

# KBS K-12 Partnership

## Spring Newsletter

Issue 9 Ecological Literacy in K-12 Classrooms April 2011



### From the Directors

Dear KBS K-12 Partners,

Another successful school year is coming to a close at KBS. We've ushered in a new GK-12 Project, collected mounds of student data in the Math Science Partnership teaching experiments, planned (and planted the seeds for) a multi-district research network (the BEST Research Network), and we're not done yet. Our last schoolyear workshop for 2010-2011 took place on April 19<sup>th</sup> and our annual Summer Science Institute will take place from June 20-24<sup>th</sup>. We look forward to continuing our partnership with all of you in 2011-2012. In the fall, 10 new GK-12 Graduate Student Fellows will begin work in our partner districts with your teachers and students. Fall 2011 will also be the official start to data collection on our research network BEST plots, where your teachers and students will conduct experiments and collect data to answer the question 'Can we grow our fuel and our flowers and butterflies too?' Stay tuned for more from the KBS K-12 Partnership.

Phil Robertson, Tom Getty, Andy Anderson  
Sara Syswerda, & Robin Tinghitella

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## Hands on Science Draws a Crowd at Plainwell Community Schools

On March 31, 2011 more than 500 students and parents attended the fourth annual, district-wide Science Night at Plainwell Middle School. The event was a great success! More than seventy students presented their scientific work in the form of science fair projects, research posters, and artwork. Additionally, twenty-four local and community groups brought science to the fingertips of kids of all ages through informational booth and hands-on activities. Several organizations brought live animals, including The Kalamazoo Nature Center, which brought an American Kestrel, Binder Park Zoo with a red-tailed hawk and box turtle (both Michigan natives), and the DNR Wolf Lake State Fish Hatchery, which brought a lake sturgeon. Additionally, the Kalamazoo bee club had live bees on display as they taught kids and parents alike about the importance of bees and the art of bee-keeping. Science topics at the event

ranged from biology and ecology to physics and chemistry. In one corner, Jerry Pahl of the Kalamazoo Air Zoo used his magnetic gun and coil cannon to 'shoot' with metal objects, demonstrating the physics of electromagnetism. In another corner, Western Michigan University's Chemistry club made sparkly silly putty with kids using simple chemical reactions. Iurii Shcherbak and myself, Kali Bird, both Michigan State University graduate students and GK-12 fellows, worked together with Plainwell Community Schools' teachers and staff to coordinate the event. We would particularly like to thank Sandy Breitenbach, Marty Green, Lisa Winiger, Lisa Smith, and Paul deMink, as well as the thirty-five enthusiastic and tireless elementary, middle, and high-school students who volunteered their help for the evening. If you weren't able to come this year, be sure to watch for next year's event in March 2012!

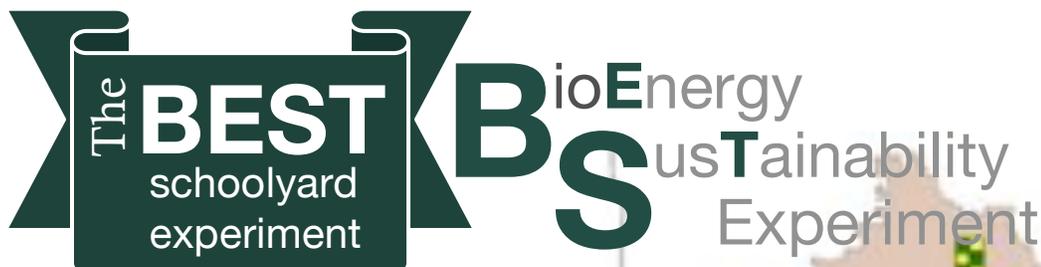
- GK-12 Fellow Kali Bird

We heard from a few of our partner teachers this spring – here's what they had to say...

Kari Freling from **Gull Lake** writes, "Right now the first grade is finishing up our unit on weather and we'll soon be in the field behind Kellogg watching the cloud formations and discussing how they're formed. After spring break our unit on insects began with the arrival of milkweed and monarch larva."

Debi Kilmartin, also of **Gull Lake Community Schools** has been working on the MSP Biodiversity strand teaching experiment. She says, "We've collected macroinvertebrates in leaf bags, and have sorted them all. I was so happy to keep them alive overnight – I had 37 leaf bags in buckets with bubblers in my classroom!!! I've also integrated the biodiversity strand with my Cell Unit. We are now covering cell structure, will build 3D cells next, and then, we'll go back to the biodiversity unit and incorporate more of those lessons."

We heard from Marty Buehler from **Hastings** who says his "students have finished everything and anything related to genetics in AP Bio and to wrap it up, went to see Sam Rhine, the genetics speaker. He brings the latest and newest things happening in genetics in an informative lecture series around the Midwest. It was a great day! I brought my biology staff with me too. They were astounded at how much has been discovered in the last 10 years. Textbooks certainly don't cut it now."



