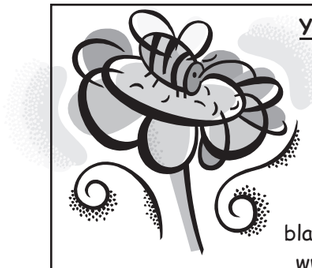
Stormwater Sidebar

Spring brings around snowmelt, rain, and the beginning of gardening season. It is a great time to talk to your students about non-point source pollution. Here are some ideas for getting your students inspired to care about water quality

- Tour the parking lot. Have the students look for the tell-tale rainbow sheen of oil in empty parking spaces.
- Check out the catch basins. If your school has storm drains in the parking lot or along the street, take a flashlight and take a look inside. Remind your students that things they drop on the pavement end up in these storm drains and get carried into our streams and lakes.
- Investigate the drainage. Go outside on a rainy day and look at where the water comes off of your building roof, and where it runs off of the playground, sidewalks, and parking areas. Is there any evidence of stormwater pollution?
- Talk to your janitor! See what they do with grass clipping, paint, cleaning supplies, kitchen grease, etc. Ask them where the roof runoff goes, if you can't see the downspouts.

You may have noticed poster kiosks in your community; at the library, city hall, community center, or other public location. The posters discuss various local water pollution issues and how people can make a difference. If you would like copies of these posters, please contact Lake SWCD. The posters are changed quarterly and are 18" by 24" in full color. The posters are free to member communities after they have been displayed.



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Look for us at NEOEA Day!

Lake SWCD will be hosting a workshop on using maps in the classroom. Expect hands-on activities and mapping applications that you can take back to your school to inspire your science or social studies curriculum.

Congratulations to Riverside High School and Perry High School for their achievements at Northeast Ohio Envirothon.

Useful Pollen Websites

http://www.pollen.com/forecast.asp - Pollen forecasts including severity and dominant species. A good way to keep track of what is currently blooming.

http://www.geo.arizona.edu/palynology/sem/berkeley.html - Light micrograph images of pollen grains

http://myweb.dal.ca/jvandomm/forensicbotany/index.html - This website has some excellent case studies relating to pollen, growth rings, root growth, and other botanical clues. Also a good glossary of terms.

http://www.palynology.org/ - American Association of Stratigraphic Palynologists website, including newsletters, photos, and links.

Pollination *(Continued from page 1)*

ultra-violet light, the plants often look very different through an ultra-violet filter.

As spring spreads north, keep an eye out for the earliest flowers, and the insects they attract. It is a great opportunity to teach your students about adaptation, interdependence, and food webs. It is also a great reason for leaving the classroom behind and enjoying those warm spring breezes.

Muddy Hands

Soil and Water Information for Educators Brought to You by the Lake County Soil and Water Conservation District

Pollination Appreciation

As spring approaches, and students start gazing longingly out the classroom windows, it is a great time to take a look at pollination and the sometimes intricate interaction between plant and animal. With some background and preparation, every teacher can be prepared to head outside that first warm, sunny day and still get their science coursework completed.

Pollination is perhaps one of the most interesting areas of botany. It is a complex relationships between plants and animals. It is difficult to resist the urge to give flowers human traits when you talk about pollination. The topic is full of spy-movie intrigue, ranging from hidden messages to clever traps, stealthy attacks to the employ of feminine decoys. Some pairs of species have so completely adapted to each other that the absence of one means the death of the other. In most cases, though, plants and their pollinators aren't quite as picky.

In its simplest form, insect pollination is simply bribery. The plant offers its pollinator a reward for carrying pollen from one flower to another. This can be sugary nectar, protein-rich pollen, a nursery for the pollinator's young, or the (false) offer of a chance to mate. A botanist can tell just by looking at a flower what it's likely pollinator is.

