

Bringing Children Outdoors to Learn – LEA, Grand Rapids, Michigan

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- 1. Teaching in the Outdoors - Safety** – Visit the area prior to the visit. Appropriate Attire – Consider and anticipate weather. Teachable Moments – Take advantage of teachable moments. Collections – Respect the area and all area regulations on what are safe items to collect. DO NOT release purchased tadpoles, insects or plants into the wild. Make sure students know: their assignment, the boundaries or area of study, keep them informed of time, poison ivy, the bee freeze. Take a Walkie Talkie or Cell Phone with You – in case of emergencies you may contact others or they may contact you. ***
- 2. Scavenger Hunt – Forest Park**
Each person is given either a fact card about the park or a memory card. If you have a fact card, read it and keep it to yourself. If you have a memory card try to think of a memory you have of the park. If you don't have an experience in the park, think about a nice story or experience that someone else may have shared with you or you might read in the paper. Give each person a treasure hunt form. The group will have 10-15 minutes to mix and mingle to try and complete as much of their own treasure hunts as possible. They should go about asking questions and try to find the person with the correct answer on their fact card or fill in a memory from someone's memory card. After the allotted time circle the students back together and ask how many people found at least 10 facts? 15? 20, etc? What was an interesting memory you heard? What was a surprising fact? Why? How does this change or reinforce your impressions of Forest Park? Students can do research on an area beforehand and submit a fact to use in the game prior to the outdoor education day. The students make a connection with the community – which helps them to take ownership. The place does not have to be a park. It could be a zoo, or a natural area, or a state park...etc. ***
- 3. Poetry Lesson in Nature** – Groups of 4-6 students gather and go to an area (a lake, a scenic spot, etc.) that they find attractive/ interesting (all within sight of teachers). They should just sit quietly, observe and listen for about 5 minutes in nature. After observing quietly, each student should write down one descriptive phrase, capturing the beauty/mood/feeling/creation, etc...of the area. They will share that one phrase with their group, writing them on their own sentence strip. The group will then decide how to arrange their phrases to form a poem. They will meet back up with the entire group and perform their poem, line by line. All students will be involved in reciting their line. Creativity of how the group presents their poems is encouraged.

4. **Clear Tape Bracelets and Paint Swatches** – Give each student a piece of clear packing tape to make a sticky, side-out, bracelet that they can wear on the opposite wrist of their dominant hand. They will collect non-living objects along the 5 senses journey of the prairie, and stick it to their bracelet. They will also keep a log of items they have found along their journey, by using their five senses. Also each student should be given a paint swatch and as they walk along find things in nature that match the color of their paint swatch. Paint swatches may be taped into their Science notebook along with one or two items (if possible) that they find. Otherwise they can keep a running list of items.
5. **Living Camera Activity** – Discuss terms background, foreground, middle ground. Work in pairs, standing back to back. Describer paints a picture of scene in words, making 3 statements. The recorder writes down description and can ask 3 questions. They turn and the recorder has to find that picture. (Repeat switching roles)
6. **Sound Map and Deer Ears** – Each child is given an index card with an x on it in the middle. The card is a map and the X shows where they are sitting. When they hear a sound, they should make a mark on the card that aptly describes that sound. The mark's location should indicate as accurately as possible the direction and the distance of the sound. The marks should be interpretive, not literal: just a few lines that represent the sound. For example: two wavy lines indicating wind, or a musical note indicating a songbird....they should spend little time drawing and most of the time listening. Reflection: Ask the following questions. How many different sounds did you hear? Draw a circle around the sounds you have heard before. Do you know what made the sounds? Draw a line under the sound you liked the least. Why did you like that the least? Draw a star next to the sound you like the best. Why did you like that the best, etc?
7. **Tank** – (Physical Education) Objective to use hearing and touch to have the tank find ammunition and hit the other tank. Two teams: Each team has: One tank (blind-folded person), one tank commander and any number of gunners. Materials: Blind-fold, Ammunition (stuffed animals, foam balls, rag balls, sock balls...etc.) The commander has his/her back to the tank. The gunners are facing the commander and can see the tank. The gunners can NOT talk to the commander, they can only use hand signals. Each team will have two minutes to decide on their hand signals. The commander will verbally direct the tank to find some ammunition and pick it up. Then the commander will verbally direct the tank towards the other tank and fire (throw the ammunition towards the other tank). When either tank is hit the game is over. Do a debriefing with the team. ***
8. **Ecosystem Chart** – Students write down organisms (living and non-living) and fill in the schoolyard ecosystem chart. (Discuss terms: Plant, Animal, Producer, Consumer, Herbivore, Carnivore, Omnivore, Decomposer, Scavenger, Predator, and Prey). ***

9. **Biotic/Abiotic Stick Squares** – Students work in pairs and take their stick squares and lay them on the ground. They make a list in their notebook of things they see in the squares, labeling them as biotic or abiotic. ***
10. **Circle Up Reflection** – Using climbers rope students form a circle. We stand evenly spaced around the circle. We lean slightly back with arms extended, all pulling on the rope and on the count of three all sit down at the same time. And then on the count of three, we sit with our feet on the ground and knees bent and we all stand up at the same time. This is a lot of fun to do and the kids will want to do it multiple times. After we do that, we pass the knot of the rope around the circle and when the teacher says stop, or blows a whistle, or ...etc... the rope stops being passed and the student holding the rope answers a question about the day, such as: What did you learn today that you didn't know before? What was your favorite part of the day and why? If you could tell anyone anything about the day, what would you tell them? Etc....
11. **Pacing** – Divide the students into two groups (5 & 6 and 7 & 8 grades) and have them practice counting paces in a 50' marked area. Using regular strides students should count each pace as they walk. (Note: One pace is two steps: left foot, right foot counts as one pace.) When they have walked 10 steps they should stop. They should learn to adjust their pace to equal the 50'. Some will need to take bigger steps, some shorter steps. They should practice this until they have a muscle memory or a feeling of what their measuring pace is. Each pace equals five feet, so as students walk, they can count by fives each time their left foot touches the ground. ***
12. **Using a Compass** – Students practice using a compass to find a bearing. Give them a degree measurement, students will turn their dial (compass housing) so that degree lines up with direction of travel arrow on the base plate, then students turn their bodies around until the red magnetic needle is inside the red orienting arrow underneath ('put red Fred to bed'). Students should now be facing in the direction of that degree. Do this a couple of times using different degrees. Students should practice using a compass to take a bearing. Students should select an object like a tree that is some distance away. They should face the object, pointing the direction of travel arrow at the object. Then have students turn the dial (compass housing) until the red magnetic needle is inside the red orienting arrow underneath ('put red Fred to bed'). Have students look at the degree measurement that is lined up with the direction of travel arrow on the base plate; that degree measurement is the bearing for that tree from their present location. If students are spread out for this activity, their bearing measurements could be slightly different. Do this a couple of times using different objects. ***
13. **Mystery Animal Activity** - Students will practice using their compass, locating each letter to solve what their mystery animal is, having set up a small orienteering course, complete with degree measurements of how to get from point to point, and the distances in feet between each point. Make up one index card for each point with the degree measurement and distance between each point. To make it more fun, choose an animal with 4 or 5 letters (like SNAKE) and put one letter from the animal name on each card as the students proceed through the course.

They will have to remember each letter so they can name the “mystery animal” at the end. (If time allows students may switch and find the other mystery animals of other grades.) ***