This map indicates the locations of our GK-12 BEST schoolyard research plots in SW Michigan.





This summer, I (Nikhil Jaikumar) will be continuing and broadening my research from the last two summers. I will be working with perennial cereal crops (wheat, rye and kernza) which are currently being investigated as potential food crops that could be grown in a more environmentally friendly manner than most annuals. I will specifically be looking at how they balance investing resources in seed production vs. long term survival. I will be measuring photosynthetic rates, chlorophyll content, leaf traits, and seed production, and determining how these traits are affected by reproduction. I will also compare many genotypes of perennial wheat to determine how resistant they are to common cereal diseases in Michigan. I look forward to an exciting field season!



The ice has melted! This means that I (Melissa Kjelvik) can now start working with my fish that have been overwintering in the KBS research ponds. This month, my intern and I will collect adult bluegill from lakes and put them into a pond so they can reproduce. One prediction I plan to test with my research is that risk-taking bluegill will spend more time out of refuge habitats than shy bluegill. This year we can see which habitats they are using because some of the KBS ponds were recently renovated to reduce the amount of vegetation that creeps in from the shore. Renovation left the shores of these ponds completely free of vegetation! I will add artificial vegetation into the ponds as hideouts for fish and then use an underwater camera to see how much time bold vs. shy fish spend in the vegetation.

## Comstock

The 2011 spring has continued to feature interesting and exciting learning experiences in Comstock. I have continued to work with Ms. Jameson's elementary school class as they learn about photosynthesis, the different parts of plants, and how organisms interact with their environments. We conducted an experiment in which we observed photosynthesis through seeing how submerged leaf disks produce oxygen bubbles and float to the top of a solution. I also presented lessons for Ms. Jameson's class about mutualism, and about the nitrogen cycle, and we talked about why fertilizers are so important for plant growth.

I have also continued working with several science teachers at Comstock High School. I conducted an activity with Ms. Poulson's Biology II class in which we looked at the rate of transpiration in plants under different environmental conditions, and also presented several lessons about different groups of plants and how flowers function in plant reproduction. Ms. Lester's Bio II class learned about genetics and how genes affect physical traits through an activity that I designed and led in which we explored the genetics of human eye color. Finally, I have been working with Ms. Rodwan's earth science and environmental science classes on a number of topics, including a lesson in which we set up a water column with a variety of different soil types and other materials, and observed how polluted water could be filtered.

## Delton-Kellogg

Connie High and I have been working with other fellows to develop lessons to help students increase their analytical and critical thinking skills. Specifically we want students to be able to look at data collected from a variety of sources and be able to make and support their own scientific claims. This is an important skill for students to have as they graduate from K-12 schools because they need to be able to think critically about claims they hear on the news and from the internet.

I also recently joined KBS fellow, Alycia, in British Columbia to help her collect stickleback fish. While we were there, we blogged about the experience in order to introduce students to field research. After the trip I went into Mrs. Renaudo's class to teach the students more about the stickleback and Alycia's research.

## Gobles

The BEST plots are planted! One is near the Middle School and another by the garages on the way to the football fields. We are excited to see what germinates this spring – keep your eyes out for changes! The students will soon be collecting data about plant and insect diversity, information about the landscape in Gobles and information about the soil near the school.

I have had a great year with Mrs. Drayton's Middle School students. I was able to share data I collected from the Kalamazoo River with Mrs. Drayton's 8<sup>th</sup> grade earth science class. It was great to give them a chance to apply what they learned. I have also had a great time teaching the 7<sup>th</sup> graders about genetics and even helped them extract DNA from strawberries! I also worked with Mrs. Drayton to teach the 7<sup>th</sup> grade students how scientists classify organisms. To do this, I brought in insects from the Kalamazoo River and a small lake to show them the diversity of organisms from local water bodies. It was great to show them what dragonfly, caddisfly and mayfly larvae look like as well as a crayfish. I have enjoyed my year with the students and talking to them about my research and I look forward to coming back next year.

## Harper Creek

This spring, I am bringing my research into the classroom by keeping a blog about my recent trip to Canada to collect fish for my research. Another GK-12 fellow, Melissa, traveled with me for my research, and she is also contributing to the blog. We are using the blog to connect elementary classrooms from multiple districts to real research experiences. Check out our blog and discussions with classrooms at [www.kalamazoo.edu/~k12partnership](#).

I am also continuing to visit elementary classrooms. Most often, I visit Sandi Overgaard's and Shayne Elwell's 3<sup>rd</sup> grade classes at Sonoma Elementary and Jim Eckert's 4<sup>th</sup> grade class at Wattles Park Elementary. In 3<sup>rd</sup> grade, I have been helping with small group explorations for the Battle Creek Science Kit light unit. I am also developing extensions and alternatives for the organisms unit. In 4<sup>th</sup> grade, I helped students make progress on their animal research books by providing examples of unique animals across the world.

From Harper Creek's fellow, Alycia Reynolds-Lackey: Spring and summer are especially busy for my research because this is the breeding season for the stickleback fish I study. In late March, I took a 10-day trip to British Columbia, Canada to collect stickleback from three lakes along the west coast. We fly the fish back as baggage on the plane from Vancouver to Lansing. People are always surprised to see me with 6 gigantic coolers labeled "Live Arctic Fish. Keep Cold." This summer, I will run two experiments in the lab at MSU. First I am testing whether different habitats are important for helping females to choose between mating with males of her own species and males of the other species. My second experiment looks at whether hybrids (offspring of matings between different species) are rare because the eggs and sperm of members of different species don't combine very successfully. These questions are important for understanding how different species arise and are maintained, and the answers advance our understanding of the origin and maintenance of biodiversity.



I (Leila Desotelle) have been working to understand how the oil spill on the Kalamazoo River affected the base of the food web. In previous years, I

have collected data in the river from Battle Creek to Allegan, MI to understand how the dams affect stream food webs by measuring food source changes and measuring the invertebrates that live there. When the oil spill happened, I put in special samplers to collect stream insects and see how the numbers changed. I even went in the river in the middle of winter and used leaf packs similar to the ones used by the K-12 students to collect insects. Sampling in the winter is important because we find very different kinds of insects from those found in the summer. My advisor, Dr. Stephen Hamilton, and I are working hard to understand how the oil spill impacted the river, and it is very important to measure the insect communities carefully to get precise results. In the coming months I will be counting these insects and will continue sampling in the Kalamazoo River to see how the insects compare to last summer.





I'm Liz Schultheis, and I study invasive plant species in Michigan, and how release from natural enemies (like disease or predators) may be a key

factor explaining how invasive a species can become. This summer I plan to set up gardens with a mix of native and invasive species, all found in Kalamazoo County. Each garden will receive its own treatment – such as fencing out deer so they can't eat the plants, or removing insects to prevent their damage to plants. Which type of species will benefit more from my treatments? I expect native plants to benefit more, because they should have high levels of enemy attack in nature. Invasive species should have naturally low levels of attack from deer and insects, so fencing and spraying them to keep these enemies out should not help them much.

## Lawton

Working with my partner teacher, Marcia Angle, I developed a lesson on how scientists classify living things. Classification happens in every day life, yet the process is so subtle we might not even realize that we do it. We started with an example each student is familiar with, their own shoes, and worked as a class to divide them into meaningful groups, each branching from a previous group. I learned the fashion term "skater shoe", which helped students understand the importance of choosing terms for their trees that would be understandable to a wide audience. After classifying shoes, we applied the classification skills to species of plants that are planted in the BEST (Bioenergy Sustainability) plots at Lawton. Identification skills will be helpful for students once we begin research on the plots this spring! This lesson was a lot of fun because it got students to think like scientists and make their own decisions about how to meaningfully group living things.



## Olivet

I (Nick Ballew) have been bouncing around all different grades at Olivet these past few months. In the early part of the year, I taught students in Mrs. Morton's 9th grade class about natural selection by using a lesson modeled after my research on bass fishing. The lesson worked well for teaching students the material and as a bonus, the students seemed to really enjoy the activity too! In Mr. Stolberg's 8<sup>th</sup> grade earth science class, I taught students about factors that affect the transfer of heat and how heat transfer impacts weather. Students used state of the art temperature probes to observe how heat is transferred by measuring the rate of temperature change in real time under a multitude of scenarios and conditions. Additionally, The 4<sup>th</sup> and 5<sup>th</sup> grades also had their annual science fair and it was a huge success! As part of the lead up to the fair, I gave an assembly to each grade about how I use the same scientific process to answer my research questions as they used to answer their science fair questions.

A common complaint among fisherman is that fishing opportunities are not as good as they used to be. One explanation for this may be that the fish that now inhabit our lakes and rivers do not strike at bait and lures as eagerly as the fish that lived there in the past.

As part of a larger effort to understand if fishing has had such an effect on largemouth bass populations, this summer I (Nick) will be investigating if fishing decreases the reproductive success of easy to catch bass more than hard to catch bass. If this occurs and bass also inherit their catchability from their parents, then fishing has the potential to cause

populations to become comprised mostly of fish that do not easily strike at the bait.



## Plainwell

See page 2 to read all about what's up in Plainwell – check out pictures from their wildly successful Science Night at the Middle School!



