



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

Newsletter

Fall

ECOS (406) 243-6016

www.bioed.org/ecos

September 2005

No Child Left Indoors!

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.

Inside:

Migration curriculum idea

Artists in Residence

Schoolyard updates

Upcoming Events:

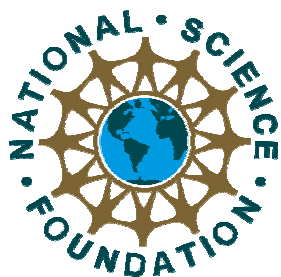
Brown Bag Lunch: October 7th

Monthly update due: October 14th

In-service: November 4th

Brown Bag Lunch: December 2nd

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From the Director: Looking back and looking forward

Brisk fall mornings usher in the brilliant colors of fall against rich blue skies in western Montana. This season reminds us to reflect on the first year of ECOS, and to appreciate the power of educational partnerships. Teachers and faculty, graduate and undergraduate students, and community volunteers came together to work on a common mission - to bring new opportunities for learning about the environment to K-12 students.

What is possible with the support and work of so many students, teachers and community members? Big Sky High School students learned about fire ecology by conducting

a controlled burn experiment. A native plant garden covers 465 m² (5000 ft²) where there once was rubble at Target Range School. Children at Lewis and Clark School can explore Bancroft Pond with tools in their nature backpacks. We helped improve wildlife habitat at Sussex School by building a greenhouse and native plant garden. Florence Carlton schoolyard was designated as an official National Wildlife Federation schoolyard habitat!

We were amazed at the generosity of area businesses, non-profit organizations, and government agencies (see partial list on page 4). And all

the while, the ECOS staff has been learning how best to support the effort of all the school teams.

The brilliant fall leaves remind us of our successes. At the same time we look forward to celebrating future successes in the coming spring, in a new year, with new leaves, and new ideas so that no child is left indoors.



Carol Brewer, Director of ECOS

Ecology in a Day: ECOS Teams Ask Tantalizing Questions and PhD Fellows Simplify their Science

During the ECOS Institute in July 2005, fellows and teachers began discovering what ECOS is all about: getting outdoors and questioning, experimenting, and working together to do ECOLOGY!

ECOS teams of fellows and teachers practiced the scientific inquiry process in Greenough Park. Each team made observations, came up with questions that could be answered in less than four hours, and presented their results. Teams posed questions in terrestrial and aquatic systems about plants and insects. Investigations ranged from how substrate influences caddisfly homes to changes in Cranesbill abundance based on disturbance. In addition to the outdoor inquiries, the first institute challenged PhD fellows to present their science for non-

scientist audiences. One goal of ECOS is to train scientists to communicate with the public. Scientists are accustomed to presenting their work to other scientists, but it can be a challenge to communicate

complicated research. These fellows prepared posters and presented their research to ECOS teachers and undergraduate fellows without jargon and in ways that made it relevant to the public.



ECOS fellows Allison Greene and Mike Machura conduct an inquiry during a summer Institute

Mimicking Migration



When it comes to weathering the cold, some birds seem to be an awful lot smarter than humans; they simply head for warmer locations, where they find more food and favorable conditions. But getting there may be a challenge.

With Fall upon us, we have a special opportunity to help students understand how and why songbirds migrate. Here is an activity that can be done either indoors (great for a rainy day!) or outdoors and can be adapted appropriately for different grade levels.

Have the students make models

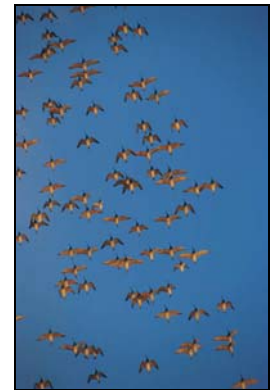
of large migrating birds using simple materials of construction paper, poster board and popsicle sticks. Beforehand, arrange a migration route of whatever size you feel is appropriate (40 feet by 20 feet is a good size). Using string, chairs, trees, and whatever else you can find, arrange the course so there are a few natural and human obstacles along the way (hawks, storms, tall buildings, power lines, oil spills, etc), along with important resting spots (like wetlands). Be creative and consider local migration patterns, stopovers and species diversity.

Mark one end of the course as "north" and one end as "south".

Then, have the children fly their birds in both directions. During this activity, you can have them fly in formations, stop to rest, or turn off the lights and follow the route by the light of the "moon".

