and tenacious roots systems.

What Weed Where?
Observe winter weeds present in and around your schoolyard. After discussing their adaptations for winter survival, each person or pair of students should gather a weed and describe its unique characteristics. Is it an annual, biennial, or perennial? Does it still have its seeds? How might it make it through the winter? What will it look like in the spring? Is it a native or nonnative plant species?

Winter Weed Search
Another activity is a winter weed search. Each pair of students is given a card with instructions to find a weed with a few of the characteristics listed (seeds that stick to clothes, rough stalk, fragile, stalk, seeds that look like an umbrella, seeds arranged in a circular pattern, etc). Students also can be asked to find the smallest and biggest patch of one species and count the number of individuals in the patch. The ECOS natural history guide can facilitate this project by providing photos of what common plant species look like in the winter.

"We've shown a lot of students that science exists outside of their textbooks" - ECOS Fellow

" I truly believe this will be an experience some students will remember for the rest of their life and may influence their career path." - ECOS Fellow

A Lesson that Keeps on Giving

While I was a Teaching Assistant at UM, I frequently found myself standing at the head of a room full of students yammering away about biology and wondering if anybody would remember what I had to say long enough to get a good grade on the quiz at the end of class. The same feelings came back to me the first day I met the 4th and 5th grade class at Sussex. I came prepared to talk to them about my research armed with yucky pictures of bacteria and my box turtle, Julius. Julius was there as a visual aid to help me explain how bacteria that live harmlessly in the intestines of one species can cause illness in another, and some bacteria that live harmlessly in our intestines help us stay healthy. Unfortunately for me, Julius can be quite charming and proved to be more of a distraction than I had anticipated. I left almost certain that the little bit of the bacterial wisdom I had sought to impart had fallen on deaf ears. The following week our team met with the Sussex school kindergarten class for a microbiological experiment in apple washing. Before we started the experiment I initiated a question and answer session. After one boy mentioned that bacteria could make you sick, a little girl, whose sister was in the previous class, raised her hand and very seriously informed him that some bacteria that live in turtles can make you sick but some bacteria that live in people are good for you.

Margie Kinnersley - ECOS Fellow

Sussex ECOS Team

Biomimicry in the Schoolyards with Janine Benyus

On February 4th Janine Benyus, author of the best seller "Biomimicry", helped ECOS fellows and teachers strategize about how to teach students to learn from nature, as opposed to learning about nature. Her research suggests that many of today's life forms have already figured out what it takes to survive on earth. By observing and seeking to understand organisms in their natural habitat, humans can create new innovations inspired by natural processes that minimize negative environmental impacts. A few of the technologies that use bio-mimicry include paints that replace ink with the arch-itectural surface designs that reflect brilliant colors found in some birds and insects and "air conditioned" buildings that mimic the air flow of a termite mound. So what does all this mean for ECOS teams? Benyus urged ECOS teams to use their schoolyard as a place to "learn from the geniuses right outside their door." The Lewis and Clark team suggested researching the filters and cleansers found in ponds to redesign their turtle tank cleaning system.

Using the biomimicry lens to look at nature creates awe, respect and inspiration thereby giving people not only a conservation ethic, but also technologies that take advantage of both human intelligence and nonhuman resilience.

"Using schoolyards and nearby open spaces as outdoor research laboratories, ECOS Teams will develop science demonstration projects related to local ecology and conservation biology."

ECOS Goes into the Schoolyard – Ecology Demonstration Projects

Up in Flames

To burn or not to burn: that is the question. Plants and animals in the Northern Rockies are a product of fire, but in most places people have spent a lot of time and money to prevent flames from playing their historical role. **Big Sky High School's** demonstration project will introduce students to the scientific process with an experiment on the influence of fire. Plots will be located on public land managed by the Department of Natural Resources and Conservation. Three of the plots will serve as controls, and six plots will be burned at varying levels of intensity. During March, pre-burn plant and insect diversity and abundance data are being collected. After the burn, the ground will be partially seeded with native plant species. The students will return to the site periodically year after year to observe how plant and insect succession differs depending on fire intensity.

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A Forest Restoration Outdoor Classroom

Forests in the Bitterroots have been subject to nearly a century of grazing, burning, and logging. The **Florence-Carlton School** grounds have a diverse remnant woodland, including even riparian and wetland habitats. This schoolyard, while providing habitat for native Montana plants and wildlife, also has its share of noxious weeds. ECOS fellows are working with: older students to map the area and build trails; teachers to have the outdoor classroom certified by the National Wildlife Federation as an official Schoolyard Habitat; and the whole K-12 school to restore the land. The ultimate goal is to leave the school with lasting resources to be used by all levels and subject areas. The area will provide a permanent outdoor laboratory for ongoing biodiversity monitoring programs and inquiry-based learning investigations.

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Schoolyard Discoveries

The **Lewis and Clark School**, with its fully implemented Outdoor Discovery Center (ODC), has shown a commitment to bringing outdoor ecology into their regular curricula by creating a natural area with planted habitat for birds and butterflies on the school campus. The ECOS team is working on three projects that will provide tools and interactive ideas for learning about local ecology and make it easier for students and teachers to take advantage of their outdoor classroom. These projects include creating a school-wide worm composting system to reduce lunchroom waste and provide compost for the ODC; constructing a bird blind to allow observations of birds, butterflies and mammals; and creating "science backpacks" with supplies for students to use during field trips and outdoor activities.

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If We Build It, They Will Come!

Sussex School is restoring a schoolyard area from an exotic to a native environment while monitoring the biodiversity and ecological health before, during, and after restoration. All grades from K-8, will participate in project activities. The ECOS team and students will conduct plant, invertebrate, mammal, bird, reptile, and amphibian surveys of the schoolyard. These activities will help students acquire skills in performing field research while comparing non-native and native environments. This year's ECOS team will work on restoration, begin a butterfly garden, and build a greenhouse. In the future, several educational themes will be applied to this area, including native plant restoration, riparian habitat, and weather monitoring.

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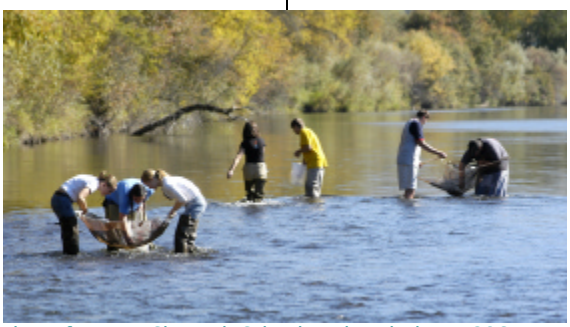
Creating a Sustainable Native Plant Garden

Native plant gardens demonstrate ecological connections to the landscape and stewardship of increasingly scarce resources. The ECOS team at **Target Range School** will lead the transformation of the school's vacant land into a sustainable native plant garden, creating the basis from which all ecological teaching will be developed. Various topics have been identified to make this area useful for all K-8 grades: (1) recycling and composting, (2) weed management, (3) habitat inventory, (4) the water cycle and (5) restoration. Each topic is essential for developing a native plant garden and has links to the curriculum of specific grades.

A general plan for an EcoWalk garden has been created and approved by school administrators. The fellows also organized a very successful weed pull this fall and have garden materials and plants ready on site for spring planting. In February, they started a series of lessons to complement their restoration garden efforts, including composting, seed starting, and plant physiology.



Students from Big Sky High School work with their ECOS Team to estimate fish population size in the Bitterroot River

MEET THE ECOS TEAMS FOR 2004 – 2005

Big Sky High School
Frank Janes[?]
Kathleen Kennedy[☞]
David Oberbillig[☞]
Andrew Whiteley[?]
Jenny Woolf[?]

Florence Carlton K-12 School
Nancy Adams[☞]
Sarah Keller[?]
David Nicholas[?]
Megan Parker[?]
Lisa Verlanic[☞]

Lewis and Clark Elementary School
Kathy Dungan[☞]
Mary Jane McAllister[☞]
Tammy Mildenstein[?]
Jeff Piotrowski[?]
Hollie Sexton[?]

Sussex K-8 School
Dianna Fairchild[?]
Lisa Hendricks[☞]
Margie Kinnersley[?]
Maree Mitchell[☞]
Wendy Ridenour[?]

Target Range K-8 School
Melodee Burreson[☞]
Jann Clouse[☞]
Rachel Loehman[?]
Lauren Priestmann[?]
Carl Rosier[?]

[☞] Teacher
[?] Undergraduate Fellow
[?] Graduate Student Fellow

Assessment Tips

"Science Talks"

A great way to identify what students know and don't know is simply to ask and listen. Gather students around for open-ended discussions about a certain topic, question, or experiment. Ask questions like: What is the evidence? Who cares? What must we do with what we know? Do we know what would happen? This questioning technique can help you help students put their data into context. During this discussion be flexible and allow students to explore ideas. After your science talk, ask kids to draw or journal about the topic discussed.

Adapted from Inquiry and the National Science Education Standards 2000

Paul Alaback identifying plants with ECOS Undergraduate Fellows

"I believe that [ECOS] experiences, beyond just changing the ways I can work, have changed the ways I want to work."

– ECOS Fellow

ECOS Staff

Dr. Carol Brewer, Director
Carol has a PhD in Botany and directs research programs in both plant ecology and ecological education. She serves as the VP of the Ecological Society of America and is an Associate Editor for the journal Conservation Biology (Education).

Dr. Paul Alaback, Co-Director
Paul has a PhD in Forest Ecology. His research centers on disturbance ecology and plant biodiversity patterns. His skills have allowed ECOS to develop a fantastic local plant guide.

Josh Burnham, Webmaster
Josh is responsible for the design, management, and maintenance of the ECOS website. He also provides much appreciated technology support to ECOS staff, fellows, and teachers.

Jennifer Marangelo, Program Coordinator
Jen is the newest member of our ECOS team. She has ten years of experience in three labs in DBS. Jen is responsible for ECOS recruiting, web content development, and tracking progress at the school sites.

Kim Notin, Administrative Assistant
Kim is responsible for all the odds and ends of the ECOS project. She is a first year Masters student in the College of Forestry and Conservation.

Alison Perkins, Communications and Media.
Alison is responsible for getting our messages out clearly and helping with ECOS outreach. She is starting a PhD in the College of Forestry and Conservation.

"Perhaps the most valuable part of our lessons is that the kids take part in making a change to something they really care about."

–ECOS Fellow

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TO: