

Transforming the graduate school experience through the Montana GK-12 “Ecologists in residence” program

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ECOS Objectives

To meet the need for enhanced understanding of environmental sciences in the northern Rockies, the ECOS Program will:

- Develop scientific ways of thinking and understanding in K-12 students through authentic research experiences in their schoolyards and adjacent habitats
- Promote teaching practices focused on “learning by doing” and inquiry instruction for both teachers and future science faculty (ECOS Fellows)
- Develop and model linkages between educators in the K-16 continuum
- Identify project indicators to make the program sustainable at UM, and facilitate transfer to other sites in Montana and around the country
- Ultimately, ECOS will contribute to a national model of how authentic ecological research can be introduced into the K-16 curriculum to enhance the teaching and learning of science.



Fellows and Schools



We developed a partnership with our ECOS teachers, Betsy and Christy, to collaboratively teach scientific concepts about weather and climate change, insect behavior and adaptations, riparian processes, and microbial ecology.

- Nate Gordon and Alison Perkins

Fellows and elementary students are working together to create a student-friendly plant field guide for native plants being planted in the schoolyard.

- Mary Bricker and Mike Machura

We are working closely with the administration in organizing the First Annual Clinton Science Fair. This science fair will set the template for future science fairs, which will eventually lead to Clinton students' participation in city- and state-wide science fair competitions.

- Johnny MacLean and Joss McKinnon

Abstract: To meet the need for enhanced understanding of environmental sciences in the Northern Rockies, the Ecologists, Educators and Schools (ECOS) Program promotes teaching practices focused on “learning by doing” and inquiry instruction for both teachers and University of Montana graduate student fellows. Through their participation in ECOS fellows transform the way teachers and their students look at schoolyards, changing the perception from playground to ecological laboratory. At the same time, the fellows experience transformations as well. Through assessment and reflection activities, fellows reported significant learning directly related to the project's major goals including an improved ability to communicate about science with non-scientific audiences, an increased awareness of how much science even elementary school children are able to do, an increased familiarity with the challenges and issues faced by schools, and stronger commitments to staying involved in science education and school outreach. All of the fellows said they gained experience and confidence in communicating about science to non-scientists, and that this had even improved their approach to their own research. Even those who said they already had significant skills in this area felt they had gained an even greater breadth of expertise. And nearly all said they felt more confident and competent to continue a professional relationship with K-12 educators. Participating fellows said they expected to be more effective in any outreach efforts they pursued because of their ECOS experience. ECOS is well on its way to having a lasting impact on the University, the local school system, and its surrounding community and in meeting its chief objective: when it comes to learning about ecology, ecologists need to make sure no child is left indoors.

Elements of the ECOS Program

What is the ECOS Program? ECOS is a partnership program for enhancing science education in K-12 schools in western Montana by using the schoolyard and adjacent open areas as outdoor laboratories for learning about the environment.

What is the ECOS mission? No Child Left Indoors! Ecology graduate and undergraduate students from the University of Montana are showing K-12 students and their teachers how to use an ecological lens for viewing their schoolyard. Instead of a playground, they learn to see an ecological laboratory filled with organisms with interesting adaptations and interactions. The ECOS teams model what ecologists do by immersing themselves in ecological investigations with their partner school collaborators in their schoolyard and classroom laboratories.

Who is on an ECOS Team? ECOS Teams are comprised of two Ph.D. candidates and one undergraduate from the environmental sciences at the University of Montana, and two lead teachers from the partner school. Each year ECOS supports five partner schools with “ecologists in residence”.

What does an ECOS team do? Teams work together for an entire academic year to mentor students in ecological investigations, both inside and outside of the classroom. Teams work together to develop ecological curriculum materials that are well-matched to the habitats in and around the schoolyard, and that meet the recommendations of the National Science Standards for science education. And, the teams provide support for enhancing general science instruction in a school by consulting with all interested teachers.

What is the plan for making a sustainable impact at the participating schools? One activity of the ECOS fellows is the development of *demonstration research sites* in their schoolyards to help provide authentic research experiences for local K-12 students. These projects are designed to 1) take advantage of unique ecological features in a schoolyard or adjacent “natural area” to develop sustainable outdoor ecological research laboratories, 2) integrate technology, and 3) sustain long-term use of these resources for teaching and learning about science, especially ecology. The projects also serve as models for schoolyard-based ecological research and science education that can be readily transported to other sites and schools, both within and beyond the region.

Transforming Education through Partnerships

Graduate fellows, schools and the community form partnerships that all interact with each other to enhance ecology education.

For example, fellows have partnered with the schools in a relationship that has catalyzed the formation of student-written nature guides, science fairs, and other activities. Through this relationship, fellows and teachers also have learned from each other in developing ecological inquiries.

The ECOS program also has allowed schools to partner with the community of parents, local businesses and the University of Montana. This relationship has formed connections that might not have otherwise been realized, such as international pen pal programs and collaborations with the U.S. Forest Service and fisheries biologists.

In serving as a conduit in forming these community relationships, graduate fellows also have partnered with the community in ways they might not have done outside of ECOS. For example, fellows have formed close connections with Native American tribal governments and schools and learned much about Montana's Indian Education for All Act. Through working on demonstration projects, they have also forged important connections with local organizations, businesses and consultants and have learned from other fellows and university researchers who are studying scientific disciplines other than their own.

These three different categories of partnerships have acted synergistically, so that fellows and schools work together with the community towards the realization of a common goal: transforming ecology education so that it reflects not just the needs of the school curriculum, but the importance of students, teachers, and the community in understanding the world around us. This unique model ensures that **no child is left indoors**.

Fellows and the Community



The Arlee ECOS team is the first to lead a GK-12 program in a tribal reservation school district. The team has developed and implemented ecological inquiries that incorporate local Traditional Ecological Knowledge. It has become an established outdoor classroom for teachers and students to study ecology and environmental biology.

- Matt Corsi and Flo Gardipee

We have partnered with Deborah Lorenzo's Clinton Farms Greenhouse and Nursery. She is a key participant in the logistical planning of greenhouse design. Also, Jon Roske, the president of the Clinton School Board and a professional woodworker, has agreed to provide power tools and manual assistance for our demonstration project.

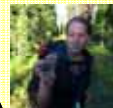
- Johnny MacLean and Joss McKinnon

Graduate Fellows



Being an ECOS fellow has helped me develop teaching and communication skills that I'll use as a professor. A great thing about working on those skills with 5th-graders is that they just don't let you get away with anything less.

- Mary Bricker



My contributions to the ECOS online field guide are placing me in the unique role of providing a sustainable means of communication between the University of

Montana, the local community, and ecological education programs nationwide.”

- Sarah Bisbing

I went to graduate school to combine my interests in ecology and education. It was easy to get bogged down with the stress of deadlines and loose sight of why I wanted to do this in the first place. Having the opportunity to go into elementary schools through ECOS and seeing kids as excited about ecology as me was a great reminder of my focus.

- Jen Marangelo

Schools, Teachers, Students



I didn't really have an understanding of how to carry out a research study before. Work with partner scientist raised my awareness of minimizing error, random selection of study lots, deeper understanding of what it is to do science...

- Middle School Teacher



It's fun to go outside, find stuff, and compare it to the findings of other classmates.

- Student



Our ECOS teachers have learned new and creative ways to teach, and are sharing their excitement about our schoolyard as a teaching resource with the other teachers. Above all, this program has sparked the imagination and curiosity for science in our students, and that is what matters most.

- Principal



I saw a fungi!

- student



Transforming Ecology Education

Community of Parents, Businesses and the University of Montana



Further development of the online field guide by the special project fellows promotes a sustainable partnership between the University of Montana, members of the local community, and science education programs across the country.

- Sarah Bisbing

Schools and the Community



We partnered with the U.S. Forest Service to participate in insectary investigations. They have continued their involvement into this school year.

- Hellgate Elementary School

Craig Barfoot, a fisheries biologist for the Confederated Salish and Kootenai Tribes, has radio-tagged several migratory trout in the lower Jocko River. We have been tracking the fates of these fish and mapping their movements to teach students about salmonid ecology.

- Arlee Elementary School

We set up an Eco-Pen pal exchange with two rural primary schools in northern Scotland. Projects are paired between the schools so that data and experiences can be directly connected.

- Target Range School

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