As the school year nears the end, a new field season begins at the Kellogg Biological Station. I (Iurii) Shcherbak will begin a set of new experiments that ask why (and what portion of) fertilizer applied to an agricultural field turns into a gaseous form of nitrogen gas or nitrous oxide, which is a potent greenhouse gas. A new experiment at the KBS Long-Term Ecological research site will involve installing instruments for the measurement of concentrations of greenhouse gases (carbon dioxide, nitrous oxide, and methane) in the soil and comparing those measurements for various soil management practices from conventional tillage to no-management grassy fields and forests. In another experiment, I will measure gas concentrations and analyze data in a fertilizer gradient study, where fields have the same agricultural management, but different amounts of fertilizer added.

I (Kali Bird) study how lake bacteria use different types of phosphorus containing particles, which influences the amount of algae and other organisms that live in the water. In the last few months, I have learned that bacteria vary in their ability to use different types of phosphorus-containing particles. In fact, some bacteria are able to 'specialize' on using certain kinds of phosphorus-containing particles. Interestingly, I also found that the bacteria which I isolated from the high-phosphorus lake tended to be 'specialists,' while the bacteria isolated from the low-phosphorus lake had no tendency toward specialization. These differences in phosphorus-use abilities may reflect the bacteria's evolutionary history. If so, this may mean that when we allow excess phosphorus to get into lakes, we not only increase the amount of algae, but we may be changing which bacteria can live there and how they evolve. It is my hope that such knowledge will aid our abilities to remediate nutrient-polluted waters.



## A few shots from our partner districts...



## Vicksburg



The Vicksburg Bulldogs are having a wonderfully scientific year! One of the most exciting new developments is the formation of the Vicksburg Environmental Science Club. This club is composed of middle and high school students and is collaboratively led by

middle school teacher Lisa Harbour and high school teacher Liz Ratashak. With help from GK-12 fellow Lauren Kinsman-Costello, Vicksburg's young environmental scientists started the year off by planting prairie grass seed at their Bioenergy Sustainability Experiment research plot. This initiated Vicksburg's participation in an experiment that is taking place at school districts across southwest Michigan organized through Michigan State University's Kellogg Biological Station. The club learned about winter ecology by building animal feeders and going on a winter hike to look for animal signs. To top the year off, two middle school members applied for a Vicksburg Curiosity Grant to fund the club's spring visit to Grand Rapids to the Bodies Revealed exhibit at the Van Andel Museum and the Frederik Meijer Gardens and Sculpture Park.

I' (Lauren Kinsman-Costello) have spent my past summers investigating how nutrients, particularly phosphorus, move through wetland ecosystems by collecting water and mud samples from shallow, muddy places throughout southwest Michigan and analyzing their chemistry. Now I am in the final year of my graduate career, and this summer will be decidedly less dirty, as it is time to write my dissertation. This means that I'll spend most of my days in front of my computer analyzing data, making graphs, reading the scientific literature, and writing the results of my research. It may not be as invigorating as taking sediment core from a wobbly canoe in a muddy wetland, but writing is an important and exciting part of the scientific process. As a scientist, looking for patterns in the data I've collected is one of my favorite parts of the job. So, if you want to find me this summer... follow the smell of the coffee.



### **Phil Robertson, Co-Director**

Phil is a University Distinguished Professor of Ecosystem Science in the Department of Crop and Soil Sciences at MSU. His research interests include the biogeochemistry and ecology of field crop ecosystems. He studies how nitrogen and carbon cycle in terrestrial systems and their impacts on crop yield, water quality, and atmospheric chemistry.



### **Tom Getty, Co-Director**

Tom is a Professor of Behavioral Ecology in the Department of Zoology at MSU. His research focuses on the role of information in various aspects of behavior, ecology, and evolution including: mate choice, aggression, cooperation, predator-prey interactions, and habitat choice.



### **Charles (Andy) Anderson, Co-Director**

Andy is a Professor of Science Education in the Department of Teacher Education at MSU. His research centers on the classroom teaching and learning of science. He studies how students' prior knowledge, language, and social relationships affect their engagement in science learning and the development of environmental science literacy.

### **Sara Syswerda, MSP Coordinator**

Sara earned her PhD in Crops and Soil Sciences and Ecology, Evolutionary Biology, and Behavior from Michigan State University. Her interests are in nitrogen and carbon cycling, environmental pollution, sustainable agriculture, and science education. Sara works with teachers, visits schools, manages the K-12 Partnership web pages, and coordinates workshops.



### **Robin Tinghitella, GK-12 Coordinator**

Robin earned her PhD in Evolution, Ecology and Organismal Biology at the University of California-Riverside. Her interests are in behavioral ecology, particularly sexual signaling and mate choice, and science education. Robin recently finished a post-doctoral position at University of Michigan. She meets with fellows, visits schools, manages the K-12 Partnership web pages, and coordinates workshops.

