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

Newsletter
Spring 2007

ECOS (406) 243-6016 | www.bioed.org/ecos | Spring 2007

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:

Important Dates:

- ECOS Science Days

(Upcoming this Spring at all ECOS schools)

- Late March

Launch of Project BudBurst! Website

www.budburst.org

- ECOS In-Service March 19th, 2007

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From the Director: Project BudBurst – *By Carol Brewer*

The days are finally getting longer in Missoula and I have been noting the arrival of new birds outside my office window. I await the first flowers in my yard. Will they be crocuses this year? Or maybe dandelions? Already I have seen active spiders basking in the sun on a warm outdoor wall of my garage.

Observing the timing of the cycles of life is called the study of **phenology** and spring is the perfect time of year to begin phenology investigations that can last the entire year. People across the centuries and across the world study phenology. And you can too. ECOS is a partner in a national campaign to document the burst of buds and the opening of flowers this year (see interview of Sara Mulder inside this issue).

For the past 6 months, I have been working with colleagues across the country to educate school children and adults alike about phenology. This spring, ECOS will team with people across the nation to collect important climate change data on the timing of leafing and flowering of trees and flowers through Project BudBurst! This national citizen science field campaign targets native tree and flower species across the country, along with common plants you might find in your garden or city park. By recording the timing of the leafing and flowering of local plant species each year, scientists can learn about the prevailing climatic characteristics of a region over time. With your help, we will be compiling valuable environmental information that can be compared to historical records to illustrate the effects of climate change.

Project BudBurst! is ideal for teachers and students, families interested in participating in a science project, scouts and 4-H groups, gardening clubs, botanical gardens anyone or any group with an interest in contributing to a socially and scientifically relevant research study. You'll find all the information you need to participate in Project BudBurst! at www.budburst.org.

I hope you will go outside and watch spring come to our Montana valleys and mountains. Take a walk and record the kinds of living organisms you see. The ECOS plant guide, complete with beautiful photos, can help you identify most of the common plant species you will see this spring – take a look at www.bioed.org/nhguideweb/.

Hope to see you looking for blooms and buds on a local trail soon. Happy Spring!!

Phenological Observations Help Show Effects of Climate Change in your own Backyard (or Schoolyard) – *By Paul Alaback*

People have always been fascinated by variations in the timing of natural events such as when flowers come out and when birds first arrive in the spring. The study of the timing of natural events is called *phenology*. Over time most species have evolved to either arrive or become active at the "right" time each year. The ability to detect when weather patterns are right to become active in any given year is critical to their survival. For example, there can be dire consequences for plants if they start growing too early (freezing to death or dying back) or too late (reduced chance of successfully reproducing, and less growth over the year). Consequently, most plants become active after there is sufficient daylight per day and the air is warm enough on average to support growth.

For centuries, farmers, naturalists, and scientists have kept careful records of phenology patterns for plants, birds, butterflies, and the spring breakup of ice on rivers, or the thawing of soil in the spring. Accurate observations of these natural events can be used to predict the best time to plant crops, when to expect problems with insect pests or diseases, and when crops or fruits (or tree cones) will be ripe for harvest. When these data are collected for many years in a row, they reveal hints about how variations in weather affect plants and animals in our environment here in Missoula. These observations can also help us better understand the influence of global warming. For example, ecologists are concerned that if our climate changes rapidly, these finely tuned evolutionary mechanisms for determining when to become active in spring will make some species become active too late in the year, and this in turn may influence how species interact with each other.

As an ecologist, I am very interested in phenology patterns. Ten years ago, my students and I started a phenology study on about 100 plant species growing on Mt. Sentinel along a trail near the UM campus. This trail is a little over one mile long (3 kilometers). As we walked along the trail, we noted the date when each plant species within 3 feet of the trail bloomed, and we also measured the temperature of the air and soil along the trail. From this simple information collected on regular walks, I have been able to show that the flowering from year to year is quite predictable. In fact, if we know the air and soil temperature, it is possible to predict what day a species will flower with an accuracy of less than a week! In some cases, flower phenology also varies according to patterns of rainfall, especially in the fall.

Our study has shown that plants on Missoula's Mt. Sentinel are even affected by the pattern of El Ñino currents in the Pacific Ocean. If we had a longer record of observations, I am sure we could detect the effects of global warming. Why is this important? Researchers throughout the world have found that flowers are opening an average of 3-7 days earlier than in previous decades, providing a clear signal of global warming. So just by keeping careful records of when flowers first come out, you can see effects of weather and contribute to our understanding of global warming in your own backyard! If you or your school is interested in setting up a study on phenology in your schoolyard, ECOS can help. Contact me at palaback@montana.com.

Yellow Bells are one of the first wildflowers to appear in the spring on Mt. Sentinel

New K-12 Ecological Inquiries

ECOS 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.

Check out the latest ecological inquiries posted on the ECOS web site at www.bioed.org/ecos/

Title: Not too Hot, Not too Cold: The Effects of Temperature on Soil Bacteria
General Goal: To demonstrate that temperature affects biological growth and stimulate thought and questions about other environmental factors that also may be important.
Target Grade Level: 4-5

Title: Hamburger Habitat – Microbiology of Foods
General Goal: Demonstrate how different food storage temperatures support different amounts of bacteria.
Target Grade Level: 5 (but easily scaled up or down)

Title: Classification Using Insects
General Goal: Provide an introduction to the process of classification.
Target Grade Level: 5-8

Title: Is That an Insect?
General Goal: To give students the opportunity to look closely at some local insects. Teach students to identify an animal as an insect by pointing out a characteristic that students should look at if they want to identify and insect to order.
Target Grade Level: K-3

Title: Go with the Flow: Sediments Up Against the Dam
General Goal: Teach students that dams collect more than just water.
Target Grade Level: 1-2

Title: Feeding the Hungary Stoneflies
General Goal: To demonstrate how insects plan an important ecological role in aquatic systems.
Target Grade Level: 1-2

Title: Bird of the Week
General Goal: What characteristics are useful in identifying birds? What are some of the birds found in our schoolyard? What are some of the interesting Montana birds?
Target Grade Level: 3-4

Title: Go Big or Stay Home? Simulation of Cutthroat Trout Life History
General Goal: Why do trout, salmon, and other fishes have variable life history strategies? Why do some fish from one population migrate and others stay in their natal (home) stream?
Target Grade Level: 5-12

Title: Insect Needs and Insect Feeds
General Goal: : To learn about the life cycles of several holometabolous insects (insects that completely change life forms) used as biological controls and to begin to understand that insects are often beneficial (e.g., as biological controls and pollinators).
Target Grade Level: 1-2

Title: Schoolyard Microclimate
General Goal: Help students discover how temperature can change across very small scales.
Grade Level: 5

How did it go? Schoolyard Microclimate Assessment - *By Mike Machura and Mary Bricker*

We did this inquiry in mid-November at Hellgate Elementary, when students in one class were starting a weather unit, and both classes had recently learned about graphing. In general the inquiry went well, and students enjoyed it. We were surprised by how much they liked the "imagination" exercise in the classroom before we went outside, and how involved they got as groups, in choosing what areas to test and how to rank them.

One thing we would suggest changing is that if at all possible, we would do this with instruments that could measure wind chill. On a cold windy day, a lot of the variation in temperature that students can feel in different areas is due not to actual temperature differences, but differences in wind chill. This is important to animals trying to preserve heat, too, and measurements of wind chill might reveal more dramatic differences in temperature, making for more exciting results. Also, in general the students in these classes get excited about getting a chance to use equipment and learn new measuring instruments. They loved using the thermometers, and most groups that finished early went on to measure many more areas out of curiosity.

Evolution Web Resources

ECOS has identified the following websites as places to go for curriculum materials and information on teaching evolution.

EvolEd – Teach Evolution and Make it Relevant. Resources and materials for teaching evolution at the pre-college level.
http://www.EvolEd.org

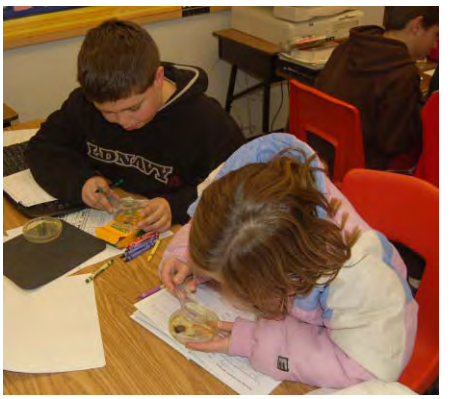
Understanding Evolution – Your one stop source for information on evolution.
UC Berkeley evolution resources
http://evolution.berkeley.edu/

Understanding Evolution for Teachers – UC Berkeley's evolution resources for teachers.
http://evolution.berkeley.edu/evosite/evohome.html

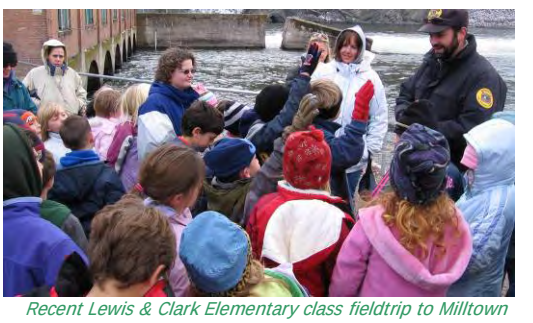
Beyond Belief – Science, Religion, Reason and Survival Scientists take a hard look at religion and science.
http://beyondbelief2006.org/

Evolution, Science, and Society – Evolutionary Biology and the National Research Agenda. Evolutionary science plays a fundamental role in modern biology. Its unique role in biological research, education and practical applications are described here.
http://evonet.sdsc.edu/evoscisociety/

Becoming Human
Journey through the story of human evolution through an interactive documentary experience.
http://www.becominghuman.org/



Sandy Johnson and Sinjun Snyder, 5th-graders at Hellgate, observe and record microbe growth on their sample plates during a decomposition inquiry



Recent Lewis & Clark Elementary class fieldtrip to Milltown Dam as part of Go With The Flow: Sediments Up Against The Dam inquiry

Connecting Missoula with the Netherlands
Interview with visiting Fulbright Scholar Sara Mulder - *By Noah Jackson*

Meet Sara Mulder. Sara came to Missoula to work in the lab of Carol Brewer, the ECOS director. Sara is interested in the study of phenology, Lyme Disease, and ecology education. Before she came to Missoula, she visited research labs in New Mexico and Wisconsin.

Why did you come to work in the United States?
I came to work on the National Phenology Network, which is in development in the United States. I've been working for the Dutch Network in the Netherlands that is partnering with the NPN in the states.

How does this relate to your broader research work?

I came to write a PhD proposal on Lyme disease and phenology. This includes investigating how you can use phenological networks to gather data and educate people. I'm focusing on ticks and their hosts. Ticks are only active above certain threshold temperatures. In the Netherlands, Lyme disease is a big problem. In one study I collected ticks, and nearly 50% of all ticks collected were infected with Lyme disease. I also came to figure out aspects of the data themselves such as forecast models that make predictions about populations.

What other projects are you working on?

I'm also working on Project BudBurst!, a campaign to raise public awareness about phenology its relationship to climate change.

What is Project BudBurst!?

The burst of buds is an important phenological event to measure—this will be a "citizen science" component of the national network—we have an education working group from the national network.

Between Earth Day and Celebrating Wildflowers Week in May, we are trying to get people to make phenological observations based on a list of species we will provide. We want to tell people about phenology and the network.

What inspires you about creating national networks?

In order to communicate, educate, and learn, we don't always need to create something new. A lot of interesting networks are local. Can we get all the data together in one database? That is our challenge. These issues connect with society—there are possibilities to link research to global networks, develop awareness for science, and excite people about collecting and sharing information.

What do you think of life here at the University of Montana?

People here are extremely busy and enthusiastic. People in the Netherlands are busy, but it is more extreme here.

What about Missoula?

There is so much space. In the Netherlands everything is arranged and ordered. I like the space, the room, walking for miles and not seeing anyone.

Meet Special Projects Fellow & Traveling Scientist Sarah Bisbing

My role in our ECOS fellows community entails acting as a "traveling scientist." Not only does this title incite oohs and aahs from the students, but the flexibility associated with this position gives me the opportunity to be a part of each ECOS team. Over the past two months, I visited, observed, and led investigations in most of the schools to test out each of my inquiries. The overall goal in testing my inquiries is to determine the pros and cons associated with student use of the ECOS online field guide. Through careful observation of student ability, I hope to narrow the search fields to the simple characteristics most useful for students in accurate identification of organisms. Active search fields will be simplified or modified to accommodate student use of the online field guide. This section of the guide will be coined *ECOS for Kids!* This will be geared toward students at the elementary and middle school levels. This section of the guide will be a user-friendly resource for teachers. Finally, this also will help students as they aspire to become traveling scientists!

