



EARTH DAY SUGGESTED EVENT ACTIVITIES

A national outpouring of concern for cleaning up the environment led to the celebration of the country's first Earth Day on April 22, 1970. Forty years later, the celebration continues. Our limited staff is often called upon to assist with these celebrations. Since we cannot always attend these events, we are providing a list of educational activities and resources suitable for an Earth Day celebration.

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LITTER WE KNOW (PROJECT WILD ACTIVITY)

Objective:

Station 1: Students identify and evaluate ways that litter can endanger wildlife; and propose ways to help eliminate these dangers to humans and wildlife.

Station 2: Students identify how to reduce litter for a picnic or daily sack lunch for school or work (from Growing Up WILD.)

Materials:

Station 1: 6-10ft piece of butcher paper, large marker, litter pieces, gloves, tape or tacks.

Station 2: Disposable and non-disposable plates, napkins, table cloth, eating utensils, cups.

Procedure:

Station 1: Display a 6-10ft piece of butcher paper. Draw a scale from 1 to 10 at the bottom. Have students tape or tack pieces of litter (either items they have collected or pre-collected items) to the scale based on how harmful the item may be to wildlife (1 = least harmful, 10 = most harmful). Discuss with students why they chose the scale number for that item and actions to reduce litter at home, school, work and in their community.

Station 2: Demonstrate and discuss how to have a trash-free picnic or pack a trash-free lunch for school or work, by suggesting things to use instead of throw-away plates, napkins, cups, and containers (such as reusable lunch sacks and food containers, cloth napkins, etc.)

Song to incorporate with Station 2 (from Growing Up WILD, Less is More activity):

(To the tune of "If you're happy and you know it")

If you're trying to use less, clap your hands (clap, clap)
If you're trying to use less, clap your hands (clap, clap)
When we use less we show
That we care for those we know
If you're trying to use less, clap your hands (clap, clap)

TEST YOUR TRASH IQ

Objective: Students discover how long it takes for ordinary household trash to disintegrate in ocean water.

Materials: [Marine Debris poster](#) FREE from the General Land office-Adopt a Beach Program; index cards and clear tape. Optional: Foam core board to mount poster.

Procedure: using index cards, cover some of the answers on the timeline. Discuss with students how litter in the oceans is a problem for people and wildlife. (See article from GLO's Texas [Adopt-a-Beach Newsletter, Sept 2009, page 4.](#)) Ask students to guess how long it takes XX (items you have covered with cards) to disintegrate.

Resources: Texas General Land Office [Marine Debris poster](#); [NOAA](#) brochures, flyers, posters and curriculum guides; EPA's ["Get Out of a Bind"](#) simple rubber band activity that demonstrates the hazards of discarded fishing line.





FREDDIE THE FISH

Objective: Demonstrate the effects of pollution on fish by reading the story of Freddie the Fish as he travels downstream. To make it interactive, use student volunteers to play the part of Freddie (must be able to read) and to pour “pollution” into the water.

Materials: Fish bowl or small aquarium; A few rocks and a small twig for the fish bowl; Water; Stick or rod that reaches across the top of the fish bowl; A fishing lure that looks like a small fish or small plastic fish; String; Small cups to hold: Dirt, Raisins, Green liquid (use green food coloring, lime powdered drink mix or powder gelatin mixed in water), Pancake Syrup or Soy Sauce, Sand or bits of limestone, Parts of a Styrofoam cup, paper, a broken plastic spoon, etc.; Child [Script for “Freddie Says”](#) cut apart.

Procedure: Use a fish bowl or small aquarium with clean water, a few rocks on the bottom and a stick in the water to represent some vegetation. Using a rod or ruler and string, suspend the lure about mid-way down in the water. This is Freddie. Ask for volunteers. You need some volunteers who like to read out loud and some who like to be messy. For large groups, use 10 volunteers, two for each stop along the way, with one student playing Freddie and the others to pour in the pollution on your signal. Be sure to line the children up in order with their scripts and cups of pollution. Encourage the rest of the children to react as Freddie would react during the story.

Tell the children that they are about to go on an imaginary journey with Freddie the Fish. (Introduce Freddie). Let them know that the volunteers will be talking for Freddie. [See script](#)

WILDLIFE HABITAT

Objective: Students learn that wildlife must have food, water and shelter to survive, and how to provide appropriate wildlife habitat in their yards or school grounds.

Materials: Resources listed below. See individual stations for material list.

Procedure: Set up 3 station areas: Food, Water, and Shelter. Provide Backyard Habitat checklists for visitors to take home and complete.



Food Station:

Objective: Students learn how native plants provide food for wildlife, and about supplemental wildlife feeders. Students also learn to make bird feeders (optional)

Materials: native plants (check with local nurseries to see if they will lend or donate plants), wildlife feeders: Optional: recycled milk jugs, lumber and wood screws, screwdrivers, gloves (to protect from splinters) and safety goggles.

Procedure: Discuss with students/visitors:

- The different types of wildlife the plants and feeders might attract (birds, insects, butterflies, squirrels, frogs, lizards, etc...)
- Why we should use locally native plants vs non-native plants
- Why we use wildlife feeders to supplement natural food sources from plants

Optional: Have students make a bird feeder out of recycled milk jugs or using donated lumber and wood screws, make simple corn cob squirrel feeder.

Water Station:

Objective: Students learn the importance of providing water and making it accessible for different species.

Materials: small, simple bird bath(s) made with shallow household containers; shallow plate, dish or clay pot tray for butterfly mud puddle, sand, “Save Water for Wildlife” DVD and DVD player (optional)

Procedure: Display various bird baths made from ordinary household items. Display “mud puddle” for butterflies (plate or pottery tray filled with sand and water.) [Add some artificial butterflies to the display] Discuss with students the importance of providing water for wildlife and making it accessible using shallow containers or placing rocks in deep containers so that critters do not drown.

Shelter Station:

Objective: Students investigate different shelter options (wild and human-made) and build a demo brush pile or create a toad abode.

Materials: various bird houses, nest boxes, groundcover native plants, pile of branches suitable for a small brush pile, nesting materials (dryer vent lint, hair, string, etc.), recycled coffee cans, or plastic food containers like cottage cheese, or old clay pots, markers, paint and paint brushes. Shallow pan filled with dirt (for use with Toad Abode.)

Procedure:

- display different types of bird houses or nest boxes (owl)
- display or let students assemble a small brush pile and discuss who might use this for shelter
- display some groundcover plants and discuss who might use this area for shelter
- display items from home that birds can use to build their nests. Explain to students how they can set these items out for the birds to find. (dryer vent lint, hair from hairbrush, bits of string leftover from food packaging, etc.)
- [Create a Toad Abode](#) – Collect recycled coffee cans, or plastic food containers like cottage cheese, or old clay pots. Let students paint or decorate the container. Demonstrate in a shallow pan filled with dirt how to place the container into the soil.

Resources:

[Backyard Habitat checklist](#)

[Providing for Backyard Wildlife](#)

[Wildscapes brochure](#)

[The Dangers of Invasive Species brochure](#)

[Best of Texas Backyard Habitats brochure](#)

[Urban Wildlife downloadable poster](#)

[Make a Seed Ball](#)

SNAKES ALIVE!

Objective: Students learn about native snakes of Texas Parks & Wildlife Dept.

Materials: Red, yellow and black pony beads, yarn or plastic lace, metal keychain rings (optional)

Procedure: Instruct students to assemble snake key chains using either the coral snake (broad black ring, a narrow yellow ring and a broad red ring, with the red rings always bordered by the yellow rings) or milk snake pattern (alternating bands, in order, of black-red-black-yellow-black. The red bands are solidly colored and are wider than the yellow or black bands.) While the students are working, talk to them about beneficial snakes and leaving snakes unharmed when they see them.



Resources:

[Snake FAQ's](#); [Venomous Snakes of Texas Poster](#) (\$\$); [Louisiana Milk Snake Fact Sheet](#);

Created by Katherine Crippens, TPWD; submitted by Amanda Adair Village Creek State Park

WANTED ALIVE! A BENEFICIAL BUG DISPLAY



Objective: Students learn about beneficial insects.

Materials: Beneficial insect poster, insect images (4"x4")

Procedure: Discuss how insects can be beneficial in vegetable and flower gardens. Scatter 4" photos of various insects on table and let students sort and classify them as "good guys" or "bad guys".

Resources: [Learn About Texas Insects](#) , [Beneficial insect poster](#), Keep Austin Beautiful's [Beneficial Bug Scavenger Hunt activity](#).

MYSTERY BOXES



Objective: Students will identify objects from nature in mystery boxes by using touch.

Materials: Six or more medium sized cardboard boxes (Xerox copy paper boxes) with 6” diameter holes cut at one end; attach lids so that they can easily open and close. 8”x10” fabric pieces or felt squares. Various natural objects and accompanying fact sheets. Glue and tape.

Prep: Affix box lids so that they easily open and close to view the item inside. Glue or tape item fact sheets to inside of box lid. Secure natural items to bottom of box with glue. Inside the box, attach fabric square above the hole (creating a flap).

Procedure: Guide students to insert one hand into the box and guess what the natural object might be by touching it. Open lid to let student see if they correctly identified the object.



FROG CALLS MADE EASY (TEXAS NATURE TRACKERS ACTIVITY)

Objective: After listening and becoming familiar with frog calls, students will imitate frog calls using simple household items.

Materials: Texas Parks and Wildlife “Texas Amphibian Watch Guide to the Calls of Frogs and Toads in Texas” CD and CD Player; 1 – Rubber Band, 2 – Balloons, 2 – Marbles, 1 – Stiff Comb, 2 – Jingle Bells, and 1 – Soda or Water bottle (An audio CD of frog and toad calls in Texas is available from [Texas Amphibian Watch](#) for \$5.00 by calling 512-389-8062)

Procedure:

1. Listen to the recording of the frog calls on the Texas Parks and Wildlife “Texas Amphibian Watch Guide to the Calls of Frogs and Toads in Texas” CD.

2. Match the sound made from objects (see A-G below) to the frog.

- ___ Bullfrog (*Rana catesbiana*)
- ___ Green or Bronze Frogs (*Rana clamitans*)
- ___ Pickerel Frogs (*Rana palustris*)
- ___ Northern Cricket Frogs (*Acris crepitans*)
- ___ Spotted Chorus Frog (*Pseudacris clarkii*)
- ___ Spring Peepers (*Pseudacris crucifer*)
- ___ Upland or Western Chorus Frogs (*Pseudacris triseriata*)

- A. **Quickly** run your fingernail across the teeth of a stiff comb.
- B. Loosely hold two jingle bells in the palm of your closed hand and shake your hand (Full chorus).
- C. Hit two marbles together.
- D. Stretch a rubber band over a cup, box, etc. and pluck the rubber band like a banjo.
- E. Take two balloons and rub them across each other. (Plains Leopard Frogs (*Rana Blairi*) and Southern Leopard Frogs (*Rana sphenoccephala*) can also make a call like this).
- F. **Slowly** run your fingernail across the teeth of a stiff comb.
- G. Blow across the top of a partially full soda or water bottle.

Learn more about these species and other [Herps of Texas](#) at the University of Texas Web site.



ADDITIONAL RESOURCES:

- Contact your local [Texas Master Naturalist chapter](#) for volunteers and/or presenters
- EPA's [Happy Earth Day Coloring and Activity Book](#), download or order copies. [What can you do with a Jelly Jar? poster](#); more [Teacher resources](#); Learn more about the [issues](#)
- Keep Texas Beautiful: [Garbage Pizza Activity](#); [Reduce, Reuse & Recycle Student Activity](#); [Packaging Activity](#); [Compost Activity](#); [Enviroscapes](#) five models to choose from (rental fee applies)
- [State Energy Conservation Office](#) has teacher programs and resources including Watt Watchers
- [Sugar Karst Activity](#), courtesy of UT Bureau of Economic Geology
- [Texas Commission on Environmental Quality](#) has many publications for K-12
- Texas Dept of Transportation: [Litter Force School Shows](#); [Activity booklets](#) in English and Spanish, [K-2 Student activities](#), and [online games](#)
- Texas Parks & Wildlife has [education loaner trunks](#) available at no charge; see the website for a list of trunks and locations. Color an [animal mask](#) to wear, if you have a nearby creek or pond conduct a ["Bug Picking" activity](#) to check water quality. Many more [activities and lessons](#) are available on TPWD's website.
- [Texas Water Development Board](#) lesson plans and kids activities
- [Texas Wildlife Association Discovery Education Trunks](#).

Have a fun and simple Earth Day activity? Share with us, education@tpwd.state.tx.us

AGES AND STAGES

SUGGESTED LEARNING ACTIVITIES

Following is a generalized overview of developmental stages children go through from kindergarten through high school and finally as adults. Children develop at their own pace and all characteristics will not be observed in all children at the same age or at the same stage of development. However, the order of the stages does not change much. It is important to remember, however, that each child is unique. Sources: *National Park Service; Recreational Boating and Fishing Foundation Best Practices.*

Pre-School

Three- to four year olds are discovering the world around them. They may be shy or eager but like to be reassured and helpful. Three- and four-year-olds need to be involved in a simple game, song or activity. For example, pretending to be animals and making animal homes is especially fun, or singing a song about animal babies. See the Kindergarten - 3rd Grade section for more ideas for 5 - 6 year olds.

Ages 3-5 (Pre-School/ Kindergarten)

Physical development:

- Very energetic and active
- Gross motor skills developing (running, jumping, bicycle riding)

Intellectual:

- Learning through senses
- Developing vocabulary
- Limited understanding of time
- Unexplainable fears
- Action precedes thought
- Short attention span

Social:

- Self-centered
- Varying degrees of independence
- Relationship with adults – most primary care person(s)

Suggested Activities:

- Storytelling, games, puppetry, nature walks, songs, finger plays

What they can do:

- Use crayons and scissors, write their name, like to handle larger objects - very tactile

Kindergarten – 3rd Grade

Five- to nine-year-olds are optimistic, eager, and excited about learning. They have short attention spans. Five-year-olds can sit still and listen for 10-15 minutes; nine-year-olds for 20-30 minutes. They still think and learn primarily by experience. Rather than simply giving instructions verbally, demonstrate the activity. They enjoy doing, want to be active, and are always in motion. They are more interested in working on a project than completing it. Children this age need rules to guide their behavior, information to make good choices and decisions, and consistency once the rule is established. Provide small group activities and lots of opportunity for them to be active.

Ages 6-9 (Elementary grades 1 - 3)

Physical development:

- Coordination improving
- Fine motor skills developing (writing, keyboarding)

Intellectual:

- Increased awareness of surroundings
- Active learning/hands-on
- Able to classify objects
- Understanding change
- Cause and effect
- Learning to follow directions

Social:

- Pair relationships – best friends
- Relationships with other adults
- Trusting
- Outgoing, busy
- Blaming and tattling common
- Believe things are alive and have feelings

Suggested Activities:

- Demonstrations, hands-on activities, structured role playing, guided discovery, scavenger hunts, cooperative learning, simulations

What they can do:

- Participate in organized sports, writing skills improving, complete sentences and paragraphs, imagination, simple rules for games, learn

Ages 10-12 (Upper Elementary grades 4 -6)

This is a period of slowed physical growth when a lot of energy goes into learning. Children 10-12 years old love to learn facts, especially strange ones, and they want to know how things work and what sources of information are available to them. They still think in terms of concrete objects and handle ideas better if they are related to something they can do or experience with their senses. They are beginning to move toward understanding abstract ideas. They still look to adults for approval and need guidance to stay on task and to achieve their best performance. They often are surprised at what they can accomplish, especially with encouragement from an adult.

Physical development:

- Wide variation in development
- Gross motor skills developed
- Fine motor skills steadily developing
- Tires easily

Intellectual:

- Concerned with things rather than ideas
- Attention span 15-20 minutes per method
- Ability to verbalize curiosities
- Begins to contrast present with past
- Able to draw conclusions
- Personal values and opinions beginning to develop

Social:

- Learning to cooperate; enjoy group activities
- Boys/girls segregate; regard each other as silly
- Competitive
- Sensitive- fear of not being liked

Suggested Activities:

- Hands-on activities, self-guided discovery, group discussions, hands-on activities, structured role plays, problem solving, group activities, simulations

What they can do:

- Sports related activities, can think about objects that are not in front of them, can write clearer, reason and problem solve

Ages 13-15 (Middle School or Junior High)

Youth 13-15 years of age are in a period characterized by much "storm and stress." Although they look older, most remain emotionally and intellectually immature. Young teens move from concrete to more abstract thinking. They can be very self-conscious, and a smaller group usually is less intimidating. Help them get over inferiority complexes by concentrating on developing skills. They are ready for in-depth, longer learning experiences. They can begin to deal with abstractions and the future. Fitting in with friends is a controlling influence.

Physical development:

- Rapid growth and development
- Fine motor coordination
- Wide variation in developing maturity
- Onset of puberty

Intellectual:

- Interested in ideas
- Beginning to think abstractly
- Longer attention span
- Looking for new ways to do things
- Eager to contribute in small group discussions
- Needs guidance and focus for learning

Social:

- Tendency to question authority
- Self-conscious
- Easily embarrassed
- Needs approval
- Developing an interest in the opposite sex

Suggested Activities:

- Hands-on activities, self-guided discovery, group discussions, hands-on activities, structured role plays, problem solving, group activities, simulations

What they can do:

- Work in groups, write well, can organize information, think in the abstract, can learn in social situations

Ages 16-18 (High School)

High school students are future-oriented and can engage in abstract thinking. Teenagers continue to be group-oriented, and belonging to the group motivates much of their behavior and actions. They have more time constraints such as work, social ties, or sports interests. They want to help plan their own programs. Involve them in the planning process. Use the discussion method when working with them. Instead of providing detailed instructions for how to put something together, provide suggestions and several alternatives.

Physical development:

- Rapid physical changes
- Great diversity in strength and size
- Advancing sexual maturity
- Periods of high energy, periods of fatigue

Intellectual:

- Ability to think abstractly
- Full comprehension of historical time
- Concern for reasons and proof
- Desire to do something well
- Forms own opinions
- Most have not made the connection between learning and life's experiences

Social:

- Vulnerable
- Self-conscious and concerned about appearance
- Needs peer group support, fearful of "looking stupid"
- Fear of being singled out for attention
- Tendency to question authority
- Need to interact with adults as adults

Suggested Activities:

- Demonstrations, debates, open-ended discovery, open-ended role playing, open-ended discussions, problem solving, hands-on activities with real equipment

What they can do:

- Handle short lectures, think independently, think about the parts of a whole, argue a position, analyze information, synthesize and evaluate information.

Ages 18+ (Adults)

Adults learn differently from children. They usually decide for themselves what is important to be learned. They have a lot of life experience, and need to validate new information based on this experience and their personal beliefs. Sometimes this makes learning more difficult, as adults may have preconceived ideas about a subject that may not be "true." Adults often tackle learning with the purpose of solving a problem or applying the information right away, as opposed to learning a new subject for its own sake. Therefore, learning occurs best when new information is relevant to learner experiences and situations. Adult learners like to contribute to the process, and like to be recognized for their contributions.

Physical development:

- Slow physical changes
- Great diversity in strength and size
- Advancing to Golden Age with limiting abilities

Intellectual:

- Ability to think abstractly
- Full comprehension of historical time
- Sensitive to multiple points of view
- Forms own opinions
- Eagerness to learn

Social:

- Secure in who they are and less inhibited
- Like the opportunity to interact with people that share their interests
- Speaks out on personal beliefs
- Vast experience base

Suggested Activities:

- Demonstrations, debates, open-ended discovery, open-ended role playing, open-ended discussions, problem solving, hands-on practice with real equipment.

What they can do:

- Handle lectures, think independently, think about the parts of a whole, argue a position, analyze information, synthesize and evaluate information, group discussions. Bring their own experience to the discussions.

Adult Learning Styles

Adults vary tremendously in how they acquire knowledge, and no single theory on adult learning styles can adequately address the diversity of each learner. However, a synthesis of the research findings on adult learning is illustrated in the following:

Structure of Learning Experiences

1. Adults prefer flexible schedules that respond to their own time constraints.
2. Adults learn better when learning is individualized.
3. Adults prefer face-to-face learning rather than through the use of video or audio tools.
4. Adults benefit from interactions with others who differ in age, level of experience, and professional preparation.

Learning Climate

1. Adults seem to learn better in an atmosphere of mutual helpfulness and peer support.
2. Since adult learners are reluctant to take risks, the climate should be characterized by a sense of trust and acceptance.
3. Adults appreciate the invitation to express their views and are open to the views of others.
4. Adults bring clear expectations to the learning environment and expect instructors to accommodate these expectations.

Focus of Learning

1. Since adult learners are often focused on problem-solving or immediate application of their learning, they derive the greatest benefit from instructional methods that assist them in processing their experience through reflection, analysis, and critical examination.
2. Adult learners value teaching methods that increase their autonomy.
3. Adult learners are motivated by practical, how-to learning.

Source for Adult Learning Styles: Stroot, S., Keil, V., Stedman, P., Lohr, L., Faust, R., Schincariol-Randall, L., Sullivan, A., Czerniak, G., Kuchcinski, J., Orel, N., & Richter, M. (1998). Peer assistance and review guidebook. Columbus, OH: Ohio Department of Education

BENEFICIAL BUG SCAVENGER HUNT

(Source: Keep Austin Beautiful)

Activity Description

Hands-on Discovery Lab

Age Group: Can be adapted for elementary through middle school.

Class Time: 45 minutes

Objectives

1. Students will learn to identify several beneficial insects and spiders, including predators and pollinators.
2. Students will search an outdoor environment and record numbers and types of beneficial insects and spiders that they discover.
3. Students will choose one insect or spider that they observed, and write a brief description detailing the appearance and behavior of the creature and where it was found.
4. Students will present their observations to the class.
5. Students will understand alternatives to pesticides to protect water quality.

TEKS

3rd grade: 1A-B, 2A-E, 4A, 5A, 8A-C, 9A-B

4th grade: 1A-B, 2A-E, 4A, 5A, 6A, 8A-B

5th grade: 1A-B, 2A-E, 4A, 5A-B, 6C, 9A-C

Materials – (magnifier boxes and bug chart available from KAB & WPDR)

Magnifier boxes or hand lenses

Bug collection container or jar

Gardening gloves for each student (optional to protect hands)

["Beneficial Insects" fact sheet](#)

Other insect field guides (optional)

Markers and paper (optional)

Background

Outdoor gardens and flower patches are great places to find beneficial insects. If your school has a small garden, or if you can arrange a field trip to a public garden or arboretum, you can introduce students to some of these "good guy" insects.

Why are insects so important? Insects comprise over 10,000 species and over 2/3 of the known species of animals on our planet. In fact, there are more species of beetles in the world than there are all of the other animal species combined! So just by the sheer number of species, we know that insects play many vital roles in the ecology of our planet (from pollination to decomposition to being a food supply for other animals).

Beneficial or Harmful? When gardeners talk about bugs they are usually referring to them as beneficial versus harmful bugs. Beneficial bugs help the gardener in some way (pollinate plants, eat harmful bugs, or decompose organic matter). Beneficial bugs include: assassin bugs, ladybird beetles (ladybugs), praying mantises, lacewings, many types of wasps and syrphid flies. Harmful bugs inconvenience gardeners in some way – usually by eating the plants. Harmful garden bugs include: slugs, snails, many types of caterpillars, cucumber beetles, aphids, spider mites, whiteflies, and flea beetles. Remember these bugs aren't 'bad' they are just not beneficial to a gardener.

For this discovery lab, all you need to do is familiarize your students with a few common beneficial insects, and then let them start searching. Despite what you may think, it's not hard to identify most common types of beneficial insects. If you have a field guide to insects, show students pictures of some of the not-so-well-known beneficial insects, such as green lacewings and assassin bugs. A hand-out with pictures of beneficial insects is also available for you to print: www.ci.austin.tx.us/growgreen/downloads/beneficial.pdf Remember that the pictures on this sheet are only examples: there are many more kinds of wasps and spiders, for instance.

Since students will be recording the number of different types of insects and spiders, create a friendly competition to see who spots the most bugs or the most different kinds. Also, encourage students to note and describe insect predators or insects that are visiting flowers that aren't on the list. With a little research, they can probably figure out what these insects are as well.

Below are some basic facts about each kind of beneficial arthropod. Use this info as ammunition to keep the discussion going as students talk about their observations.

PRAYING MANTIDS: Praying mantids catch victims in their front legs and devour their prey with chewing mouthparts. Praying mantids are also excellent jumpers. They can fly too, but they don't do it very often.

LADY BEETLES: Lady Beetles, also called "ladybugs," are very common garden predators. They specialize in aphid control. Juvenile lady beetles (larvae) are also predators. They don't look very much like beetles, though. Immature lady beetles are more like caterpillars, and they have to go through a pupal stage (just like butterflies and moths) before they become adults.

GREEN LACEWINGS: Lacewings look a bit like small green dragonflies, but they are more closely related to beetles. Like lady beetles, adult and immature green lacewings like to eat aphids. Also like lady beetles, baby green lacewings go through a pupal stage before becoming adults.

WASPS: Wasps are known for their painful stings, but they are also very helpful. Most wasps are predators. They feed on caterpillars and other pests. Some wasps are "parasitoids." Parasitoid wasps lay their eggs inside caterpillars, where the larval wasps develop, eventually killing the host. Parasitoid wasps are important pest control agents in many crops. Many people don't realize that ants are wasps too. Many kinds of ants prey on pest insects.

ASSASSIN BUGS: Assassin bugs aren't as well known as praying mantids, but they are just as fascinating, and just as voracious. Instead of chewing their prey, assassin bugs use their tube-like mouthparts to suck juices from their victims. They are also better fliers than praying mantids. Many assassin bugs are able to bite people, so watch out!

SPIDERS: There are many different kinds of spiders. They come in lots of colors and shapes. But they have one thing in common: they are all predators. Spiders have venomous fangs which they use to subdue their prey. Most spiders aren't dangerous to people, except for the rare brown recluse and black widow. Although many spiders make webs to catch prey, some, like wolf spiders, are active hunters that search the ground for food.

POLLINATORS: Many bee, fly, butterfly and moth species are important pollinators. They are drawn to the bright colors of flowers where they feed on nectar. As these insects feed, they transfer pollen from flower to flower. This allows the plants to reproduce. Pollinator insects often have furry bodies which allow them to pick up lots of pollen. Many bees and flies are also able to hover, just like hummingbirds. This lets them remain in flight while feeding on nectar. Many pollinators also have long tongues which allow them to probe deep inside flowers for nectar. Scientists believe that bright, colorful flowers and pollinator insects evolved together. That means that if there were no pollinating insects, there might not be any flowers.

Activity

Explain the problem:

Many insects are pests. They bite us and eat our crops. So it's easy to forget that lots of insects help us, too. Many people spray pesticides regularly on their lawn and garden to prevent bugs from eating their plants. The problem with this practice is that trace amounts of some types of pesticides are showing up in Austin's creeks and springs and beneficial bugs are killed along with the pests. This can make our garden worse in the long run. Predatory insects and spiders are nature's insecticides, keeping pest species at low numbers. And many of our beautiful flowers wouldn't exist without bees, flies, and butterflies to pollinate them.

Good Bugs/ Bad Bugs Charades (2nd-3rd grade option)

1. Divide students into 5 groups. Give each group a scenario from the list below. Each group is instructed to act out the scenario on the card. Allow 2-5 minutes for preparation and 1 minute each to present.
2. The student audience should try to identify what bug scenario is being acted out and determine if the scenario depicts a good or bad bug.

Scenarios:

- A spider catching and eating small bug in its web.
- A butterfly visiting several flowers to eat nectar and pollinate the flowers.
- A caterpillar crawling up a leaf and gobbling up the leaf.
- A ladybug flying from leaf to leaf to eat lots of lots of small aphids.
- A snail crawling slowly up a plant.

Bug search:

We will be searching our garden for bugs to collect and identify. Give examples of good bugs and bad bugs. Once outside, have students collect bugs in jars, magnifiers boxes or other bug containers. Instruct students to note where they found the bugs and observe what the bugs were doing. Students should complete the tally sheet (or complete this together as a class) and record their observations on the "Wanted!" poster. Pick a few students to "show and tell" about their favorite bug.

Explain the green gardening solutions:

Decide on the health of the garden. Are there more good bugs than bad bugs? Is there a balanced ecosystem? If there is not a balance of good bugs to bad bugs, what can be done to make it a healthy ecosystem without using chemical bug killers?

Go Creative with Bugs (optional) – language arts extension

Students will select one of the bugs they found and note the appearance and behavior of the creature and where it was found. Using this information along with determining if it the bug is a beneficial or harmful bug the student will design a Wanted Poster. For example a Wanted Poster for a Ladybug may say wanted for helping the garden while a Wanted Poster for an Aphid may read wanted for eating plants in the garden.

SOLUTIONS for bad bugs that will not harm the water:

- If it is eating the garden, it is probably good for decomposing the compost pile. The solution is to move the bad bug from the garden to the compost pile.
- Another option is to leave the bad bug in the garden if it is not causing large destruction and especially if it is a bug that metamorphosizes into a good bug, e.g. caterpillars (butterflies) and grubs (beetles). A healthy garden needs a balance of good and bad bugs.
- The last option is to kill the bad bug if there is not a safe place for it in the garden or compost, or it is causing large amounts of destruction. For large amounts of destruction a chemical spray might have to be used. Choose the least toxic product when this is required.
- If it is a good bug, leave it in the garden.

Explain some natural ways to treat bad bugs: pill bugs are attracted to grapefruit rinds and beer; nematodes can be introduced to kill grubs; insect netting can be used as a physical barrier. For more earth-wise solutions go to www.growgreen.org

Remind students how gardening without chemicals protects our watersheds, creeks and groundwater (by not using chemicals we are also protecting aquatic organisms and our drinking water supply).

Additional Resources

[Texas Bug Book: The Good, the Bad, and the Ugly](#). By Malcolm Beck and John Howard Garrett
www.projects.ex.ac.uk/bugclub/bugid.html (online insect key)

FREDDIE THE FISH SCRIPT

	Narrator	Freddie Says (child volunteer narrator)
1	<p>Imagine that we're at the beginning of <name your local river or stream>. There are trees all along the banks (sides of the river/stream). The water is cool and clean. This is where Freddie the Fish lives. Freddie has lived in this stretch of the river all his life. But now he is going on a big adventure! He's going to travel downstream! Here he goes! (Wiggle Freddie.) As Freddie swims downstream, he comes to a place where people will be building new, big houses. Big bulldozers knocked down trees to make way for building. <Child Reads Freddie Says > It begins to rain. There are no tree roots to hold the soil in along the river bank and dirt slides down into the water. (Dump soil in into Freddie's jar.) Oh, no, Freddie! How is Freddie? ("Yuck!")</p>	<p>It's getting sunny and hot. What happened? All the trees are cut down!</p>
2	<p>Freddie swims on down the river. See if you can guess where he is now. <Child Reads Freddie Says > (Pour raisins into the water.) Where is Freddie? (<i>pasture, ranch or farm</i>) Are these good presents for Freddie?</p>	<p>Look! There are some big, brown animals with horns coming down to visit me! One of them said, "Moo!" Oh, look – he's leaving me some presents!!</p>
3	<p>Freddie swims farther on down the river. He comes to a new place. <Child Reads Freddie Says > (Pour in green liquid) Oh, no, Freddie! Where is Freddie? (<i>next to a golf course</i>) Some golf courses put lots of fertilizer on the grass to keep it green. Extra fertilizer runs off into the river, especially when it rains. This hurts our rivers and streams. How is Freddie?</p>	<p>I see a bunch of people hitting a little ball with a stick! Look at that green, green, GREEN grass! Hey, here's a little stream running off of that grass. Oh, no – it's sticky, green stuff!</p>
4	<p>Freddie swims beside a house. Someone is changing the oil in his car. Wait – is he pouring the oil down the storm drain along the street?? <Child Reads Freddie Says > (Pour pancake syrup into Freddie's jar.) How is Freddie? That man doesn't know that storm drains go straight into the river! Anything we pour into the street goes straight into our streams and rivers!</p>	<p>Oh, no! Oil is coming out of that pipe! The oil is heading right for me! My gills are getting covered in oil!!!</p>
5	<p>Poor, Freddie! Off he swims. <Child Reads Freddie Says > (Pour sand or rock dust into the water) Oh, my! All that sand and rock dust is blowing into the water. What do you think of the water Freddie is in now? How is Freddie?</p>	<p>Wow, there are big trucks digging in the dirt over there. What's all that stuff blowing into the water?</p>
6	<p>Freddie swims past the city park. Some picnickers didn't throw their trash into the garbage can. The wind is blowing it into the river. <Child Reads Freddie Says > (Sprinkle parts of a Styrofoam cup, paper, a broken plastic spoon, etc. into the water.) How is Freddie?</p>	<p>Ahh, look. People are having a picnic. Oh, no! What's all this junk in the water?? I can – hardly – get – through – all – this – litter! Yuck!</p>

Freddie the Fish Discussion Questions:

What do you think about the water Freddie is in now?

How did the water get so dirty?

Does this happen in real life?

How can we keep the water clean for Freddie and other fish that live in our rivers and streams?

Child script copies (cut and distribute one to each child volunteer):

1. It's getting sunny and hot. What happened? All the trees are cut down!

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2. Look! There are some big, brown animals with horns coming down to visit me! One of them said, "Moo!" Oh, look – he's leaving me some presents!!

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3. I see a bunch of people hitting a little ball with a stick! Look at that green, green, GREEN grass! Hey, here's a little stream running off of that grass. Oh, no – it's sticky, green stuff!

--------------------

4. Oh, no! Oil is coming out of that pipe! The oil is heading right for me! My gills are getting covered in oil !!!

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5. Wow, there are big trucks digging in the dirt over there. What's all that stuff blowing into the water?

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6. Ahh, look! People are having a picnic. Oh, no! What's all this junk in the water?? I can – hardly – get – through – all – this – litter! Yuck!

SUGAR KARST

(Courtesy of UT Bureau of Economic Geology)

Purpose: Explore the process that leads to formation of caves.

Students will review what they know about caves with a real 'micro cave' in limestone as a prop. They will then try to make caves in limestone and discover that it takes a long time to change rocks. The instructor will provide a "fake rock" [sugar block] and we will discuss how the fake rock is similar to and different from real rocks. We will then make a cave in fake rock that looks very similar to the one in the real rock. We will then explore using all senses (sugar water is detectable by very young chemists by a simple well-known analytical technique) to find out what happened to the sugar. We will learn the science word "dissolved."

Grade level: K -2

Materials:

1. Background material on caves
 - a. Large sample of limestone with karst dissolution features
 - b. Photographs
 - c. Models or cave tours
 - d. Show that large and small caves in the limestone sample are similar
2. Limestone or marble block, best choice is similar in appearance to sugar block (white, fine crystals, 1 x 4 x 4 slab)
3. Bucket, 6 feet ¼ inch tubing for siphon
4. 2 gallons water
5. 2 clothes pins to hold hose
6. Dish pan or similar container to use as a catch basin
7. Cookie rack that can sit securely on the catch basin
8. Set up bucket in chair above the catch basin, so that the tubing can be used to squirt water in a slow stream into the catch basin.

Sugar block "Fake rock" instructions below

Lesson

Show examples of caves, and discuss what the students know about caves.

- How big are they?
- Have they ever been inside a cave?
- What was it like?

Ask how do caves form?

- Most students think that the holes have been made by digging or burrowing. (The best story I have heard is that they were dug or gnawed by dinosaurs.)
- Tell students that caves are formed by water.
- Demonstrate by dripping water on to limestone block set on the cookie rack over the catch basin, focusing flow on one spot.
- Ask if the students see any change in the limestone yet.
- Explain that the limestone is dissolving, but that it is slow.
- Suggest we change to a fake rock so that we can speed the process up.

Students compare the real limestone rock and fake rock.

- How are they alike?
 - They are hard, crystalline, and white.
- How are they different?
 - Students are usually able to guess what the fake rock is made of.

Set fake rock on cookie sheet above the catch basin.

- Drip water on the sugar rock focusing on one spot.
- Ask the students if they see any change.
- They may need to take turns coming close.
- Emphasize that nothing but water is touching the rock (do not let anyone “dig” to speed things up), **let the student’s misconception about the action of water dissolve.**



A hole will form and then break through the fake rock.

- It is useful to pause and examine what is happening in stages.
- Compare the appearance of the fake rock cave and the real caves?
- Are they alike?

Important follow up:

- Ask where the fake rock went?
- Students thought it was dug out, did that happen?
- Invite students to put a drop of the water on the catch basin on a finger and see if they can find the sugar by the ever popular taste analysis.
- The sugar went into the water.
- Ask the students if they can see the sugar in the water.
- The science word for something that you can taste but not see is “dissolved”.

Sugar is dissolved to form caves in our fake rock.

- Real limestone is dissolved to form real caves.
- OK, can you taste real rock dissolved in water?
- Ask if students have ever visited another town and the water tasted funny. That is because rock does dissolve in water and give it a taste.
- Austin water tastes a little bit like caves, because part of our water comes from Barton Springs.

Suppose you went into a real cave, and caught a drip.

- Would it taste a little like real rock?
- Yes! Caves are still being dissolved.

Preparing the sugar block “fake rock”

- 4 cups (1L) sugar
- 4 ½ Tbsp (22.5 mL) water
- Quart mold, at least 4 inches tall (bottom of gallon plastic jug works well)- microwave-safe
- plastic bag to line the mold

1. Mix sugar and water very thoroughly, sugar will be just damp.
2. Line the mold with a plastic bag.



3. Pack damp sugar firmly into the mold, fill so that sugar mixture is at least 1 ½ inches deep.
4. Microwave the mold on high 3 minutes
5. Use a spoon to press down the sugar firmly, ****Handle with Care, Burn Hazard****
6. Microwave on high 2 minutes
7. Cool to safe handling temperature
8. Remove from mold, peel off plastic bag, and cool on a rack.
9. Store in a dry place, preferable to let dry several days. The block should be dense and hard; rock-like

Making the sugar block can be part of the lesson.

- The sugar is like sand, a sediment.
- Let students compare textures of sugar and sand-box sand.
- Geochemical changes (heat and pressure), and the presence of water can turn a sediment into rock.
- Our sugar rock can be made quickly at low temperature and low pressure. Real rocks take thousands of years to form, and may be formed by high heat and high pressure.

Resources

USGS Exploring Caves

<http://egsc.usgs.gov/isb/pubs/teachers-packets/exploringcaves/>

Virtual Cave

<http://www.goodearthgraphics.com/virtcave/>

Barton Springs/Edwards Aquifer Conservation District, Education Coordinator 282-8441

<http://www.bseacd.org/>

What's in a Name? Mussel Identification

Written by Jeff Janvrin; adapted for Texas by Marsha May
Source: US Fish and Wildlife Service



Objective:

Students will use descriptive language to develop names for freshwater mussels.

Methods:

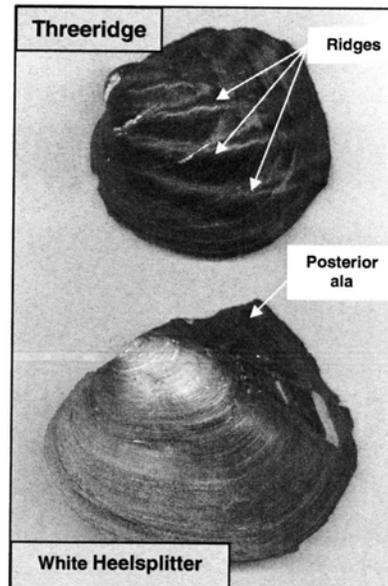
Students will use provided freshwater mussel shells (or pictures of freshwater mussels) and instructed to work in teams to develop names which concisely describe the mussels.

Background:

Identifying freshwater mussels may seem intimidating, especially when you are first introduced to them. However, many of the common and scientific names are very descriptive of the mussel shell's exterior shape, color, texture, size or in some cases the type of habitat a mussel is found.

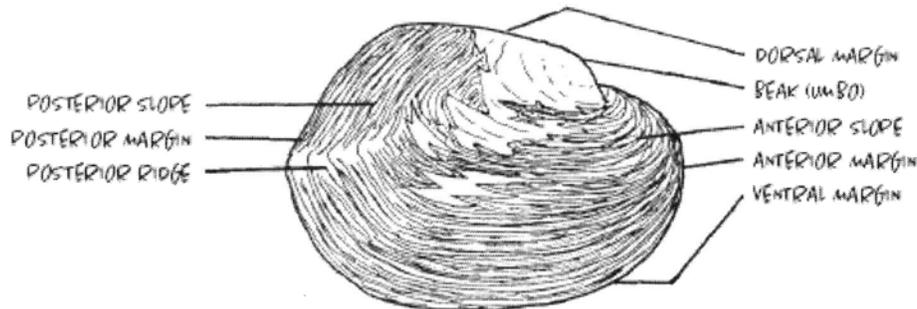
The following two examples illustrate how descriptive language has been used to name mussels: the threeridge (often) has three **ridges** on its shell and the group of mussels called heelsplitters have a sharp wing, or **posterior ala**, that quite literally could cut someone's heel if stepped on.

Some common names of mussels are based on the similarity of the mussel's shape to an item which was used in the 1800s. For example, the pocketbook was given its name because it looks like a small purse, also called a pocketbook, carried by women of that era. Other mussels named after items commonly used in the 1800s include the following: washboard, spike (after a railroad spike) and spectaclecase (after a case that would hold eye glasses).

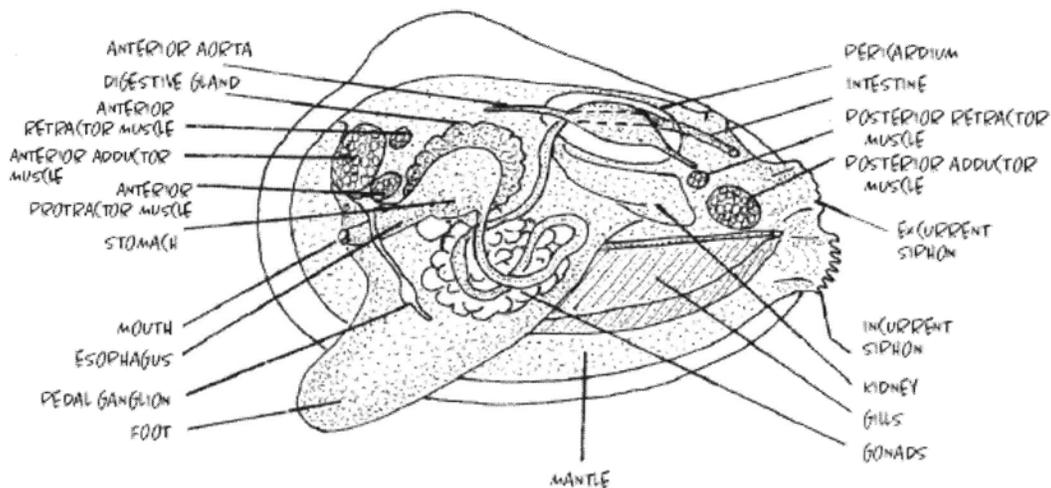


The common names of other mussels are based on the resemblance they have to plants, animals, or parts of animals; pigtoe, monkeyface, fawnsfoot, deertoe and mapleleaf. However, the same mussel may have several different common names, which is why biologists often refer to mussels, and other plants and animals, by their scientific name, thereby eliminating any confusion.

EXTERNAL SHELL FEATURES



INTERNAL SOFT TISSUE ANATOMY



Materials:

- Freshwater mussel shells or pictures of freshwater mussels. (See “Making a Freshwater Mussel Collection” and “2009 List of Threatened and Endangered Mussels in Texas” to avoid collecting protected species)
- Water (optional)

Procedure:

1. Place students into groups of 2-4.
2. Choose one shell to demonstrate to the students how they should use descriptive language to develop a name for the mussel.
3. Have the groups develop a descriptive name for each mussel. Water can be used to wet the surface of the mussel shell to make coloration and features more obvious.
4. Hand out mussel identification books to the groups and have them look up the mussels in the book to compare the names given in the book to the names they developed.

Assessment:

Have students make a Beany Baby™ mussel by using cloth and fabric paint then sewing the pieces together. Place beans inside and finish sewing shut. Accompany each Beany Baby™ mussel with a placard listing the mussel's name, reason for name (if known), identifying characteristics and artist's name.

Extensions:

1. Take a field trip to a local stream before the activity to collect freshwater mussel shells. **Note:** In order to collect shells and/or monitor mussels it is recommended that educators attend a Texas Mussel Watch workshop to receive background information about the different mussel species in Texas, how to identify them, and how to monitor them. Workshop participants will be included on a scientific permit, given a notebook of information about mussels in Texas and can access Texas Mussel Watch staff after the workshop for further help. Check our website for workshop schedules: <http://www.tpwd.state.tx.us/tracker>
2. Have students interpret the scientific names of the mussels and compare them to the descriptive names they developed for the mussels.

Field guides available for identification of freshwater mussels:

Howells, Robert G., Raymond W. Neck and Harold D. Murray. 1996. Freshwater Mussels of Texas. Texas Parks and Wildlife Department, Austin, TX

Texas Mussel Watch Workshop Notebook, Texas Parks and Wildlife Department, Austin, TX, available with workshop attendance. Information at <http://www.tpwd.state.tx.us/tracker>

A bibliography of other mussel field guides can be found on the internet at: http://fly.hiwaay.net/~dwills/bks_id.html

Making a Freshwater Mussel Collection:

The following excerpt on how to make a mussel collection is from the Field Guide to Freshwater Mussels of the Midwest by Kevin S. Cummings and Christine A. Mayer, Illinois Natural History Survey, Manual 5, Champaign, Illinois, December 1992.

"Before collecting mussels it is advisable to contact the Texas Parks and Wildlife Department to find out whether there are any restrictions and to obtain any permits that may be required. Because of the rarity of many of the native species, live mussels should never be collected without prior permission. One can still build a nice collection by taking only shells and returning all live mussels to the stream or lake.

Perhaps the best place to begin looking for shells is along the bank of a medium-sized or large river when the water is at its lowest level. Although a few species can withstand some dessication, most are found in permanently flowing streams or lakes that contain water year-round.

Mussels can be found in a variety of habitats but are most abundant on shoals, where they live in gravel or a mixture of sand, mud, and gravel. A wide variety of shells can often be found along the shore in piles or "middens" left by muskrats or raccoons. The simplest and possibly the most effective method of collecting mussels is by hand-picking along the shore or in the stream. A small net bag or old potato sack makes a good container for holding shells in the field.

For your specimens to have scientific as well as aesthetic value, you need to keep accurate labels and records of field observations. After specimens are collected, a label should be made immediately and placed in the bag with the specimens; it should include the following information: the name of the body of water, road or bridge crossing, distance and direction from the nearest town, the county and state, the date, and the name of the collectors. Other information, such as water temperature, depth, current velocity, bottom type, and time spent collecting, can be recorded in a field notebook. Locality data should be written in pencil or India ink on a good grade of label paper so the label will not mold or disintegrate in the bag. Specimens without sufficient locality data are essentially worthless, so it is extremely important to accurately label specimens..." Also complete a Texas Mussel Watch data sheet and mail it to Texas Parks and Wildlife Department, Texas Mussel Watch, 4200 Smith School Road, Austin, Texas 78744 (contact marsha.may@tpwd.state.tx.us for a copy of the data sheet).

"Once collected, the shells should be cleaned with warm water and a brush or Teflon scrub pad to bring out the true colors and other markings needed for identification. After cleaning, locality data or a numbering system used to tie that specimen to a particular locality should be written directly in the shell with a pencil or India ink. If, after cleaning, you still have trouble identifying your specimen, you can often send it to a specialist for verification." In Texas, you can send a digital

photo of both sides of the shells valves to marsha.may@tpwd.state.tx.us or mail the shell to Texas Parks and Wildlife Department, Texas Mussel Watch, 4200 Smith School Road, Austin, Texas 78744. Prior arrangements should be made with TPWD before sending specimens for identification.

2009 List of Threatened and Endangered Mussels in Texas:

Federally endangered:

- Ouachita rock-pocketbook

Federal Candidate:

- Texas hornshell

Under Consideration for listing:

- Texas fatmucket
- Texas heelsplitter
- Salina mucket
- golden orb
- smooth pimpleback
- Texas pimpleback
- false spike
- Mexican fawnsfoot
- Texas fawnsfoot
- southern hickorynut
- Louisiana pigtoe

For more information on Texas mussels, go to <http://www.tpwd.state.tx.us/mussels>



Nature Treasure Hunt



Find 3 shapes of leaves
and draw them.

Find an animal home above
your head.

Find an animal home under
the ground.

Find a rock with more than
3 colors. List the colors.

Find something in nature
that starts with the first
letter of your name.

Bonus: Use names in your
family.



4200 Smith School Road • Austin, Texas 78744
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