Here are some other ideas to incorporate into an activity on migration: the hazards of migration; the importance of neotropical and northern hemisphere habitats; identify local species that migrate and some that do not. Include some ungulates and butterflies into the concept of migration, bring in maps of actual migration routes and keep your eyes out to see which species leave this winter and return next

spring to the schoolyard.



Adapted from M.J. Caduto and J. Bruchac. 1988. *Keepers of the Earth*

ECOS Schoolyard Ecology Investigations

ECOS fellows create exciting, innovative curriculum pieces for science education. Here is a sample of the work from the 2004-2005 cohort of fellows. You can access these on the ECOS website at www.BioEd.org/ECOS.

 Classroom Mark-Recapture with Crickets: How do we estimate the size of animal populations in the wild (9-12)

 A Tour of Soils: How many soil types can be found in the schoolyard (1-2)

 Effect of Acid Rain on the Ability of Soil Microbes to Decompose Organic Matter: How do changing environmental factors influence decomposition (9-12)

 Composting 101: It's the Microbes. What is composting and what causes decomposition (1-4)

 Mystery Scat: Describe the ecology of this animal through dissection of its scat (5)

 Isolation of Microbes from the Environment: Where do microorganisms grow (5)

 Brewing Root beer: What is your hypothesis for each of the treatments? What is the purpose of the yeast (5)

 What Is This Beak For? How does form define function? How are beak differences adaptive for exploiting different food sources (1-5)

 Water Bottle Rockets: an

Exploration of Newtonian Physics: What water to air ratio is needed to achieve maximum height? How do Newton's laws of motion explain and influence a rocket's flight (5)

 Knapweed in the Web: Can food webs be altered by the introduction of non-native species (2-5)



Brooke McBride and Alison Perkins: Artists in Residence

Brooke McBride and Alison Perkins provide just two examples of the hidden talents in ECOS teams. In May of last year, the ECOS staff asked fellows, students and teachers to submit nature artwork. We all gazed in delight at the submissions by these two PhD fellows.

Alison Perkins, born in St. Louis, MO, is both an avid outdoor woman and a city girl. With a background in wildlife biology, she is now exploring the media world with the aim to share cool stories about ecological research through television.

Brooke McBride grew up in rural Wisconsin, where she developed the nature observation skills so evident in her sketches. Brooke aspires to teach and conduct

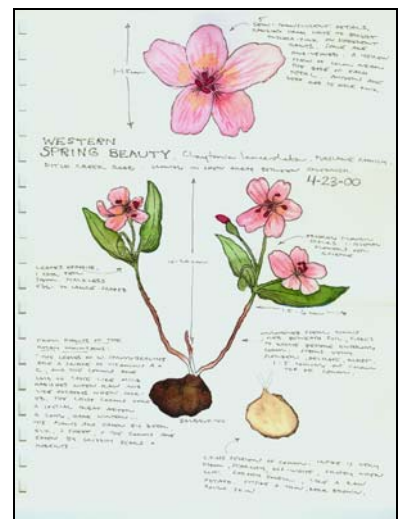
research, integrating her love of both science and education.

Look for illustrations from both of these women in future ECOS publications and on the web. Brooke's watercolors also will help students of all ages identify plants in the ECOS Natural History Guide. You can see these illustrations and others at www.BioEd.org/ECOS.

Thanks to both of you for your special contribution.



Long-tailed duck by Alison Perkins



Western spring beauty by Brooke McBride

"When one tugs at a single thing in nature, he finds it attached to the rest of the world."
John Muir

News from ECOS Schoolyards

Birds, Bats, Bees and Blossoms: Improving Florence Carlton's Outdoor Classroom



A special place in the Florence Carlton Outdoor Classroom

Florence Carlton's outdoor classroom (OC or the "Lyceum") will see some big changes this year. The OC is a unique resource for the school, though it remains under-utilized and underdeveloped. This year's ECOS team hopes to make the following improvements: 1) construct a wheelchair accessible nature trail, (2) develop inquiry-based nature stations along the trail, (3) write discovery booklets for teachers, (4) develop inquiry binders, with relevant curricula, (5) install an entrance kiosk with a trail map, basic safety information, recognition of community participants, and a short narrative of the history, purpose, and goals of the Lyceum, and (6) install aluminum plant identification signs. These improvements will ensure use of the OC by the whole school and community.