Nectar is a common attractant. This bit of sugar water is useful to butterflies and hummingbirds. Nectar-producing flowers are often pink, red, or orange, and these are the colors that their pollinators are attracted to. But getting the butterfly to the flower is only half the battle. The flower must also get its pollen onto the butterfly in such a way that the pollen will be deposited in the right place on the next flower. By storing the nectar in a deep spur in the center of the flower, the butterfly is forced to dig deep, ensuring that the stamens will leave pollen on the insect's wings and body. Common butterfly-pollinated plants include cardinal flower, impatiens, jewel-weed, and milkweed (though milkweed makes the butterfly stand on the pollen).

Some plants are more adapted to the heavy, ponderous bees and flies. These flowers tend to have large, disc-shaped flowers, or landing pads for the insects. The flowers are always stout and hearty, otherwise one bumblebee would tear apart the reproductive parts of the flower. Daisies, black-eyed susans, dandelions, and the like are usually bee or fly-pollinated. Since these insects see

Pollination *(Continued on page 4)*

At left are two different images of the same flower. The one on the left is 'visible light' - how we perceive the flower. The image at right is the same flower under UV light - as a bee would see it.

Inside this Issue:
Pollination

Did you know that Lake SWCD offers numerous classroom programs tailored to the Ohio Standards in science and social studies?

Our programs are free and can be scheduled anytime from October through April.

How doth the little busy bee
Improve each shining hour.
And gather honey all the day
From every opening flower!

-Isaac Watts

A Classroom Full of Butterflies

You will need:

one (noiseless!) party blower per student (the kind that unroll)
small paper or plastic cups
double-stick tape
posterboard or heavy paper
pompoms or paper wads in multiple colors

Preparation: Use the posterboard to cut out flower shapes. Attach a cup to the center of each flower to represent the fertile parts of the flowers. Separate pompoms by color. They will be your pollen grains. Place the flowers around the classroom (or outside if the weather is nice!) and place one color of 'pollen' in each flower (about 10 pompoms in each cup). There should be about as many flowers as students.

In class: Explain to the students that they are all butterflies, and as butterflies they have long, curving mouth parts that they use to gather food from flowers. Show them a flower with pompoms in the cup and explain that they feed by extending their long mouths into the cup and the food sticks to their tongues. Give each student a party blower. (Caution them that butterflies with broken mouths will starve to death and have to sit the activity out.) Have each student put a piece of double-stick tape near the end of their party blower. They are now ready to be butterflies.

In action: Butterflies will move between different flowers, feeding at each one. As they feed on nectar, pollen will get stuck to them (the tape). After feeding at a flower, students should remove one pompom from their 'mouth' for food. They then move to the next flower, leaving any other pompoms on their party blower. Any pompoms that fall off during feeding should be left in the cup. Pompoms that fall off in between flowers should also be left. Give the 'butterflies' about 2 minutes to feed.

Wrap-up: Any butterfly that doesn't have at least 5 pompoms (either collected from their party blowers or still attached to the tape) has starved to death. Have students count up how many flowers have more than one color of pom-pom in them. This represents the cross-pollination that the 'butterflies' did. Explain that this is how plants mix genetic material for the next generation. Have students look around for pollen that isn't in any flower. This represents pollen that is lost to the environment (wind, rain, and other factors can dislodge pollen without it finding another flower of the same species). The pollen in their hands and on their mouths is the extra pollen that the plant produced to bribe the students to pollinate the plants!

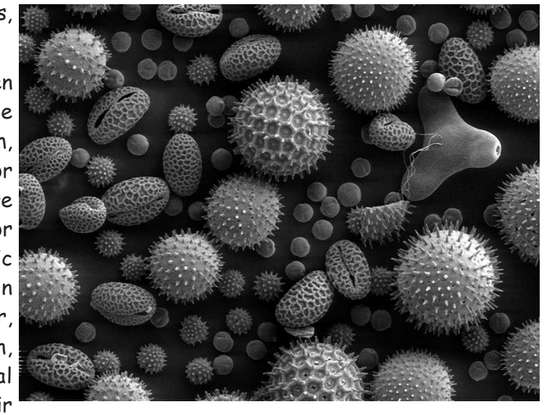
For more pollen activities, try:
University of Nebraska http://wonderwise.unl.edu/02teach/pollenact.pdf Five activities, complete with student pages, on attracting pollinators, allergies and asthma, fossilized pollen, and pollen anatomy. Written for 8-12-year-olds.

A Classroom Full of Butterflies, Take Two

Different butterfly and moth species demonstrate warning coloration (bright colors), camouflage (colors and patterns that blend in) and cryptic coloration (false eyespots or shapes that break up the wing outline). Pull out your Ellison die and cut out multicolored and white butterfly outlines. Camouflage some to hide in your classroom, and create some that are bright and showy. Scatter them throughout the classroom while the students are out and challenge them to find all of the butterflies. Give the students their own white butterflies to camouflage and hide in plain sight.

CSI: Pollen

Not only is pollen responsible for many of our groceries, but it can also be used to solve mysteries. Palynology is the study of pollen and pollen patterns. Pollen grains on a suspect's shoes can link them to a crime scene. The collection of pollen grains in the bottom of a lake can tell us what the past climate was like, and ancient pollen grains in the clothes or wrappings of a mummy can tell archaeologists what time of year the person dies, and where they were from.



In modern forensics, pollen can be used to determine the region something came from, where a car was driven, or even if illegal drugs were grown in a basement or closet of a house. Forensic technicians look for pollen in dirt or mud, hair and fur, woven items and cloth, packing materials, nasal cavities, imported crops, air filters in a house or car, and even on money if they suspect it was used in a drug sale. Someone who grows marijuana in a house might get rid of every leaf and seed in the hopes of not getting caught, but there is still pollen evidence in the furnace filters, carpet, and wallpaper, as well as the criminal's clothes.

Paleontologists (scientists who study 'old beings' or prehistoric fossils) also collect pollen that has been captured in the rocks. They use various methods to break down a rock into the original particles and then search these particles for fossilized pollen grains. The types and amounts of different species tell them what plants were growing when that layer of sediment was deposited, and can even indicate what season of the year. By knowing a plant's traits and life history, the amount of pollen in the paleo-record will tell a paleobotanists what the weather was. This helps the paleontologists to understand more about the animals they find as well as the plants.

Archaeologists (scientists who study human culture) have also used pollen information to learn more about ancient human lifestyles. A few grains of pollen in a textile can tell an archaeologist that the wrap was worn hundreds of miles away from where it was found. Pollen grains in the lungs of a mummy can tell what time of year that person died. And pollen that has drifted into a cave dwelling can tell how long the site has been abandoned between the time that an artist painted a pictograph on the wall, and the time that the archaeologists discovered it. Otzi, an accidental mummy found in the Alps in 1991, has been studied quite thoroughly, including the contents of his digestive system. Not only do scientists know what his last two meals were, but they also know that he ate one of them in a mid-altitude coniferous forest during the spring. The same process that preserved his body also preserved the pollen from various conifers and hop-hornbeam in his digestive system.

Climatologists are also interested in fossilized pollen. Scientists can take core sample of sediment from the bottom of very old lakes and trace the change of plant communities as the landscape responds to periods of warm and cold temperatures. In the United States, there are many such lakes in the Southeast. Pollen information in these sediments has been used to construct a computer model that demonstrates the northward migration of plant species after the most recent glaciation. These numbers can be used to predict the results of future global climate changes, and what we can expect to grow or not grow in certain areas.

One final branch of pollen investigation is in immunology. As anyone with seasonal allergies can tell you, a little bit of pollen can ruin your day, and leave you dependent on tissues and antihistamines. An allergy specialist relies on daily monitoring of airborne allergens to help determine exactly what plant a person is allergic to. About 11%of the U. S. population suffers from some degree of allergic rhinitis, and this number has been rising steadily over the last few decades.