OUTDOOR CLASSROOM SYMPOSIUM

LEAPING INTO

Ten years of Taking Teachers Outdoors

Symposium Resource Guide

Addendum

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*From Green & Healthy Learning Creation Stations - "Make & Take" Session

OSC 2006 – Leaping Into Green and Healthy Schools
Charlie Elliott Wildlife Center, Mansfield, GA
Friday, October 27, 2006

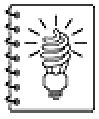
Presenter Contact Information

organized by session topics

AIR

Carla Bahun
Chattahoochee Nature Center
9135 Wileo Road
Roswell, GA 30075
P: 706-369-0597
F: -
schoolprograms@chattnaturecenter.com

Michelle Waters
The Clean Air Campaign, Inc.
Education Outreach Coordinator
1401 Peachtree Street, Suite 320
Atlanta, Georgia 30306
P: 678-244-7724
F: 678-244-7740
mail@cleanaircampaign.com



ENERGY

Naomi Thompson
Stone Mountain Memorial Association
Environmental Education Instructor
P.O. Box 689
Stone Mountain, GA 30086
P: 770-498-5619
F: 770-498-5659
n.thompson@stonemountainpark.org

IPM - INTEGRATED PEST MANAGEMENT

Kelly Kirby & Chris Nelson
Elliott Wildlife Center, DNR
Education Interns
543 Charlie Elliott Trail
Mansfield, GA 30055
P: 770-784-3059
F: 770-784-3061

SCHOOL GROUNDS

Melissa Hamilton
Chattahoochee Nature Center
School Programs Manager
9135 Wileo Road
Roswell, GA 30075
P: 706-369-0597
F: -
schoolprograms@chattnaturecenter.com

Sara Nichol
Stone Mountain Memorial Association
Instructor
P.O. Box 689
Stone Mountain, GA 30086
P: 770-498-5620
F: 770-498-5659
s.nichol@stonemountainpark.org

Peter Gordon
Elachee Nature Science Center
Education Director
2125 Elachee Drive
Gainesville, GA 30504
P: 770-535-1976
F: 770-535-2302
peter@elachee.org

Jerry Hightower
National Park Service/CRNRA
EE Coordinator CRNRA
1978 Island Ford Pkwy
Atlanta, GA 30350
P: 678-538-1245
F: 770-399-8087
Jerry_Hightower@nps.gov

WASTE MANAGEMENT

Elise Berman
Georgia Power
Environmental Education Coordinator
241 Ralph McGill Blvd., Bin 10221
Atlanta, GA 30308
P: 404-506-7505
F: 404-5061499
edberman@southernco.com

Trecia Neal
Fernbank Science Center
Biologist II
156 Heaton Park Drive, NE
Atlanta, GA 30307
P: 678 874-7139
F: 678 874-7110
t.neal@fernbank.edu

WATER

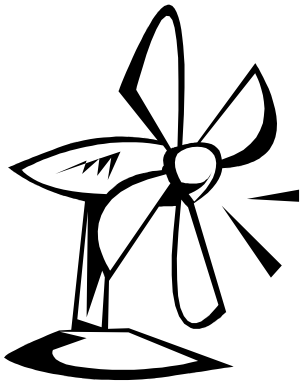
Sharon Smith &
Fulton County Public Works
Environmental Education Coordinator
141 Pryor St. Suite 6001
Atlanta, GA
P: 404-730-8006
F: 404-335-5250
sharon.smith@fultoncountyga.gov

Jennifer McLaurin
Fulton County Public Works
Environmental Education Coordinator
141 Pryor St. Suite 6001
Atlanta, GA
P: 404-730-8745
F: 404-335-5250
jennifer.mclaurin@fultoncountyga.gov

INTERDISCIPLINARY SESSIONS

Harriet Bryant
Georgia DNR/EPD
Environmental Education Coordinator
4220 International Pkwy , Suite 101
Atlanta, GA 30354
P: 404-675-1670
F: 404-675-6247
Harriet Bryant@dnr.state.ga.us

Mary Gazaway
Georgia DNR/EPD
Environmental Education Coordinator
4244 International Pkwy , Suite 101
Atlanta, GA 30354
P: 404-675-1745
F: 404-675-6247
Mary_Gazaway@dnr.state.ga.us



AIR SESSIONS

Materials provided by speakers from the following sessions:

- **Make A Smog Alert Poster**
  - Make your Own Smog Alert Indicator Poster
- **Tree Capture Air Pollution**
  - Trees Capture Pollution!

MAKE YOUR OWN SMOG ALERT INDICATOR POSTER

To sign up for Smog Alert emails visit www.cleanaircampaign.com. You can let your family know how clean or dirty the air is each day! Hot, sunny weather helps to "cook" the pollutants in the air, so we see more Smog Alerts from May to September! You can help to reduce air pollution by using less electricity, asking your parents to go inside a restaurant instead of using the drive thru, and by walking or riding the bus to school!

AIR QUALITY
SMOG ALERT POSTER

Directions: Color to match the large smog alert poster. Use the correct colors. Then cut out the section under the word today. Use a hole puncher to punch a hole under the word TODAY. Attach a paper clip to an 8 inch piece of yarn or string. Attach the string/yarn to the poster by tying it to the hole under the word today and reinforce with tape. Each day check the AQI on www.cleanaircampaign.com and move the paper clip to show the AQI for each day or Sign Up for Smog Alerts via the website. This is a great activity to add to your daily warm-up or calendar activities.

TODAY		Air Quality	Air Quality Index	Health Advisory
		**GOOD**	**0-50**	The air quality is good. Enjoy activities.
		**MODERATE**	**51-100**	At this level the air is probably safe for most people. People who are sensitive to air pollution consider reducing prolonged or heavy exertion.
		**UNHEALTHY** **for Sensitive Groups**	**101-150**	Active adults, people with heart or lung disease (including asthma), older adults and children should cut back or reschedule strenuous activities.
		**UNHEALTHY**	**151-200**	Everyone, especially people with heart or lung disease (including asthma) should avoid strenuous activities.
		**VERY UNHEALTHY**	**201-300**	Everyone, especially people with hear or lung disease (including asthma), should avoid physical activities.

Trees Capture Pollution!

Background

Fine particles floating in the atmosphere have been linked to respiratory illness. In urban areas, as much as 80% of emissions of these health-damaging particles can come from road traffic.

Research has shown that trees act as biological filters by removing many particles from city environments—as much as 234 tons per year in Chicago, for example!! Trees have a relatively large surface area created by their leaves in relation to the small ground area they occupy, and the presence of a waxy surface or leaf "hairs" in some tree species capture these particles easily.

Tree Identification and Pollution Project

Materials:

Sturdy cloth squares, assorted light and dark colors that don't bleed
Scissors, non-washable glue
A variety of tree field guides depicting leaf shapes
Push pins, tacks, or appropriate outdoor attachment devices

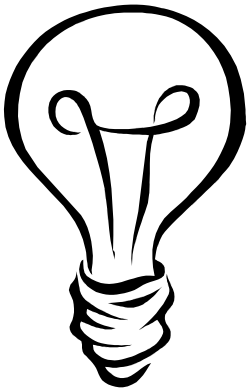
Learn about tree types and different leaf shapes while conducting an air pollution experiment.

1. Using field guides and schoolyard trees, allow students to examine the shapes of leaves and their role in tree identification.
2. Have students cut out representative leaf shapes (wide shapes are better) traced on cloth squares at least 3X5 inches.
3. Attach the leaf cutouts to larger squares of light-colored cloth (at least three inches wider all around than the leaf cutout) with enough glue at the edges to hold the cutout in place, keeping in mind that the leaf shape will need to be removed later.
4. Hang the cloth up outside, nearby, but not on, a busy road. Make sure the cloth is hanging in an area free of other debris such as a gutter or bird feeder.
5. After at least a week, remove the leaf shape from the larger cloth and see how clean the cloth is underneath. Pollution particles in the air have made the rest of the cloth dirty.
6. Remind students that trees help to remove particles from the air by catching them on the waxy or hairy surfaces of their many, many leaves!!

(This "Make-n-Take" session is conducted for time's sake and demonstration purposes with a facsimile pollution source.)

Adapted from *Nature for Fun Projects* by Sally Hewitt

Activity courtesy of the Chattahoochee Nature Center
www.chattnaturecenter.com
9135 Willeo Road, Roswell, Georgia 30075
770-992-2055



ENERGY SESSIONS

Materials provided by speakers from the following sessions:

- **Energy from the Sun**
  - The Bernard Solar Panel Cooker
  - Solar cooking background information

The Bernard Solar Panel Cooker

Created by Roger Bernard of La Association Lyonnaise pour l'Etude et le Developement de l'Energie Solaire. Can be found at http://p2.utep.edu/watts/manuals/bernard.pdf

Materials

A cardboard box (figure 1) with the height BC greater than the width DC
aluminum foil
glue
oven cooking bag
glass jar (painted black, leave a small strip so you can see the food cooking inside)
box cutter
string
tape
sunglasses
oven mitts

1. Label the box sides as seen in Figure 1.

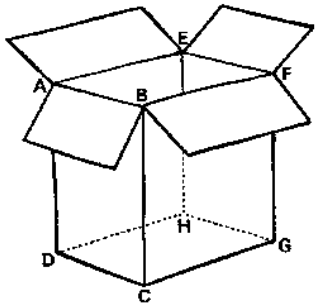


Figure 1

2. Cut off the box flaps. Next, cut along seams FG and GC and on the other side along EH and HD. Your box will fold out flat into five rectangles as shown in figure 2. (Letters that appear twice in figure 2 indicate two points which were the same point before cutting.)

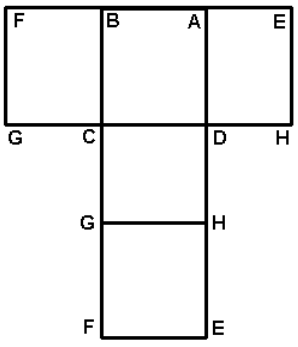


Figure 2

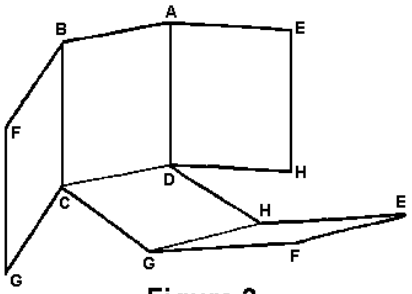


Figure 3

3. Now, glue aluminum foil to one side of the box, on all five rectangles.

4. Next, place the rectangle CDHG horizontal on a flat, level surface and position the other rectangles as shown in figure 3. Tilt the front "mirror" EFGH at an angle (play with this angle to see which concentrates the most sun in the middle of your cooker). BFGC and AEHD are set at a 45 degree angle.

5. Tape a piece of string from the middle of side AB to the middle of side EF. This will help mirror EFGH hold its' angle. Another piece of string should be taped from one GC side to the other GC side and from one HD side to the other HD side. This will prevent the side flaps from blowing open. You might need to use sunglasses at this point so you don't burn your eyes from the reflection off the panel sides.

You don't need to worry about constantly turning this cooker so it fully captures the sun's rays. However, you will have to turn it if you have both morning and afternoon use.

Paint the glass jar black but leave a small strip clear. Put your food to cook in the jar and finger tighten the lid. Place the jar into the cooking bag with the opening at the top. Put on your sunglasses. Position the panel cooker so the panels concentrate the sun in the middle. Place the jar in the bag in the center.

Food cooked in solar cookers usually takes twice as long as that cooked in conventional ovens.

The jar will be very hot; make sure to use oven mitts when moving it.

Frequently check on the panel cooker, especially if it is a windy day. The panels will get blown around and may tip over your jar.

A few recipes:
Food jars can be placed immediately into the panel cooker. Within an hour, most containers with liquids should be ready. If you open the bag and jar to check, don't forget that you have let out all of the heat you just trapped**.**

Try to make spaghetti in your panel cooker. Use 2 jars, one with water and spaghetti and one with the sauce.

If you have a flat glass container that you can paint black, try making S'mores in this cooker.

Cheese Dip: Combine half a block of Velveeta cheese, can of chopped green chiles, can of refried beans, 1 cup of salsa. Enjoy dipping into this with good chips!

Solar cooking background information

Some common solar cooker designs are box, parabolic and panel cookers. Box cookers use an inside, insulated cooking space with a glass or plastic top through which a reflective panel reflects sun light. Parabolic and panel cookers are open designs that focus reflected light onto one spot. All of the cookers use cooking pots or jars painted black. The parabolic and panel cookers use an oven cooking bag to contain the heat. The box and panel cookers don't have to be turned as much as the parabolic cooker to follow the sun. On a completely sunny day, the box or panel cookers could be set up with food and left alone for and hour or two.

Learn more about solar cooking and designs at http://foundobjectart.com/sca/Plans.pdf. Multiple designs can be found at http://solarcooking.org/plans.htm.

Solar cookers work due to principles of light reflection, material insulation capabilities, heat conduction, radiation, retention and convection.

Visible light hits the reflectors and is reflected at the dark cooking vessel, which absorbs this energy. The dark colored vessel re-radiates invisible infrared light, or heat back out into the cooking space. A box cooker is designed to trap this heat, but a parabolic or panel cooker must add the oven cooking bag to the design to trap the heat. The infrared light can't pass back through the glass or plastic. Instead it bounces back to the cooking vessel, which heats up more, creates more infrared light to bounce around and continues to heat up the pots. Sometimes a dark bottom tray of cardboard or metal is added to absorb more infrared light and conduct heat to the vessel. In this way heat is radiated within the cooking system, conducted from the vessel to the food, and convection air currents set up as the whole system heats up. Heat will be lost no matter what design is used. Most heat loss is through the plastic or glass. Care is taken in each system to choose insulation materials that can retain the most heat. The oven cooking bags work best because the plastic they are made of can withstand high temperatures without melting. While you can tightly close the bag, if you must check on the food, you lose all heat built up in the bag. On a box cooker, cardboard, crumpled newspaper and air spaces are used as insulation.

Learn more about solar cooking principles at http://solarcooking.org/sbcdes.htm.

Solar cooker enthusiasts can be found all over the world. However, solar cookers are also the main cooking equipment in parts of the world where fuel is in short supply. Solar Cookers International works with refuge camps in places like Darfur, Sudan to provide cookers to many families. Villages in India, Kenya and Chile also use various solar cooking designs in community kitchens.

For more information on world solar cooking use, visit http://solar cooking.org/, click on the archives link.

IPM SESSIONS

Materials provided by speakers from the following sessions:

- **Make and Take: Make your own spider**
  - Hanging Spiders
  - Spiders in your Garden; Friend or Foe

2006 Outdoor Classroom Symposium
Charlie Elliot Wildlife Center
Department of Natural Resources, Wildlife Resource Division
Make & Take Project

"Hanging Spiders"

Supplies Per Student:
Two cardboard egg carton sections (still joined together)

Four pipe cleaners (for the legs--any color will do)

Fishing string or yarn

Paint (this is for your spider, so any color you like is fine)

Construction paper (optional)

Glue

For extra creativity, you can use stickers, beans, and/or glitter to brighten up your spider. Use him as decorations for the fall holidays.

Directions:
1. Gather the pipe cleaners together, holding them in the middle. Tie the yarn or string around the center, leaving about 12"(inches) of yarn on the end.
2. Paint the egg carton sections and let them dry.
3. Poke a hole in the bottom of one section and then turn it upside down. Now pull the string or yarn (that is tied to your pipe cleaners) through the hole. This section should rest against the pipe cleaners, forming the front part of the spider.
4. Bend the pipe cleaners to look like legs.
5. Make the spider's eyes out of construction paper (or use your imagination and be creative!)
6. Hang your friendly looking spider by the end of the yarn.

Note: For additional fun, use fishing string in place of the yarn but in a longer length. Place a hook on the ceiling and thread the string through the hook. Then tie or tape it to the top of your door, on the side that opens towards you. When the door is closed, the spider should be high in the air. When you open the door, the spider will drop down.

2006 Outdoor Classroom Symposium
Charlie Elliot Wildlife Center
Department of Natural Resources, Wildlife Resources Division
Make & Take Project
"Green and Healthy Schools"

"Spiders in Your Garden; Friend or Foe?"

Intro: As you walked in here today you may have noticed all of the gardens, trees and shrubs around the building. What you probably didn't see or notice were the spiders that live there. The spiders act as **predators.** They feed on many insects that act as pests that destroy our garden flowers and vegetables. What this does is it allows the "good" organisms to battle the "bad" organisms on the playing field that is our (and your) garden. Having spiders in your garden can help you avoid the use of **pesticides** in the areas close to our homes and kitchens. Pesticides may contain harmful chemicals which can make us sick and can damage **food webs** by killing not only the organisms that eat our plants, but also the "good" organisms that eat them as well. A spider is one of the "good" organisms that you want living in your garden.

Background Information: Spiders belong to the arthropod class **Arachnida**. Greek mythology is responsible for the spider getting its scientific name. The princess Arachne challenged the goddess Athene to a weaving contest. When Arachne lost, she was turned into a spider and destined to weave forever. (www.hort.wisc.edu/master**garden**er/Features/insects/**spiders/spiders**.htm)

Their bodies are composed of two body segments called the **head** and **abdomen**. Spiders have unique organs under their abdomen called spinnerets. They use these special organs to spin their webs. Spiders also have about 3-4 pairs of **compound eyes** that allow them to see differences of sensitivity to light and movement. These paired eyes help aid them to be good hunters during the day and at night when they are most active. Most spiders are **nocturnal**.

Spiders have unique mouthparts comprised of chelicerae, or jaws, that end in fangs. Although most spiders are venomous, they are harmless to humans with a few exceptions--the black widow and the brown recluse being the most common spiders that require extra consideration. All spiders are predaceous, feeding on mostly on insects. Virtually any active stage of an insect's life cycle can fall prey to a spider. Some spiders will even eat insect eggs or pupae.

There are about 50 families of spiders in the United States. About 15 families of spiders are frequently encountered in crops, where they provide benefit as natural control agents.

(www.hort.wisc.edu/master**garden**er/Features/insects/**spiders/spiders**.htm)

What we can do: To help keep our gardens safe from being eaten by the "bad" organisms and having our health impacted by toxic chemicals: first ... put down the spray can! You most likely are applying too much, too often anyway. You're most likely killing of the more "good" guys than bad. (http://www.entomology.wisc.edu/mbcn/fea404.html)

Learn non-chemical ways to control pests such as bio-control that uses natural enemies such as our little garden friend the spider You can learn more about **bio-control** as well as other ideas by calling your county extension office, researching them online or at a library, or check out these websites about spiders, bio-control, integrated pest management and pesticides:

1. http://www.entomology.wisc.edu/mbcn/fea404.html
2. www.hort.wisc.edu/master**garden**er/Features/insects/**spiders/spiders**.htm
3. http://www.dnr.state.wi.us/org/caer/ce/eek/critter/invert/spiders.htm
4. http://ipm.ncsu.edu/urban/cropsci/c11struc/spiders.html
5. http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7442.html
6. http://www.epa.gov/pesticides/factsheets/ipm.html

SCHOOL GROUNDS SESSIONS

Materials provided by speakers from the following sessions:

- **Hummingbird Feeder**
  - Make Your Own Hummingbird Feeder
- **Sniff Out Your Breakfast (make & take)**
  - Sniff Out Your Breakfast
- **Schoolyard Bio-Blitzing**
  - Ecoregional Survey
- **Make and Take: Field Study of Mirapods**
  - How Many Legs Live Here?

Make Your Own Hummingbird Feeder


Photo by Kim Bailey

Overview: Based on what they know about hummingbirds, students will design and create their own feeder using everyday materials. (Adapt this activity for younger grade levels by having students make their own feeder by replicating a model homemade hummingbird feeder instead of designing their own.)

Subject Areas: science, visual arts, math

Key Concepts: physical adaptations

Skills: problem solving, creative thinking, teamwork/cooperative learning, artistic expression, observation, investigation

Location: indoors and outdoors

Estimated Time: varies, at least 45 min.-1hour for planning/design and 45 min.-1hour for making and testing feeder. Observation and investigation time after feeders are hung will vary.

Materials: recyclable/reusable materials such as plastic bottles with caps, deli containers with tops, plastic tubs for (e.g., for margarine or cream cheese), plastic cups, plastic plates, wire, string; art supplies such as paint pens, craft foam, ribbons; tools such as scissors, nails, wire snips, drill, tape, safety goggles, measuring instruments; water; sugar; sample commercial hummingbird feeders (optional)

Preparation: Gather all construction materials.
Design a Hummingbird Flower is an excellent activity to do before starting this project. (See www.kidsgardening.com/growingideas/PROJECTS/mar04/pg1.html for a link to this activity and many more!) Students need to be familiar with the feeding habits of hummingbirds and adaptations of hummingbird pollinated flowers (see the link above for this background information). They can use this knowledge to help them design the feeder.

Procedure
1. Hanging feeders can be an important part of attracting hummingbirds to the schoolyard. Having students create their own feeders provides additional learning opportunities and motivates them to make careful observations as the birds begin to visit! It is also a lot of fun! To begin, review the characteristics and feeding habits of hummingbirds as well as the adaptations of flowers that attract them. How can these features be incorporated in a hummingbird feeder (basically an artificial flower full of nectar)? If desired, examine several styles of commercial hummingbird feeders. What are the pros and cons of each? What special features such as ant traps or bee guards are included? How do they work? Which everyday materials can be used to make a hummingbird feeder?


"Hungry Hummer Jr."

made from shallow food

2. Divide students into pairs or small groups. Ask each group to design and build their own hummingbird feeder. The feeder can be their own design or based on one they've seen. As they work on their creations, students should consider the following questions:

- *Will the birds hover and/or perch to feed?*
- *How many feeding stations will the feeder have?*
- *Will the nectar be stored above (gravity fed) or below feeding holes?*
- *How will you prevent nectar from leaking out?*
- *How will the feeder survive wind, rain, and other weather events?*
- *How will you prevent ants, bees, or others from accessing the feeder?*
- *How will you hang the feeder?*
- *How will you clean the feeder?*
- *Will you be able to tell by looking how much nectar is left?*
- *Does the feeder pose any potential harm to hummingbirds?*

Photo by Kim Bailey

3. Ask students to describe and sketch their feeder designs on paper before building them. Students may need to experiment with some of the materials before completing their design. For testing purposes, start by using plain water instead of the 1:4 sugar to water nectar solution that will be put into the final feeders. Make sure groups have addressed each question above in their design. One of the toughest items to address is keeping out ants and bees. Crawling insects can be excluded by creating a water barrier or sticky area between them and the feeder. Flying insects have shorter tongues that hummingbirds and can be excluded in various ways by keeping the nectar out of their reach. This may be best accomplished by storing the nectar below feeding holes.

4. When it is time to build the feeders, take all necessary safety precautions. You may need to have classroom aides or parent volunteers to help with cutting, drilling, or punching holes.

5. When feeders are complete, let students show them off and explain their features to classmates.

6. Make the nectar solution by adding one part regular white granulated sugar to four parts water. Ask students, "What percent solution is this?" It's 20%, which closely matches the concentration of sucrose in most flower nectar! Stir to dissolve all the sugar, then boil for approximately two minutes to sterilize. Nectar should be cooled before filling feeders. Any extra can be stored in the refrigerator for future use. Please note that is not necessary or advisable to add red food coloring to the solution. Never make the solution from anything else but plain white granulated table sugar. Nectar made from honey is especially dangerous because it can cause a fatal infection.

Photo from Junior Master Gardener

Wrap-Up: Hang the filled feeders outside and wait for the hummingbirds to arrive. Which feeder will the birds judge to be most useful and attractive? If you have more feeders than you can use at school, allow students to take extras home and test them there. Monitor feeders closely and make sure to clean them regularly.

Extensions

Students can track the cost of building their feeder and create a budget for their feeder design.

Compare the costs of the homemade feeders to commercial feeders.

Have students make careful observations, then make recommend changes to make their feeders even more effective.

Ask students to create detailed step-by-step plans for building their feeder. Include diagrams or photos. Other students should be able to recreate the feeder based on their plans.

Conduct various experiments using the feeders. Investigate a question that interests students about birds' feeding behaviors. See the suggestions for hummingbird inquiry ideas below. Students will likely come up with their own list of questions to explore.

Hummingbird Inquiry Ideas

Hummingbird gardens and feeders arouse curiosity and enable students to design experiments to answer their own questions about hummingbird behavior. Here are some questions and mysteries to get them started.

- Which type of feeder is most attractive to hummingbirds?
  Tip: Test several different types of commercial feeders or make your own. Hang the feeders in similar areas or the same area. Observe birds feeding and measure how much nectar has been consumed from each feeder. Be aware that one dominant bird may guard the feeder it prefers and force others to feed at less preferable feeders.

- Do hummingbirds feed more or less often at feeders placed near nectar flowers than at feeders placed far away from them?
  Tip: Place one feeder in or near the hummingbird garden. Place another feeder of the same type in a distant but easy-to-view location. Observe birds feeding and measure how much nectar has been consumed from each feeder.

- Do hummingbirds really prefer red?
  Tip: Obtain colorless feeders or make your own. Color the feeders with non-toxic paint or tie differently colored ribbons on them. Place the feeders in similar locations or the same location. Observe birds feeding and measure how much nectar has been consumed from each feeder.

- Which flowers are most attractive to hummingbirds?
  Tip: Observe hummingbirds feeding at different times of the day. Use a stopwatch to record the amount of time a bird spends feeding at each type of flower. Graph and compare feeding times, showing the favorite flowers in order of preference.

- Do hummingbirds prefer nectar made from purified water to nectar made from ordinary tap water?
  Tip: Make two batches of nectar, one using purified water and one using tap water. Use two identical feeders placed at the same location, just a few feet apart, each with

a different batch of nectar. (Be sure to label them.) Record daily observations. Reverse the feeders and keep recording. Compare results with those at www.naturalinstinct.com (click on Hummingbird).

- Do hummingbirds prefer nectar made from white cane sugar or white beet sugar? Tip: Granulated white table sugar used to make hummingbird nectar can be made from beets or cane. The sucrose should be the same in both products, however, there is some anecdotal evidence from reliable observers that hummingbirds do prefer nectar made from cane sugar (may be due to different residues). The source of the sugar is usually written on the front of the bag it comes in. Find out if your hummers have a preference!

More questions (primarily for high school students) are available from Operation Rubythroat - www.rubythroat.org/ProjectsResearchMain.html

Caution: When investigating questions related to hummingbirds, be careful not to set up an experiment that could possibly cause harm to the birds. For example, never experiment with providing nectars of different concentrations or nectars made from any substances other than ordinary granulated white table sugar.

Feeder Tips

- Use feeders designed to exclude wasps, bees, and ants.
- If spring mornings are cold where you live, use a feeder without perches. Hovering while feeding helps hummingbirds stay warm.
- To make nectar, use one part sugar to four parts water. Use ordinary granulated white table sugar. Do not use honey, artificial sweeteners, flavorings, or anything but 20 percent sugar water! Do not add food coloring to nectar.
- To slow the rate of spoilage, boil the nectar for up to two minutes. Cool the nectar before adding it to the feeder.
- Store unused nectar in the refrigerator for up to two weeks.
- To avoid waste and remind you to clean and refill the feeder, only put out a small amount of nectar at a time.
- Always keep feeders clean and nectar fresh!
- When temperatures are over 60 F, it is best to clean feeders every two days.
- To clean, rinse the feeder with hot water. If you see fungus growing inside (usually black spots), use a bottle brush or pipe cleaner to remove all tracing or the fungus. You can also try adding sand and water to the bottle and shaking vigorously to remove fungus. It is usually not necessary to use soaps or cleaners. If you do, be sure to rinse very thoroughly.

For more information and lessons on how to attract and study hummingbirds in your schoolyard, please visit:
www.kidsgardening.com/growingideas/PROJECTS/mar04/pg1.html

- by Kim Bailey, Georgia regional editor for Green Teacher magazine.

SNIFF OUT YOUR BREAKFAST (Game 2)

Explanation/Background:

Odor is a major tool for finding food for all animals. Often animals have more effective scent receptors than humans do. Their noses are more sensitive and can pick up smaller traces of scents and/or distinguish smaller differences in odors. Animals also learn the scents of food they like and are able to digest.

Many insects find their food by smell. Pollinators, such as bees and butterflies, often seek out flowers with the same scent of those that they have been feeding on. This helps in furthering pollination, by the pollinators visiting the same kind of flowers.

What You Will Do:

Like a butterfly or bee, find a food plant with a particular smell and distinguish its smell from others.

What You Need:

- 6 spice bottles
- Scents: Pine, Vanilla, Peppermint, Lemon, Floral (i.e. Jasmine, Lavender)
- Cotton balls
- Permanent marker or label
- Sniff your Breakfast box

What to do:

1. Label 5 of the spice bottles with A-E using the permanent marker. The remaining spice bottle will be the "Flower" and should be distinct from the others (marked with a flower).
2. Put a cotton ball with one of the 5 scents in each Lettered spice bottle. **Remember, a little bit of these oils goes a long way.
3. Choose one of the five scents to be the "Flower" and place this scent in the remaining spice bottle. Make note of the letter of the matching Lettered spice bottle.
4. Activity:
    a. Explain that the participant is a butterfly or bee looking for a particular flower to get nectar. Before testing the odors, they must smell the scent of the "flower" they seek (spice bottle marked with a flower).
    b. Have participants smell the "Flower" and then smell the other 5 cups.
    c. Participant will then match the scent of the "Flower" with one of the Lettered spice bottles.
    d. A successful match means that the participant (butterfly or bee) has found the matching scent – and the desired food.

ECOREGIONAL SURVEY

How much do you know about where you live?

(Used with permission from World Wildlife Fund's *Windows on the Wild: Biodiversity Basics*)

1. What major habitat type do you live in? (temperate forest, temperate rain forest, grassland, taiga, tundra, desert, and so on)

2. Name three native trees that live in your area. Collect a leaf from each one.

3. Name five native edible plants that grow in your region, and list in which season(s) each is available.

4. Name one poisonous plant that lives in your area.

5. Name ten native animals that live in your area.

6. Name three native animals that you can see in your area at any time of the year.

7. Name three migratory animals that live in your area , and list in which season(s) you're able to see them

8. Do deer live in your area? If so, when during the year do they give birth?

9. How much average rainfall does your community get each year?

10. When (during what season or month) does your community normally get the most precipitation?

11. How long is the growing season in you community?

12. What is the average temperature in July? In December?

13. What are some natural signs in your community that show that the seasons are changing?

14. What body of water – lake pond, stream, or river- is closest to your school?

15. How has your area changed in the past 25 years? (Ask your parents or neighbors.)

16. What types of plants and animals lived in your area 10,000 years ago? What was the climate like then?

17. What species in your area-if any- are threatened or endangered?

18. What natural events or processes influence the land around your community? How have they affected the land? (For example, have there ever been glaciers, earthquakes, or volcanic eruptions in your area? Do frequent fires, high winds, or flooding shape where and how things grow?)

19. Are there any threatened ecological areas in your community? (Are any wetlands, rivers, or forests, for example, in trouble?)

20. Name a non-native species that has created problems in your community.

SYIP

Prepared for the 2006 Oxford Institute for Environmental Education
By Jerry Hightower, Environmental Education Coordinator
Chattahoochee River National Recreation Area

How Many Legs Live Here?

A bio-diversity survey and comparative analysis of Myriapods in the forest.

Are more Myriapods found in the litter of an open deciduous forest or in the litter of a dense pine forest?

I. Overview:

This investigative study will introduce students to a group of important, but often overlooked organisms in the Wildlife Sanctuary Outdoor Learning Center of the Chattahoochee River Environmental Education Center and school campuses. The campus wildlife included in this group of animals, centipedes, millipedes, and close relatives, is very exciting and even sometimes frightening to people. As amazing as any cinema monsters, these "way cool critters" will turn on young minds and launch grand discoveries. Students, through this Field Study can discover the significance of these animals in terms of the overall biodiversity of the habitat.

Students, working in discovery teams will (1) describe the micro-habitat of the study site, (2) observe and record the Myriapods located, (3) collect and identify the Myriapods found, (4) describe the size and diversity of the Myriapod populations within the study site.

Observing small organisms hidden in the litter of the forest floor can present challenges. This field study requires patience, taking risks (lying and kneeling on the forest floor), over coming fears, and getting your hands dirty. These organisms are little known and therefore, little information exists concerning these organisms for the state of Georgia. Much of the easily obtained information concerns the control of these animals as pests.

Materials:

Field Study Journals
Pencils and sharpener
Field Microscopes, one per team
Hand lens, one per student
Plastic collection containers (large Kroger spice containers)
Clear plastic snap together observation boxes
Forceps, one per student
Ruler, one per team
Cloth 3 meter measure tape, one per team
Yellow plastic tent pegs, one set of four per team
Nylon survey line
Black permanent markers, one per team
Golden Guide *Spiders and their Kin*, one per team
Campus Myriapod key, one per team*
Soil moisture gauge, one per team
Soil and air thermometers, one per team
Antiseptic wipes and hand sanitizer
Paper towels
18" X 60" Al-u-lite tables, one for every two teams
* Yet to be created.

Questions:
Introductory;

- What is a centipede and millipede?
- What is so important about these and the other two Myriapod classes?
- Do we need predators and decomposing plant processors at this level of the habitat?

Investigatory;

- How many different types of Myriapods are in this habitat?
- Does the type of forest floor litter affect diversity and abundance?
- Are both centipedes and millipedes present?
- Which class and which species is most common?
- Does soil moisture or temperature affect the populations?

Anticipated Student Questions;

- Can these creatures hurt me?
- Are Rolly-Polly Bugs Myriapods?
- How do we choose our study site?

Hypothesis:

The litter of the open deciduous forest provides better conditions for Myriapod populations.

Additional hypotheses;

Cooler, moister soils and forest floor litter provides better conditions for Myriapod populations.

Acceptable levels of food, temperature and moisture for Myriapod populations exist in pine and open deciduous forests.

Procedures:

Pre field study preparation:

Students will be placed in two to three person investigation teams. Each team will conduct independent research on Myriapods. The teams will compile the information collected into a report and will present a presentation to the other students. Stress to the students that boring means snoring and encourage very creative presentations using multi-media, song, creative movement, etc. This is to lay a strong foundation of basic understanding of the nature and nomenclature of Myriapods and their role in world ecosystems.

Students may develop a Myriapod key for use with their field investigations.

Next discuss with the students the forest habitats present at the Chattahoochee River Environmental Education Center. Ask them if they would expect to find Myriapods in the forests. Have the students respond in their teams after discussing the question with their team mates. Open the discussion to encourage maximum student participation. Explain to the students that in their teams they will conduct a field study investigation of Myriapods in two different forest situations. Discuss poison ivy and other field study safety precautions.

Field Investigations:

1. Gather the students on the lower deck. Provide each student with a Field Journal, a pencil, and a hand lens.

2. As a group walk to the pine forest study area. This site is a young less than 20 year old Loblolly Pine forest that was formally an agricultural field, then pasture, and finally old field succession site. Trees at the corners of the approx 30 meter square study area would have been previously prominently marked with flagging tape.

3. Have the students observe the overall characteristics of the area and record this in their journals. Remind students to cooperatively work with their team mates.

4. As a group walk to the open deciduous forest study area. This site is predominantly broad leaf trees that are 45 to over 80 years old. This study area has also been marked with flagging tape.

5. Have the student teams observe the overall characteristics of the area and record this in their journals. Next ask the students to record any questions that they could pose concerning Myriapods in these two forest settings. Determine the amount of time to allow for this, tell the students, and call time to keep the investigation on schedule.

6. Assign one half of the class to investigate the pine forest and the other half to investigate the deciduous forest. Encourage the student teams to develop questions as they conduct their field investigations.

7. The team investigation materials have been previously placed on Al-u-lite tables at each area.

8. Explain to the teams that they will use the nylon twine, the tent pegs, the markers, and the measure tape to create quadrants on the forest floor. See Worm Worlds; Action Card – Making your own Quadrant. Each team will further divide the quadrant by placing a section of twine diagonally across the square from each tent peg. Each team will them investigate within their Quadrant from the top of the leaf litter to the soil layer. They are to investigate one triangle in the quadrant at a time. They will work as a team, but each team member will independently record observations and data in their journals.

9. Stress to the teams that at the conclusion of the quadrant investigation the area will be returned to as close to undisturbed as possible. Constantly reinforce principals of good stewardship as well as good scientific investigations. Therefore, have each team place each layer of litter material to the side so that it can be properly replaced.

10. Each team should now begin testing for temperature and soil moisture. Test the soil in each triangle of the quadrant. Test the air temperature in sun and shade if possible. If the quadrant is on a slope determine approx. direction. You could also determine aspect with slope.

11. The team should carefully describe the forest floor in their quadrant.

12. Next have the teams begin their Myriapod searches. Each team should remove the litter layer by layer searching for the Myriapods.

13. When organisms are located that may be Myriapods, the students should use their forceps to collect the organism placing it a plastic collection container. Reinforce responsible behavior in studying live organisms and stress that all of the organisms will be returned to the quadrant.

14. When all four triangles in the quadrant have been investigated to the soil layer, an option would be to use very small trowels to carefully excavate small areas of soil in the quadrant to a dept of one to three inches to determine if any Myriapods are in the soil.

15. Each team will use forceps to carefully collect each organism taking due care to avoid causing injury or death.

16. Have each team take their collected organisms to their study station at the table. Tables will have been set up with the microscopes and other equipment at each study area to save time and facilitate the field investigations. Tables should be convenient to the quadrants. The equipment for each team should be placed on each end of the tables.

17. The teams will use their identification materials, microscopes, plastic observation boxes, and hand lens to identify the organisms to the extent possible. If a team determines that an organism is not a Myriapod, they could attempt to identify that organism at a later time.

18. All observations and data are to be recorded in full and complete detail in their journals. NOTE: Within the total amount of time available for this portion of the field study; you must divide the time for identification, recording, and then final analysis. You must also insure that time is available to rehabilitate the quadrants.

19. The students should select one organism at a time. They should sketch the organism and describe the organism while observing the organism with the naked eye, a hand lens, and the microscopes. Each organism should be measured as accurately as possible. An option could be to weight the combined Myriapods by class from each quadrant and each study area.

20. Organisms will be digitally photographed for each study area.

21. Teams will review their findings, analyze their data, and determine what their data indicates.

22. What questions arise from their findings? Any surprises? Each team should quickly write a brief summary of their data. Do the teams have their own hypothesis? Encourage and facilitate the teams developing their own questions, predictions, hypotheses, and conclusions. Create an atmosphere for creative thinking, active questioning, and challenging earlier predictions.

23. Teams at each study area may now compare and see each others collections.

24. Now combine the individual teams into a study area team. Have them review and discuss the sum of all of the data for their area. Allow 15 minutes for this and advise the combined teams that you are keeping time.

25. Bring the teams together on the deck. The teams are to prepare a presentation of their findings and conclusions of no more than ten minutes. Provide markers and flip charts for this presentation.

26. Encourage and facilitate discussion.

27. Pack individual team equipment into large plastic sweater boxes. Pack these into large plastic totes to allow for easy storage and transport to the study areas.

Prediction:

There will be a greater diversity and abundance of Myriapods in the litter open deciduous forest floor.

If the floor litter of the open deciduous forest provides better conditions, then a greater diversity and abundance of Myriapods will occur in this habitat.

The Myriapods are multi-legged members of the phylum Arthropoda and consists of four classes; Chilopoda, Diplopoda, Symphlya, and Pauropoda. These organisms are little understood and popular "word of mouth" accounts are often inaccurate.

Most centipedes are carnivorous predators that are flattened, flexible, and fast. Most millipedes by contrast are more cylindrical in body shape, not very flexible, and are slow moving burrowers that feed on decaying plant material. Larger centipedes have the ability to inflict a painful bite due to venom producing glands. The bite is caused by modified legs, which can inject venom into other organisms. The millipedes have no structures that allow them to bite.

Secondary Activity Options:

1. *Oh, What A Rottn' Place To Live*

2. *Insectigation;* Both activities adapted from the National Wildlife Federation, NatureScope Environmental Education Curriculum Activity Series; by Petey Giroux, Environmental Education Coordinator, Georgia Department of Natural Resources, Environmental Protection Division and Jerry Hightower, Environmental Education Coordinator, National Park Service, Resources Education Division, Chattahoochee River National Recreation Area.

Extensions:

1. Ask students to write a short story for younger grades using the Myriapods in the Field Study Investigations as the principal characters. Compile the writings into a short story collection to be placed in the Media Center. Use a creative title. (An example, *Many Tales of Many Legs*). Have the students read their own short stories to the younger students during story times.

2. Students could write the music and lyrics to Myriapod songs. Using digital photographs of the Myriapods observed in their natural macro-habitat of the

forest floor, the students could produce a CD of images coordinated with their original music compositions.

3. Divide the students into teams of four to five persons. All the persons in each team must have investigated the same study area; either the pine or deciduous forest sites. Instruct the teams to carefully review their field study journals paying very close attention to all notes and sketches. They are to share and compare all information in all the journals on their team. Next instruct the students to develop and design a multi medium "construction" that will serve as a creative educational display depicting the micro-habitat, the Myriapods, and the other observed organisms. Provide the students with the greatest diversity of art and craft materials possible to afford the students the opportunity to be as creative as possible. After each team has completed their constructed three dimensional displays; place the constructions on exhibit in the Media Center or front lobby of the school.

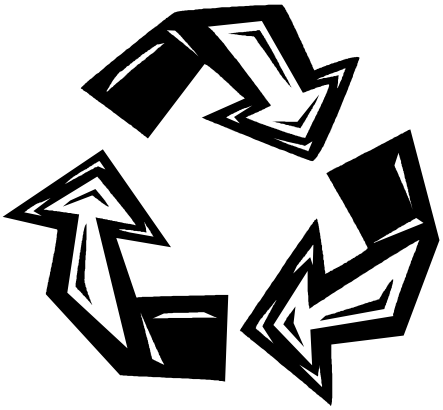
NOTE: You could invite parents, the local newspaper, and local officials to an opening reception of the exhibits created by the students.

Resources:

Golden Guide *Spiders and Their Kin;* ISBN:1-58238-156-9
www.whatsthatbug.com
www.efn.org
www.emporia.edu/ksn
Callaway Gardens Crawloseum
Fernbank Science Center
UGA School of Agriculture, Entomology Society

Sources:

- Al-u-lite Folding Table, 196H 18" X 72" with "H" style legs and salt and pepper finish. Southern Aluminum Manufacturing Co.; P.O. Box 884; Magnolia, Arkansas 71754 1-800-221-0408 www.alulite.com
- Soil Moisture Gauges and Soil Thermometers, Ben Meadows Co.; P.O. Box 5277; Janesville, WI. 53547 www.benmeadows.com
- Ezscope field microscopes, hand lens, forceps, etc. ETA/Cuisenaire; 500 Green View Ct.; Vernon Hills, Ill. 60061 1-800-445-5985 www.etacuisenaire.com



WASTE MANAGEMENT SESSIONS

Materials provided by speakers from the following sessions:

- **Recycling: Reduce/Reuse/Recycle**
  - The Triple “R” Ranger, 1st Grade Lesson
- **Worms in my Classroom**
  - Kitchen Composting

THE TRIPLE "R" RANGER
A FIRST GRADE LESSON

Hello, boys and girls! I am _____, the Triple "R" Ranger. I've come from Georgia Power's Environmental Teacher Corps program to talk about something very important. Today we are going to talk about the three R's, which are reduce, reuse and (what do you think the third one is?) that's right, recycle.

Everyday we use and throw away lots of many different things. Try to think of some things that you might have thrown away in the last week. (some examples might be papers, napkins, drink bottles, snack bags, milk carton, etc.) Each week every one of you probably throws away a trash bag full of garbage like the one I have here. (Have garbage bag handy) If every one of you throws away 1 bag of garbage, how many bags would that be? (Answer will depend on how many students are in the class) Think about everyone in the school. If everyone in the school threw away 1 bag of garbage, that's how many bags of garbage? (look to teacher for answer of approximate # of students in school) That's a lot of garbage, isn't it? Where does the garbage go? (Stress that it doesn't just "go away". It has to go somewhere.)

First it goes in the trashcan, and then a trash truck picks it up and takes it to a landfill. A landfill is a hole in the ground that is lined with clay or another material that trash is thrown into. The reason for the liner is to prevent anything from the garbage seeping into the ground and possibly getting into nearby water supplies. If we keep making so much trash, our landfills are going to fill up and we could possibly run out of the materials we use to make certain products.

We need to think about ways we can MAKE LESS TRASH! How can we do that?

(Remember the 3 r's?) That's right! By reducing, reusing and recycling.

Today I have brought some of my garbage in this trash bag and we are going to see how we can make this bag smaller. Let's first try to REDUCE the amount of waste we create in the first place. Who can tell me what reduce means? (take answers, try to steer them towards making something less. For an example, blow up a balloon and then let the air out of it, tell the students you just reduced the size of the balloon.) Ask students if they have ever eaten a lunchable. Did you know there is more packaging in the container than there is food? What could we do to reduce the amount of packaging? (Ideas might include bringing our lunch in reusable containers) Get out juice boxes and juice mix container's

comparison poster. If we make up our own juice in a reusable container we have this much trash but if we drink our juice out of these little boxes you have all of this trash. Sometimes just by making the right choices we can reduce the amount of trash that we create. Can you think of other ways that we can reduce our trash?

What is our second “R” in our three “R”’s? REUSE. What does reuse mean? That’s right, using something again. It can either be used as the same item or as something different. (Pull out a plastic water bottle from the bag.) Ask can this be reused? As the same thing or as something different? (take answers from using again as a water bottle or bug catcher, terrarium, etc) Ask students to look around their classroom and see if they see any items that are being reused. (Answers could be things in art supplies, boxes being used as containers, etc.) Manufacturers are also helping us to reuse items. Some laundry detergent bottles, window cleaner bottles, and other household items now come in a refill size. You buy one bottle, but when it is empty instead of throwing it away you buy a refill that uses less packaging.

After we have reduced the amount of trash we create in the first place, reused all that we can; now we must _____?

That’s right, RECYCLE! Now who can tell me what recycle means? (steer answers to take something old and make it new again) Let’s see if I have anything in my bag that can be recycled. Pull put a newspaper. Can this be recycled? Yes! What do you think will be made out of this? More paper. Sometimes it is even used to make insulation for our houses or chicken house bedding. Take out a glass jar. Can this be recycled? Yes! What do you think it will be make into? Another glass jar or window or glass paperweight. Hold up the newspaper and the glass jar, are these the same? No, of course not. What do you think we make the paper out of? Trees. What do you think we make glass out of? (Have them guess a few guesses then tell them that glass is made out of sand) When we recycle something it gets melted down or shredded and washed in order to make something new out of it. Could we take this newspaper and make a glass jar out of it? No. Could we take this glass jar and make paper out of it? No. So in order to recycle it, we must first separate the items. (Set up bins and have teacher give out recycle cards) I have bins up here that represents the different bins a recycling center might have. Each one of you has a card with a picture of an item on it. I would like for you to bring your card up and tell the class what item it is and put it in the correct bin.

Now that we have all of our materials separated I would like for us to make an instrument out of something that we probably use every day. Did everyone bring in a plastic bottle? This bottle is something that we can reduce, reuse and recycle but today we are going to reuse it.

(Make soda bottle shakers)

Now that we have our instruments finished will you help me sing a song about recycling? Everyone stand up, the words to the song are right here on this poster, please sing along. (start CD or tape)

Here we go reducing this,
Here we go reusing that,
Here we go recycling this,
As we make our products flat.
We drink our soda's up,
We rinse it out like this,
We give our can a shake, shake, shake,
And stomp it just like this.
Here we go, reducing this
Here we go reusing that
Here we go recycling this
As we make our products flat.
We write all on our paper,
We make a big mistake
Instead of trashing it right now,
We turn and use again.
Here we go reducing this,
Here we go reusing that,
Here we go recycling this,
As we make our products flat.

You guys are great singers and I want you to remember the 3 R's. What are they?
REDUCE, REUSE AND RECYCLE. Great job!
Thank you very much for being such a wonderful class.

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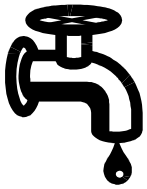


WATER SESSIONS

Materials provided by speakers from the following sessions:

- **The Great Water Cycle Expedition**
  - All The Water In The World

Water PDF here

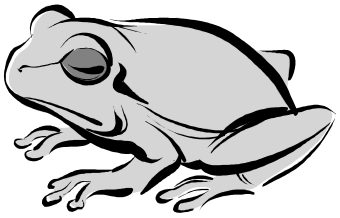
Water PDF here

Water PDF here

Water PDF here

Water PDF here

MULTIPLE



TOPIC SESSIONS

Materials provided by speakers from the following sessions:

- Recycle Lunchroom Supplies into “A-maze-ing Water

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RECYCLE LUNCHROOM SUPPLIES
INTO A-MAZE-ING WATER
(Adapted from Project WET "A-maze-ing Water")
Mary Gazaway and Harriet Bryant

Follow a prescribed diagram drawn on a paper plate to make a storm drain system with plastic drinking straws that empties directly into a receiving stream represented by a plastic cup. Saturate three different land surfaces made from paper napkins, Styrofoam and juice pouches with colored water representing polluted storm runoff. Direct the runoff areas down three straws representing storm drains to see how storm water systems deliver pollution to our waterways.

Materials:

If possible, ask each student to bring lunchroom supplies they use personally to be recycled into "A-maze-ing Water" activity materials.

- 2-sided sheet: (side 1) What Is Storm Water? Storm Water: Where Does It Come From, Where Does It Go? (side 2) What's In Storm Water? Storm Water Management: What You Can Do To Prevent Storm Water Pollution.
- Bendable, clear plastic drinking straws – must have bendable ends
- Paper napkins
- Styrofoam cups or plates – minimal amount
- Tin foil or empty juice pouches
- Scissors
- White paper plates
- Photocopies of diagram showing storm drain system
- Craft Glue
- Three (3) tubes of liquid food coloring: red, green, yellow
- Adhesive labels
- Clear plastic drinking cups
- Gallon container of water

Preparation:

Organize the class into groups of two-to-three students and assign to workstations. Prepare enough "system set-ups" for every student in the class.

- Glue photocopies of storm drain diagrams to paper plates. Prepare enough for every student in class.
- Remove/cut bendable section from straws so they are completely straight to be used as pipettes. Prepare enough for two at each workstation.
- Distribute one "system set-up" consisting of one paper plate with diagram, five drinking straws, one empty plastic cup, and one copy of 2-sided "Storm Water" sheet to every student in class.
- Place a glue dispenser, a pair of scissors, 2 paper napkins, a piece of tin foil/2 empty juice pouches and a Styrofoam plate/cup at each workstation.
- Write following "pollutions" onto enough adhesive labels to make one set of 3 different "pollutions" for each workstation:

    - "Soil/Mulch/Sand"
    - "Fertilizer/Pesticides"
    - "Oil/Gas/Antifreeze"
- Affix enough labels to plastic cups (one different label to each cup) to make one set of 3 "pollutions" for each workstation.
- Fill each cup ¼ full with water, and add appropriate "pollution" color of food dye to each cup until color is easily noticeable:
    - Red dye to "Soil/Mulch/Sand" cup
    - Green dye to "Fertilizer/Pesticides" cup
    - Yellow dye to "Oil/Gas/Antifreeze" cup
- Place one set of 3 different "pollution" cups containing food dye and 2 straight pipette straws at each workstation.

Procedure:
Reference pages 42-44 of International Project WET "The Urban Watershed Educators Guide" and/or 2-sided "Storm Water" sheet.

- Begin with **Warm Up** to stimulate discussion.
- Present **Background** overview of storm water.
- **A-maze-ing Water with Straws - S**tudents will be making mazes that represent storm pipes carrying away runoff from school grounds.
    - Point out areas in diagram that represent "Playground", "Athletic Fields", and "Parking Lot".
    - Explain that each area is source of "pollution" represented in the cups:
        - Playground = Red = Soil/Mulch/Sand
        - Athletic Fields = Green = Fertilizer/Pesticides
        - Parking Lot = Yellow = Oil/Gas/Antifreeze
    - Direct students to use diagram as a guide:
        - Students will trace triangle shapes onto paper napkins and cut out.
        - Students will trace napkin triangles onto tin foil and Styrofoam and cut out.
        - Students will fold tin foil triangle shape in half at the corners.
        - Students will arrange drinking straws on diagram drawing to match pattern.
        - Note: Students may have to cut straws and insert them together to create longer pipes.
    - Students will **first glue straws in place** on top of diagram drawing.
        - Note: Students may have to take arrangement apart and glue straws down one at a time as they put them back together.
    - Students will **next glue down triangle**s at following designated areas on diagram so that one triangle point is slightly inserted into straw and overlapping edge of opening. **Aim crease in tin foil into straw.**
        - Note: Each triangle represents a different land surface:
            - Styrofoam = Playground
            - Napkin = Athletic Fields

        - Tin Foil = Parking Lot
    - Instruct one student in each group to lift up their plates so that storm drain openings are at top and discharge ends are at bottom. Another student in the group will introduce colored water into the storm system.
    - Show students how to create vacuum in pipette straw to fill ¼ full from "Soil/Mulch/Sand/Shavings" cup, cover top with finger, and then release red water drop-by-drop onto "Playground" area triangle until Styrofoam is saturated and leaking water into the straw.
    - Direct students to hold plate over plastic cup and tip/tilt plate so that water flows out of discharge end into cup.
    - Students empty pipette straw back into "Soil/Mulch/Sand" cup.
    - Students fill pipette straw ¼ full from "Fertilizer/Pesticides" cup, and release green water drop-by-drop onto "Athletic Fields" area triangle until napkin is saturated and leaking water into straw.
    - Students empty pipette straw back into "Fertilizer/Pesticides" cup.
    - Students fill pipette straw ¼ full from "Oil/Gas/Antifreeze" cup directly, and release yellow water drop-by-drop onto "Parking Lot" area triangle as water flows down crease and directly into straw.
    - Students empty pipette straw into "Oil/Gas/Antifreeze" cup.
    - Activity will continue until every student has introduced all 3 storm water runoff "pollutions" into their storm drain systems.
- Wrap up the session by having students review various land uses and lifestyles in an urban environment and how each contributes to storm water pollution.

Extension:

Reference "No Waste Lunch" Product Sources sheet -

Students can research alternatives to disposable lunchroom supplies. Explore methods and materials for successful composting of lunchroom garbage and trash.