Sara Bisbing leading an inquiry this past fall

Lewis and Clark Elementary School: Enhancing the Outdoor Discovery Core - *By Alison Perkins*

ECOS Fellow Nathan Gordon helping students make observations in the Outdoor Discovery Core

Since November, students at Lewis and Clark Elementary School have been noting weather observations and seasonal change from the Outdoor Discover Core (ODC) in their journals.

Resources for inquiries in the ODC include a weather station, environmental temperature data loggers, developing a site-specific herbarium, personalized scientific inquiry CDs for teachers, and a web-cam highlighting a nearby wetland.

The ECOS weather station will be a permanent fixture on the school's campus that teachers can access and use to collect data. Inquiries that incorporate the weather station and are aligned with the national and Missoula County science standards are being developed or enhanced for students in all grade levels. The weather station, the herbarium, and the data loggers are a resource for exploring the interrelationships between biotic and abiotic factors. Also, the weather station also links into the GLOBE Program, providing a repository for long-term data collection, advanced equipment and ideas for investigation, and the opportunity for large- and small-scale data analyses.

ECOS in the News: *Flock of Dodos* Screen Debut in Missoula

The University of Montana joined science centers across the nation on February 12th in the University Center Theater to celebrate the birthday of Charles Darwin by presenting the film "Flock of Dodos: The Evolution-Intelligent Design Circus". Film attendees were treated to birthday cake to celebrate Darwin's birthday, and participated in a panel dialog after the film. Thanks to ECOS Fellow Alison Perkins for organizing the event, and to the panel members for making the debut a success!

The event provided an opportunity for scientists and community members to come together to share a dialogue about science and its role in society. Following the film the audience participated in a lively panel discussion about the film and the evolution-intelligent design debate. ECOS would like to thank the panel members who included:

- Betsy Wackernagel Bach, PhD, Professor and Director of Graduate Studies, Department of Communication Studies, The University of Montana
- Pastor Glen Moyer, Author of "The Adventures of Clothman" column in The Missoulian.
- Dave Oberbillig, Science Teacher, Hellgate High School, Missoula, MT
- Eric Olson, brother of *Flock of Dodos* producer, Randy Olson, and Missoula resident
- Paul Spruell, PhD, Research Assistant Professor, Division of Biological Sciences, The University of Montana

For more information about Flock of Dodos, see www.flockofdodos.com

ECOS Staff

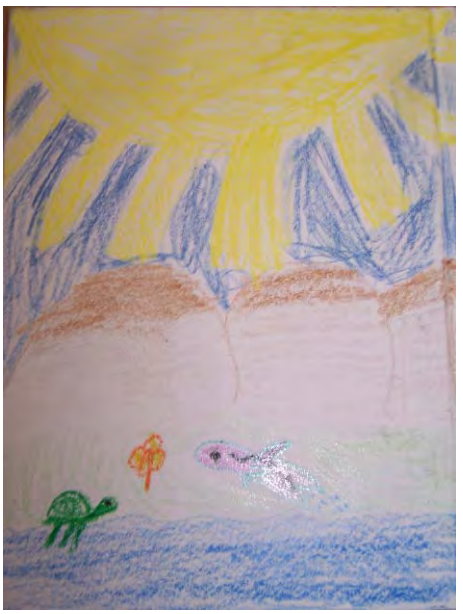
Carol Brewer, PhD Director
Carol has a PhD in Botany and directs research programs in both plant ecology and ecological education. She serves on many national ecology research boards and is an Associate Editor for the journal *Conservation Biology* (Education).

Paul Alaback, PhD 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.

Dave Oberbillig, Lead Teacher
Dave is in his 9th year teaching high school science. He serves on the Ecological Society of America's education advisory board. Dave mentors teams in many aspects of science education and teamwork.

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.

Noah Jackson, Program Assistant
Noah deals with the day to day operation of the ECOS Program. He provides administrative support for ECOS while working on his Masters in Forestry.



Recent ECOS Journal Cover image from Tara Barba's 3rd grade Target Range Class

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