Exploring Eco-Diversity at Hellgate K-8

As the newest school in the ECOS project, the **Hellgate** team has the challenge of starting a demonstration project from scratch, but also the advantage of learning from last year's teams on how to design a feasible project. Their project will complement features in their schoolyard and will consist of four learning centers, each focusing on a separate aspect of

western Montana ecology. The learning centers will include 1) a Native Medicinal Garden, 2) a Behavior Ecology Center, 3) an Insectary, and 4) a Rock Walk representing geological time. These learning centers will offer specific settings for inquiry lessons that will include diverse subjects, ranging from microbial studies on soils and plant form and function, to rodent behavior and the geologic influences on ecosystems.



The future home of the Hellgate Rock Walk

Rediscovering the Discovery Core; Exploring the Outdoors Like Lewis and Clark



The butterfly garden at L&C with (L-R) Katie Hailer, Bruce Threlkeld, Carol Reeves, and Julie Greil.

The fun in the Outdoor Discovery Core (ODC) continues at **Lewis and Clark Elementary School!** The goal of the 2005/2006 ECOS team is to encourage every teacher to use their outdoor classroom to its full potential. To do that, fellows and students will identify and label plants in the ODC, produce a color, laminated tri-fold brochure identifying the most common plants, and a full-length nature guide with all the plants in the outdoor classroom. In addition to providing a resource for every classroom, the

guide will help students learn identification and observation skills and become better acquainted with the ecology of their schoolyard.

Target Range Outdoor Classroom Expands!

The 2004-2005 ECOS team and students at **Target Range** planted a beautiful native plant garden at the southern end of the schoolyard. The current ECOS team plans to continue this project by expanding the outdoor classroom to include a cottonwood grove adjacent to the garden. The team will clean up the grove, enhance it for wildlife habitat and stabilize it for safe use by teachers and students. Once improved, the grove will be a wonderfully shaded gathering place well suited for leading ecological inquiries and nature journaling. The team will also produce Ecology Field Kits that teachers and students can use for ecological inquiries.



Cottonwood grove at Target Range that will become a part of their outdoor classroom

MEET THE ECOS 2005 TEAMS

Hellgate Elementary School

Jo Fix & Mike Plautz
Alison Perkins
Johnny MacLean
Hannah Elliott
Andrew Hoyer

Florence Carlton K-12 School

Brent Heist & Byron Weber
T.J. Fontaine
Sam Stier
Melissa Maggio

Lewis and Clark Elementary School

Julie Greil & Carol Reeves
Bruce Threlkeld
Katie Hailer
Corissa Crowder

Target Range K-8 School

Debbie Caron & Peggy Purdy
Michael Machura
Brooke McBride
Allison Greene

At-Large PhD Fellows

Rachel Loehman
Carl Rosier

Special Projects PhD Fellow

Jeff Piotrowski



Chickadee and Nuthatch by Alison Perkins

Community Support

Many members of our community contribute to the high quality science education of children, helping us insure that no child is left indoors. The ECOS footprint is enlarged by their generosity.



RMRS
Fire Sciences
Lab
Mick
Harrington

Thank you for helping in the design of the Big Sky high school burn experiment

Montana DNRC
Sue Clark,
Rob Gustafson
and Ken Parks

Thank you for donating your time and expertise to the Big Sky high school burn experiment

Missoula
County
Extension
Service

Thank you all for your cooperation on the Target Range demonstration project

Bitterroot
Restoration
Inc.
Len Balleck

Thank you for donating materials for the restoration of Target Range's garden

Madeline
Mazurski
of the Missoula
Native Plant
Society

Thank you for providing landscaping advice at Sussex School

Missoula
County
Conservation
District

Thank you for your kind donation towards the development of Florence Carlton's Schoolyard Habitat

National
Wildlife
Federation

Thank you for working with Florence Carlton in developing their Schoolyard Habitat

EKO
Compost

Thank you for donating compost to Target Range School

JTL Group,
Inc.

Thank you for donating a truck and driver to deliver compost to Target Range School

Rainmaker
Sprinkler
Supply, Co.

Thank you for providing irrigation equipment to Target Range School

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 second year Masters student in the College of Forestry and Conservation.



ECOS members take part in an inquiry led by PhD fellow, Carl Rosier, at UM

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TO: