MITC Honored by Minnesota Horticultural Society

On February 2, 2008, Monarchs in the Classroom was honored by the Minnesota State Horticultural Society, receiving the Youth and the Environment Award. The honor is awarded to a group that has “organized and implemented the most notable youth project in environmental education involving community gardening.” Each year the Minnesota State Horticultural Society recognizes individuals and organizations who have made outstanding contributions to horticulture and greening efforts in public gardens, community projects and through exemplary community achievements. MITC was recognized for our Schoolyard Garden Grant program (see page 3). We would like to share this honor with the teachers involved in all of our programs. Without you, these programs would not be the successes they are! Thanks for all of your great work with students, science education and conservation.

Inside this Issue:

2008 Summer Courses 2
Digital Photography How-To 4
Science Journaling 6
Catalog & Ordering Information 8
Featured Teacher and Student 10
Field Guide Lesson 13
North American Conservation Plan 14
Logging in Overwintering Sites 15

Greetings from the University of Minnesota Monarch Lab!

This year’s newsletter focuses on the relationship between art and science, from using photography effectively in a classroom, to making and recording scientific observations in a journal. We hope you find something useful!

With a decrease in support by state governments, school districts throughout the country have been forced to make difficult decisions about our children’s education. Class sizes are increasing and programs are being cut, and testing has led to a heavy emphasis on math and language arts. While upcoming testing in many states may result in more time spent on science, music, art, and theater programs are receiving less and less emphasis. Few of us would argue the importance of math, reading and science, but we’d like to put in a plug for the creative arts. Interestingly, in many respects, our society values musicians and actors over mathematicians and scientists. Case in point: quick, can you name more famous living scientists, or more famous living musicians or actors?

Creative outlets during the school day help to create well-rounded members of society, and round out our students’ education. Art, theater, and music work effectively with students who learn visually or by hearing. Without these subjects, some students could easily become frustrated and end up being left behind. And, art complements science; it supports creative thinking, which is key to success as a scientist, and helps to develop keen observational and recording skills.

Leonardo da Vinci personifies the blurry line between art and science. While you may be most familiar with da Vinci as the painter of one of the most famous works of art ever created, the Mona Lisa, he also made huge contributions to the fields of anatomy, engineering, and mathematics. One of his drawings, Vitruvian Man, representing proportions of the human body, is a clear testament to da Vinci’s interdisciplinary studies.

In celebration of art for its own sake, and also of art as an important way of thinking and learning for future scientists, citizens and decision makers, we’ve focused this newsletter on the connections between art and science. We hope it, and other materials like our new fourth edition curriculum guides (see inside pages), will give you new ideas for using interdisciplinary teaching in your own classroom, sculpting an articulate group of citizens along the way.
Summer Ecology Institute ‘08

Our four summer classes for teachers: Insect Ecology for elementary teachers, Insect Field Ecology, and two Schoolyard Ecology Exploration classes (one for elementary teachers and one for secondary courses) have joined into a comprehensive Summer Ecology Institute at the U of M. Choose one course in which you’ll spend most of your two weeks, then mix and match shared components of the Ecology Institute to create a tailor-made summer learning experience just for you. Whichever class you choose, you’ll boost your ecology knowledge and take away techniques and materials that translate directly to your classroom. You’ll be able to choose activities based on the age of your students, the location and surroundings of your school, your own interests and needs, and content foci in your school. If you’ve already taken one of these courses, choose a different one for summer 2008, meet dozens of new colleagues, and renew acquaintances with our instructional staff of college faculty and teacher mentors.

To apply for all courses, fill out a course application at www.teachercourses.umn.edu or contact Lis at lis@monarchlab.org. Applications received by April 15 will be given first consideration.

Monarchs & More

Insect Ecology for Elementary Teachers (K-5)
Gain confidence and expertise in scientific inquiry as you learn to observe, maintain and collect insects appropriate for classroom and schoolyard study!

- Learn basic ecological concepts
- Develop and apply skills in scientific inquiry for use in the classroom to meet standards requirements
- Participate in hands-on studies of insects that are applicable to your own and your students’ scientific learning
- Learn from expert classroom teachers
- Differs from other M&M course in its emphasis on direct classroom applications for elementary teachers

Insect Field Ecology for Teachers (K-8)
Experience the process of scientific inquiry through hands-on research with insects!

- Learn field techniques for studying insects, ways to collect data, and basic ecological concepts
- Blends lab activities, research, and lectures to provide new ideas to meet standards requirements
- Spend three days of week one at Eagle Bluff Environmental Learning Center. Week two focuses on techniques for transferring these new principals to students.
- Engage in activities that will directly transfer to the classroom
- Learn from expert elementary and middle school teachers and U of M scientists
- Differs from other M&M course in its emphasis on inquiry-based research

General Course Information

- Dates and times: July 7-11 & July 28-August 1, 8:30-3:30 Monday—Friday each week
- Compensation: All course fees, materials, lunches, per diem and 3 graduate credits will be covered by a grant from the MN Office of Higher Education.

Elementary Course Information

- Location: U of M St. Paul Campus
- Lead Instructor: Dr. Michele Koomen (Gustavus Adolphus College)
- Teacher Mentor Instructors: Jane Blumer, Diane Erdman, Mary Hedenstrom, and Terry Vick.

Field Ecology Course Information

- Location: U of M St. Paul Campus & Eagle Bluff Environmental Learning Center
- Lead Instructor: Dr. Karen Oberhauser
- Teacher Mentor Instructors: Laura Molenaar, Sue Peploe, Cindy Petersen, and Caroline Waskow

2008 Summer Courses

2008 Newsletter
Schoolyard Ecology Explorations

Unlock the research potential of your schoolyard by conducting inquiry outside with your students.

Share the thrill of discovery with your students using simple schoolyard inquiry techniques. Take two weeks this summer to train your eye to view your schoolyard as a resource for student investigations.

Expert classroom teachers and University of Minnesota scientists will teach techniques for studying plants and animals in urban, suburban and rural habitats. You’ll deepen your understanding of ecology and research during two days at the Cedar Creek Natural History Area, meeting with ecologists and touring their research sites. The inquiry focus of the course is woven into the study of ecological sustainability, with field and classroom study of the relationship between biodiversity and long-term ecosystem health.

Course activities will include instruction by expert teachers who use their schoolyards and gardens for student inquiry. Master Gardeners will be available to help you develop or enhance a schoolyard garden. You’ll collaborate in grade-specific groups to integrate these experiences into your curriculum and to address learning requirements.

SEE Course Information

- Course dates, times, and locations: July 7-11 & July 28-August 1, St. Paul Campus and Cedar Creek Natural History Area, 8:30-3:30 Monday—Friday each week
- Elementary Instructors: Lis Young-Isebrand (MITC) and Dr. Robert Blair (U of M). Teacher Mentor Instructors: Ann Hobbie, Harmony Lewis, and Ann Mock (Elementary Teachers)
- Secondary Instructors: Lis Young-Isebrand and Dr. Robert Blair. Teacher Mentor Instructors: Haley Kalina, J McClelland, and JoAnn Michet (Middle and High School Teachers)
- Compensation: All course fees, materials, lunches, per diem and 3 graduate credits will be covered by a grant from the MN Office of Higher Education Office, Improving Teacher Quality Program

Schoolyard Garden Grants!

2008 marked our 3rd year distributing schoolyard garden grants. These grants have now facilitated the creation of ecologically diverse plant and insect communities that are ripe for all kinds of student inquiry. Secondary, elementary, art, and science specialist teachers have been awarded garden grants. These interesting sites enhance student motivation and make it easy to incorporate outdoor learning into your curriculum.

We hope you’ll consider applying for up to $1500 to enhance your schoolyard and student learning!

Grant applications will be available online in September at www.monarchlab.org, with a due date of December 1, 2008. Please email lis@monarchlab.org if you are interested in applying for a schoolyard garden grant in the fall of 2008.

Schoolyard gardens lend themselves to interdisciplinary projects. This tile made by students identifies bee balm. (Photo by H. Lewis)
The point and shoot digital camera fits in a pocket, making it easy to take anywhere, even during trips to the schoolyard garden! But don’t let its small size fool you: this type of camera can take excellent photos.

While manufacturers want to keep increasing the number of megapixels in their cameras because this number is easy to advertise, you should look beyond that and instead focus on the feature set of a camera. Unless you plan on enlarging uncropped photographs beyond 8”x10”, a camera with seven megapixels should meet your needs, even though there are 12 megapixel cameras in the point and shoot category. Keep in mind that the more megapixels a camera has, the larger the digital files will be.

Features like image stabilization, face detection, and programmed scene modes can all be useful depending on how the camera will be used. Image stabilization is exactly what it sounds like: the camera tries to prevent blurred images in low light situations or when the zoom is being used. A camera with face detection can identify faces in the shot and focus on the face instead of the object behind the person.

Finally, programmed scene modes can be used in specific situations. The number and type of modes varies by manufacturer, but since our “focus” is insects, we’ll concentrate on the macro setting. The macro setting allows you to focus on objects close to the lens, which can come in handy for that close-up of monarch wings.

To see this feature in action, compare the two photos of the calculator keys. There is a clear difference between Photo A and Photo B. The only difference in settings between these two photos is that the macro setting of the camera was used in Photo B.

One trick to improve macro photos is to place the subject in a lampshade (a white one works best) on a solid surface. Next, you’ll need at least one light source. A desk lamp would be ideal, or some other kind of lamp that allows you to focus the light in one direction. Depending on what you’re photographing, there are two ways to take the photo. The first way is to take the picture from above, so that the camera is just above the lampshade. This will likely require a tripod. The second way is to cut a round hole in the side of the lampshade big enough for the camera’s lens to fit. Congratulations! You’ve just created a light tent. Using a light tent eliminates shadows and you’re left with a photograph showcasing your subject.

Now that you have beautiful photographs of that excursion to the schoolyard garden, how do you get them out of your camera and onto paper? Doing this is the fun part; you get to see your photos on something bigger than the screen on the camera. There are a couple of ways to transfer photos out of your camera. First, you could connect the camera to your computer; there should be a cable that came with your camera to do this. Once everything is connected the computer should walk you through the steps to transfer your photos. The only disadvantage to this process is that it drains your camera’s battery. The alternative is to get a memory card.
Use Abstract Photography to Get Students to Think Critically

Can you guess what the image is on the left? If you guessed a monarch wing, you’re right! The extreme close-up of something familiar results in an abstraction.

This photo was taken with a stereoscope that has a digital camera built in, allowing the user to capture images of the specimen on the stage. While it isn’t always feasible for a school to purchase such a microscope, there is a website that has a lot of high-quality microscopy images: http://www.nikonsmallworld.com/index.php has images of transgenic mice embryos and fish brains, among others.

Images of such small subjects often result in an abstraction, much like the photo of the monarch wings. Abstracting what is normally an easily identifiable object can challenge student perceptions. If students are able to think critically, then they can approach situations at a different angle. Introducing students to new ways of thinking can give them the tools they need to ask inquisitive questions about the world around them. Such a skill is crucial in science.
Include Art in Scientific Journals while Teaching Inquiry

One of a scientist’s most important tools is the laboratory notebook or journal. Scientists often include drawings to document observations. Because of this, the lab notebook can be adapted to incorporate art, math, and science for use in a classroom.

Encouraging students to draw in their journals is a great way to cater to visual learners. Sometimes, drawing a picture is more descriptive, and less time consuming, than trying to verbally explain a situation. An added bonus is seeing the artistic talents of your students used in a science class!

Maria Sibylla Merian, a 17th Century artist and naturalist, used drawings to document insects and plants. She began journaling at the age of 13, and was the first person to document insect metamorphosis. For the next 50 years, Merian documented the natural world through her observations and drawings, making a lasting impression in the fields of science and art along the way. The detail of her descriptions are clear in the following passages:

About a caterpillar’s behavior: “It is their way, to roll together, when they are touched, and thus to remain like a ball.” A different caterpillar “as soon as touched, turns its head quickly to and fro, as if in anger, and that it did about ten times one after the other.”

About watermelons in Africa: “...grow on the ground like cucumbers in Holland. They have a hard skin which gradually becomes less hard towards the inside of the fruit. The flesh is shiny and melts in the mouth like sugar; it is healthy and has a very pleasant taste; it is very refreshing to the sick.”

Today, watermelons are ubiquitous, but Merian could have been seeing this fruit for the first time. Her description is accurate and detailed, and she must have cut one open and tasted it (daring, considering this was likely foreign to her) to make these observations.

Merian’s work is a prime example of what art and science can do together; this blending of subjects can also be incorporated in your very own classroom. Stacy Baugh, a high school teacher at Frankfort High School in Frankfort, Indiana, has encouraged students to use art in the science classroom. Stacy took the Monarchs and More Field Ecology course in the summer of 2006. As a result of taking the course, Stacy says, “I think about science in a different way.”

Stacy graciously provided Monarchs in the Classroom with some samples of student journals. Stacy’s students did an insect morphology lab, drawing and labeling structures on different insects, like the monarch butterfly and the honeybee. Her classes also conducted an arthropod diversity study, in which students set out to determine which habitat was the most diverse. The class hypothesized that the woods would be, but after analyzing their data, they concluded that the lawn was actually the most diverse.

The scientific journal, complete with student illustrations, lends itself to being adapted in the classroom because of its flexibility, both in what it can be used for, and who can use it. The fact that this is a tool that scientists commonly use will make science more “real” to students. They’ll be able to make their own observations and investigate their own questions, becoming scientists in the making along the way.

Want to see all of this artwork in color? Log on to our website to see this newsletter, as well as archived newsletters at www.monarchlab.org
These illustrations from a student’s lab notebook are from Stacy Baugh’s science class. In the Insect Morphology Lab, students drew insects and labeled structures. By using this method, students gain a better understanding than simply labeling a handout.

** *** New Fourth Edition Curriculum Guides Are Here*** **

Newly-revised, the 4th edition Monarchs and More curriculum guides retain all of the best features of our third edition, and have additional background information and lessons. We’ve added more content about doing inquiry in your classroom, and more lessons on engaging students in a variety of outdoor activities. Separate guides for Grades K-2, Grades 3-6, and Middle School each include age-specific lessons divided into 6 sections:

- Butterfly Life Cycles
- Butterfly Systematics
- Ecology
- Conservation
- Conducting Experiments
- Monarch Migration

Each guide includes extensive background information, with sections on monarch biology, practical tips for rearing and observing insects, and conducting inquiry-based lessons in the classroom. Lessons include both teacher and student pages. There is an appendix with an extensive bibliography, and black-line drawings that can be copied for student handouts or overhead transparencies.
Milkweed Visitors by Mary Holland
Selected as a “Best Book of 2006” by the Association for Advancement of Science! This beautifully colored, 8” by 10” paperback will be a priceless addition to your classroom. Mary Holland has captured the critters that inhabit the milkweed community in clear, large, beautiful photographs, and clearly explains their roles in this fascinating, magical location. Throughout the book, many of your students’ questions will be addressed, and additionally, you and your students will be inspired to look more closely at these amazing creatures. $11.00

Milkweed, Monarchs and More Field Guide
by Ba Rea, Karen Oberhauser and Mike Quinn
Designed to help students, citizen scientists and others explore the milkweed community, this book includes over 300 full-color photos and entries on insects and spiders. Color coded symbols are used throughout the guide to indicate the animals’ roles in the milkweed community. It also includes an overview of the unique features of the milkweed family—including photos and ranges—identifying features for 10 of the 110 species found in North America. $9.00

Monarch! Come Play With Me
Ba Rea has created a sensitive, interactive narrative that focuses on the questions and answers between a monarch and a young girl. As the monarch progresses through metamorphosis from larva to adult, the young girl compares her own needs and activities to those of the monarch. The illustrations are exquisitely simple, scientifically accurate, and truly a delight to behold. From pre-schoolers to adults, ALL ages will be captivated by this beautiful new volume. $11.00

The Monarch Butterfly: Biology and Conservation
Edited by Karen Oberhauser and Michelle Solensky, this collection of journal articles and scientific papers centers around the biology and conservation of this majestic insect. If you have ever wondered what factors affect monarch egg size, how adaptable a monarch’s migratory behavior is, or how scientists use citizen science data, this book is for you. A perfect gift for the serious monarch investigator, this volume features scholarly articles by prominent monarch biologists. $40.00

The Monarch Butterfly: Uniting a Continent
This introductory book on monarch butterflies describes monarch life cycles, their habitat, and the Monarch Butterfly Biosphere Reserve in Mexico. Available in English or Spanish. $9.00

Classroom Visit
Monarch scientists will visit your classroom to talk to students about research, monarch biology, and conservation. Contact us to work out the details: (612) 624-8706 or orders@monarchlab.org. $60.00 per hour

Teacher Workshops
One hour to 3 days, before or after school, or on in-service days. Travel costs extra; we will provide curriculum guides. Contact us for details: (612) 624-8706 or orders@monarchlab.org. $100.00 per hour
**My Monarch Investigation Journal**
Produced by Ba Rea, this 32-page journal is designed to be a permanent, personal record of each student’s investigation of the life cycle of the monarch butterfly. The book includes illustrations and photographs covering caterpillar anatomy, habitat and community, life cycle, and migration. $5.00 each or $4.00 each for 20 or more

**Community Connections Poster**
Highlights components of a monarch’s habitat. 24 x 36 inches.
Laminated: $10.00; Unlaminated: $8.00

**Monarch Larva Field Guide**
Spiral bound, plastic-covered field book with descriptions and drawings of larvae for use in identifying instars. $7.00

**Monarch Life Cycle Poster**
Produced by the Midwest Monarch Project, this 17 x 22 inch laminated poster includes photographs of monarch stages from egg to adult. $10.00

**Life Cycle Cards**
A set of 16 laminated cards highlighting the metamorphosis of the monarch butterfly. Each digital color image is backed by a brief summary of the unique characteristics used for easy identification of the monarch in all stages of its life cycle. $8.00

**Annual Life Cycle Cards**
Our laminated 20-card set covers the individual life cycle, shows side-by-side comparison photos of male/female wings and abdomens, and includes maps of the fall and spring migration and photos of predation, activities, and clustering monarchs in the Mexico. Available in English or Spanish. The set includes 20, 3.75” by 5”, laminated cards. $10.00

**Saving the Monarchs Video**
30 minute video produced by KSTP TV describes how students, teachers, & scientists are working together to promote monarch conservation. Beautiful footage of the overwintering colonies. $10.00

**The World of Monarch Butterflies CD**
31-slide PowerPoint presentation with accompanying script. All stages of development, migration, overwintering and milkweed host plants are highlighted. $15.00

**Butterfly King Video or DVD**
20-minute video on the development of two monarchs during the summer. Story highlights natural and human-caused risks faced by monarch larvae, and has excellent footage of all stages. VHS or DVD: $13.00
Featured Teacher: Harmony Lewis

Aside from that brief stint in pre-school where she thought she would drive a garbage truck, Harmony has always wanted to be a school teacher. “I think I already had my eye on all the reuse possibilities.” Harmony’s attitude makes her an ideal fit for Monarchs in the Classroom.

Harmony has been involved with Monarchs in the Classroom since her first year of teaching. She took one of the summer courses and has been hooked on monarchs ever since. After sharing her experience with Karen about mentoring a group of students who created a schoolyard garden, she helped design the summer course currently called Schoolyard Ecology Explorations (SEE) and had the opportunity to be one of the teacher instructors in both of the course’s first two years. “I felt incredibly lucky to be involved in the process and was daily in awe of the knowledge that I was surrounded with while working at Cedar Creek,” Harmony recalls. “I will never forget the phone call I made to share the experience with my mom and how I acted like a teenage schoolgirl who met a rock star as I rambled on about meeting [David] Tilman and learning about the work he and the other scientists were doing so close to our home.”

In addition to meeting scientists, Harmony also enjoys “the rare ability to influence how teachers will impact their students and share the joy of science and environment with them.” She adds, “more than anything I love how I continue to learn more myself each year.” Everyone involved in the summer courses walks away with more knowledge, even the instructors!

Currently in her fifth year of teaching the sixth grade at Edgerton Elementary School in Maplewood, MN, Harmony uses monarchs to teach students about a number of topics. In her childhood, she recalls monarchs being much more prevalent than today—her students are surprised to hear about this anecdote. “I use this as a model of how our choices as a society impact our larger world,” she says. “If I keep teaching about monarchs, students will not only be more in tune to when they spot monarchs, but will be more aware of how environmental issues impact our day to day lives.”

Outside of the classroom, Harmony’s passion is the theater. She has been involved with the Roseville Community Theater, and has been part of the cast in two plays. During the summer, she searches for monarch life and host plants with her son. The two of them also get a “kick” out of finding frogs. Photography is another one of her interests and she documents the scenery of her family’s travels while camping and hiking.

Harmony will be joining us this summer to help teach the Schoolyard Ecology Explorations Elementary course, and we hope you get the opportunity to meet her!

Featured Student: Emily Nimmer

Congratulations to Emily Nimmer, a junior at Breck School, who recently competed at the Twin Cities Science and Engineering Fair, where she advanced to the state science fair, and qualified as an alternate for the International Science and Engineering Fair. In her paper, titled, “Studying Effects of Natural Enemies on Survival of Monarch Butterfly Larvae (Danaus plexippus) to Aid in Monarch Conservation,” Emily concluded that predation in monarch eggs and first instar larvae is due to ants, and that 3% of eggs laid by one female will survive to the third instar stage. Emily worked in the monarch lab last summer, and while she wasn’t collecting data out in the field, she was busy feeding monarchs and helping out with other projects. After graduation, Emily plans to continue doing research in the field of neuroscience “because there is so much left to understand and it’s something that really interests me.” Before starting college, Emily will be spending a second summer in the monarch lab, and we can’t wait to see her again!

Emily hard at work in the monarch lab. (Photo by L. Fruen)
Insect enthusiasts of all ages gathered at Coffman Memorial Union on December 15th for the 11th Annual Monarchs in the Classroom Insect Fair. Students shared their projects with one another and somehow managed to save time for lunch in an educational, fun-filled day.

The Insect Fair, supported by the Medtronic Foundation over the last 11 years, is Monarchs in the Classroom’s premiere event of the winter. With more than 500 students, teachers, parents, and volunteers attending, Coffman was full of posters, projects, questions, and ideas.

The primary goal of this event is to allow students to discuss science in a setting similar to a formal research symposium. Most of the inquiry-based projects were presented in the form of a poster. Students asked thought-provoking questions; “How strong are crayfish?” and “Will compost worms grow more on fruit and vegetable waste or junk food?” are but two examples of the 107 questions students asked and answered. All students were interviewed by a University scientist in small groups, allowing them to hear about other projects done by their peers. After being interviewed, students received an Insect Fair t-shirt. At the end of the day during the awards ceremony, the Great Hall was a sea of red!

In addition to presenting their research to scientists and peers, students had the opportunity to participate in breakout sessions. There were 14 break-out sessions to choose from, and students selected their top choices prior to the Insect Fair. One option was to learn the science behind beverage carbonation. Students were able to make their own bottle of root beer or ginger ale, while other students learned how to make an origami monarch.

We invite you to participate in the 2008 Insect Fair; 30 schools attended this year, but we always have room for more! The date for this year’s fair is December 13th, but you can plan ahead by taking one of the Monarchs and More or Schoolyard Ecology Explorations workshops in the summer. These workshops will prepare you to help your students conduct their own inquiry based projects and create poster presentations for the Insect Fair or other science fairs. Please email Lis at lis@monarchlab.org for more information. We hope to see you at the Insect Fair!
Collecting and Sustaining a Monarch Population in your Classroom

We will not be distributing monarchs in 2008. It has become difficult for us to maintain a healthy colony that can both produce tens of thousands of eggs and larvae for distribution to teachers and support our ongoing scientific research. Additionally, one year off made all of us realize how the end of the summer had become way too stressful. We hope that you continue to use these and other interesting insects in your classroom, and have asked Cindy Petersen and Laura Molenaar to share their considerable expertise about raising monarchs for classroom use.

When raising monarchs it is important to start early, sometime in July is ideal. Depending on the timing, you can collect eggs, larvae, or even adults. While eggs are easy to find (females like to lay eggs on new milkweed growth and on the underside of leaves) they take longer to develop. Finding larger larvae at the end of July requires less feeding on your part, but they are harder to find. If you need a lot of monarchs, this probably isn’t your best option.

After the monarchs have been collected, they need a proper habitat. One option is a plastic container the size of a shoebox (make your own or buy one for $5 at www.monarchlab.org). Be sure to put holes or a screen in the lid for air circulation. Whatever you decide to use, make sure the larvae are not overcrowded. A container the size of a shoebox shouldn’t have any more than 12 larvae in it. Spreading out your larvae in several containers is a good idea. This way, if larvae in one container get sick, you still have healthy larvae in another container.

There are two key elements in raising healthy monarchs. The first is to be diligent about cleaning everything. This can be done by washing items in hot soapy water and then sterilizing in a 5% bleach solution for 20 minutes. Make sure all of the bleach is rinsed off before use. Cleaning out frass and dried milkweed is also important and should be done daily. Second, fresh milkweed should be added every other day for smaller larvae, and every day for the larger larvae. You’ll be surprised at how fast they eat!

After your larvae pupate, you get a well-deserved break! The pupa stage lasts about ten days, and after you’ve cleaned out the container one last time, all you need to do is wait. Once the adults eclose, they should all be spore-checked (details on how to do this are at www.monarchparasites.org) and the wings numbered. Labeling males with odd numbers and females with even numbers works well. Healthy adults can go in a net cage with a food source like fresh cut flowers or sponges with a 20% honey and water solution. After 4-7 days you should see pairs mating. Record the number on the female and remove that monarch from the cage the next day.

You’ll need to set up a new cage so the female can lay eggs. Since males can force the female to mate, keeping the mated females together with the males results in fewer eggs laid. You don’t want to overload plants with eggs because this makes it difficult to raise those eggs once they become larvae. Rotating potted milkweed plants is a good idea. You can feed larvae milkweed you’ve picked, but the females prefer to lay eggs on potted plants.

Raising your own classroom monarchs for the first time can seem like a difficult task, but half the battle is getting started. You could start early in the summer with a small number of monarchs and gradually work your way toward the number you need when school starts.

Laura emphasizes the tips and guidance offered on our website (www.monarchlab.org) while Cindy encourages you to experiment to figure out what works best for you. The hardest part is getting the timing down. Once you get the hang of it, raising monarchs is rewarding and fun! And don’t forget about all of the other great classroom insects; we encourage you to branch out so your students can experience a larger part of this interesting order of animals.
Creating a field guide is a great way to integrate science and art. Plant and insect identification teaches students to make careful observations and pay attention to detail as they include the characteristics that make each species unique. Field guides can be made by students of any age. Very young students who can’t read are able to replicate shapes, colors and larger features. Older students will incorporate more detail, including descriptions, drawings and explanations of the organisms adaptation for its environment. A useful guide can be made if each student creates an identification page for a chosen organism. This classroom collaboration can result in a schoolyard field guide that is useful and a source of pride for the students. This lesson is adapted, to include multiple grades, from the new Monarchs and More Inquiry and Arthropod Based Curriculum.

Objective

In this lesson, students will create identification pages of plants that inhabit their schoolyard or other accessible habitat. This lesson could be adapted to identify animals as well.

Background

This lesson works best if students can visit and observe the habitat; if you can take your students outside to your schoolyard garden or a nearby park or field, this would be ideal. However, they can also look at pictures or use organisms found near their homes. The descriptions for plants and animals will be different but the format should remain the same for both so that students’ information is consistent.

Materials

Field guides for insects and plants
Page template format (tailored to students’ abilities and lesson objectives)
Paper, pens and pencils

Procedure

1. Show students examples of field guides and discuss why they are useful.
2. Visit a diverse natural habitat with your class. Bring field guides along to help you identify the plants and animals (especially insects!) that you observe. If you cannot visit a real habitat, you can use books and other materials.
3. Have each student choose a plant or animal and make a full-page drawing of their chosen organism. Encourage them to be as accurate as possible by showing them an example or giving them a checklist to follow.
4. Have each student fill out common information on a template for the plant or animal they have drawn. They can use field guides or other sources, or their own observations, for information. Below is a list of plant characteristics divided by grade levels.

**Grades K-2**

Height of plant, shape of leaves, color and shape of flower (if present) and common name of the plant; or size, color, shape and common name of insect.

**Grades 3-6**

All of the K-2 characteristics, arrangement of leaves (basal, alternate, opposite or whorled), plant classification (annual grass or forb, perennial grass or forb, tree or shrub), shape of leaf (toothed, entire or lobed), sun and shade requirements and arthropods present on the leaves. More detail on insects or other animals, such as scientific name or order, life cycle, and food requirements.

**Grades 7 and up**

All of the characteristics listed above, detailed drawing of the flower or reproductive structure, diagram of the life cycle of the plant or animal, classification of the flower (if present) as regular or irregular, blooming season, scientific name including the family, the mechanism to disperse seeds, adaptations to the environment and names of other organisms that interact with the organism.

5. Have students put their pages together so that plants with flowers of the same color are together, and then number the pages. Similarly, insects could be separated by order. Students should make an index for their field guide, arranging the organisms alphabetically, and writing the page number for each organism. Have students make a cover for their field guide and staple or bind the pages together.
The migrations of monarch butterflies in North America to overwintering sites in Mexico and California are among the most spectacular and unusual of the world’s natural events. However, habitat loss and degradation pose threats to monarchs throughout their annual cycle of breeding, migrating and overwintering; most monarch biologists agree that their survival requires that these threats are addressed.

Recent analyses of the overwintering area document an accumulated loss of a fifth of the forested land in the Monarch Butterfly Biosphere Reserve (MBBR) in Mexico from 1986 to 2006. Data from the American Farmland Trust show that changing farm practices and suburbanization of agricultural land in the United States are resulting in losses of approximately 876,000 hectares/year of land that can support the host plants and nectar sources required for monarch reproduction and migration.

Habitat conservation and restoration are absolutely necessary for monarch survival, and Mexico, Canada and the United States must work together to ensure that 1) sufficient suitable habitat is available on the overwintering grounds in the United States and Mexico for the populations to persist; and 2) sufficient breeding and migrating habitat is available in Canada, Mexico and the United States to maintain their current contribution to the overall North American population.

On June 27, 2007, the Council of Ministers of the Commission for Environmental Cooperation (a commission that is part of NAFTA) instructed its Secretariat to initiate collaborative actions to protect the monarch butterfly and its habitat. A number of individuals working for government agencies, non-governmental organizations and scientific researchers from the United States, Mexico and Canada have been working on a comprehensive North American Monarch Conservation Plan. This completed plan, with Karen Oberhauser as the coordinating author, will soon be presented to the governments of these countries.

Key objectives of the plan include: 1) Decrease or eliminate net forest loss due to unsustainable logging and habitat conversion in the overwintering habitat; 2) Address threats of habitat loss and degradation in the migratory flyway; 3) Address threats of loss, fragmentation, and modification of breeding habitat; and 4) Monitor monarch baseline performance and habitat quality.

Each objective includes specific actions that can be carried out by government and non-governmental agencies, researchers and members of the public. Oberhauser, University of Minnesota graduate student Rebecca Batalden and several collaborators have also completed a comprehensive monarch monitoring handbook—a compendium of monarch monitoring programs that will address the monitoring objective. The Monarch Larva Monitoring Project (www.mlmp.org) and many other programs are featured in this handbook, providing an easy-to-access summary of ways for people to get involved in monitoring monarchs.
Monarch Population Update

Status of Population: Loss of Winter Habitat

Every fall, monarch butterflies return from their summer breeding grounds in the Eastern US and Canada to 12 forested mountaintops in central Mexico. Millions of monarchs arrive on these mountaintops in early November, clustering on the branches and trunks of trees, waiting for spring, when they return north. Most of the sites on which monarchs survive over the course of the winter are protected by a decree of the Mexican government which created the Monarch Butterfly Biosphere Reserve. Despite the protection of this Reserve, illegal logging still occurs, resulting in the loss of critical monarch habitat.

Recent research funded by the Monarch Butterfly Sanctuary Foundation (www.mbsf.org) and published on NASA’s research website showed severe degradation of forests within the Reserve. Using imagery from the commercial Ikonos satellite, Drs. Lincoln Brower, Dan Slayback and Isabel Ramirez have shown that approximately 450 hectares (1,110 acres) of forest were logged between 2004 and 2008. Much of this area is in areas in which monarchs have roosted as recently as 2006-2007.

An intact forest canopy protects monarch butterflies from freezing temperatures during winter storms, like those that occurred in 2002 and 2004, and from unusually high temperatures during some days. Low temperatures can result in freezing to death, and high temperatures can result in dehydration and faster use of critical fat reserves.

Satellite photos of an overwintering site from 2004 (top) and 2008. The open circles with dates next to them in the top photo show locations of monarch colonies in areas that no longer have enough trees to support these colonies. Source: http://earthobservatory.nasa.gov/

There have been many efforts to stop forest degradation in Mexico, but processes which result in everything from forest thinning to clear-cutting have been an ongoing problem throughout the Reserve. Illegal logging persists in spite of President Calderon’s recent attempts to crack down on these activities through a policy of zero tolerance for logging. It is sometimes difficult to understand this in the United States, where our protected areas are owned by our government. However, the Monarch Butterfly Biosphere Reserve, and other Reserves in Mexico may be protected by law, but they are still owned by communities and ejidos, small groups of campesinos who collectively own the land on which they live, farm and extract goods such as timber. In some cases, small amounts of timber are removed for building, cooking and small-scale woodwork by local people. Additionally, commercial companies remove truckloads of illegally extracted timber. Clearly, more enforcement and incentives for local landowners are needed to slow the rate of illegal logging in these forests.

What can be done? Organizations such as the Monarch Butterfly Sanctuary Foundation (MBSF) are working to bring illegal logging to the attention of the public and relevant government and non-governmental organization officials in North America. Much is also being done to support more sustainable living activities in the region of the Monarch Butterfly Biosphere Reserve, and all three governments have requested the development of the North American Monarch Conservation Plan. Individuals and school groups can support the work of the MBSF, ask elected officials to support the Plan, and support the milkweed and flower habitats that are crucial to monarch survival in the US and Canada.