14. **Songbird Hunt** – Participants are led into the forest for a few minutes of listening for bird sounds. They should be reminded to use their “deer ears”, where they cup their hands behind their ears for more focused listening. Participants are led in a discussion about why they are learning about migratory birds and the importance of the forest to these birds. Students are then briefed on how to observe birds and some of the features to look for when identifying them. When they are ready, they are given a clue card that has clues to the field markings on the bird that they are to look for along the path in the forest. They are challenged to walk down the path and find as many birds as they can while also picking out the bird that is described on their clue card. Participants are gathered together when they have all finished their songbird hunt. They share their experiences and each point to the bird on the songbird poster that they thought was the one that they were supposed to find. Participants are then led in a discussion about forest fragmentation and the effects that it has on the songbird and migratory bird population. They learn that humans have altered the forest, creating more of an edge effect, which has put forest birds in close proximity to the cowbirds, which invade the nests of songbirds (brood parasitism) thus lowering the songbird population. Discussions can follow such as “Why didn’t we see more “real” birds in the forest this afternoon?” “What time of day do you think we would see the most birds?” “How do you think the alteration of the forests might affect the forest bird population?” ***
15. **Tree Identification** – Use field guides to learn and identify trees of the forest. ***
16. **Leaf Identification and posters** – Gather leaves and use field guides to learn leaf identification. (Make sure you know the difference between a leaf and a leaflet. It can be very frustrating trying to ID a tree from a leaflet while thinking it is a leaf.) Make posters, labeling leaves, using guidebooks. Warn students if they don’t know what poison ivy looks like, that everything is poison ivy to them. Teach a lesson on what poison ivy looks like. ***
17. **Bird Feeders Made out of Recycled Water Bottles** – Holes were drilled in the tops of the plastic water bottle lids and a zip tie was inserted in the whole to use as the holder. Two holes were cut out of the sides at the bottom of the bottle and a stick was inserted and then filled with bird seed. I used sunflower seeds so the seeds did not spill out so easily. Hang feeders from a tree branch. Using an Ex-act-o knife or scissors, cut an X about 2-3 inches above the branch for the birds to eat the seed from. A piece of masking tape can be used to cover these openings until the feeders are hung up to prevent seed from falling out.
18. **Trolleys** – Objective: Team Walking - The team attempts to coordinate their steps and walk their boards down to the designated spot and return to the starting line. They must coordinate their movement as a team or they will find the task impossible. Players prepare themselves for this activity by placing one foot on each board. They grasp the ropes provided and make any

adjustments so that their rope is tight in both hands. (Safety concerns – Slow and steady helps to keep from falling.) ***

19. **Fishing** – It works well to have two students to one fishing pole. Use worms or kernel corn for bait. Keep a running tally of the different fish species caught. Keep track of who caught the biggest fish, the smallest fish, the most fish..etc.
20. **Water Quality Testing** – We have usually conducted water quality testing at different ponds we fish at on our fishing day. We take the water temperature, and test for acidity, and alkalinity. Water quality testing kits can be purchased to use, or you can check with the different park's departments and see if they have some for your use. They probably monitor the water of the ponds themselves and would be happy to let you use their equipment. One source for testing kits would be to Google LaMotte for purchasing Environmental Education Water Monitoring Kits.
21. **Food Web Activity** – Students will visualize the interconnectedness of organisms in a story, as a ball of yarn is passed from student to student. Students will see the interconnectedness and how the food web is affected when a disturbance occurs within the community. Description of activity: Have two balls of yarn ready to pass. Before beginning the story, assign each student the identity of an organism. Seat the students in a large circle. Explain that as you read the story, they should pass the ball of yarn to each character as their name comes up. They should hold onto a piece of the string as they pass it so that a web is formed. The string represents the flow of energy from organism to organism. Students may receive the ball of yarn more than one time, or get different colors to hold since most organisms can eat and be eaten by different organisms. After completing the story, the two balls of yarn will form two interconnected webs. Emphasize to the students that organisms depend on each other for food. Note that each of the webs begin with the sun. In the end, decomposers such as fungus and bacteria break down, or decay organisms. Discuss what happens when a pollutant enters the system, or if one type of organism drops out of the web. For example, migratory birds, like wrens, are in decline due to habitat loss. The student with the "WREN" card drops his string. The web sags. How might this affect the organisms around the wren? (Without the wren to eat them, spiders might increase in number; and snakes might go hungry without wrens to eat, and decrease in number. This will also affect the next organisms in the web.) Students who are affected can drop their string until the webs have completely fallen. ***
22. **Owl Pellet Dissection** – Students dissect an owl pellet. These can be purchased from science catalogs or a collection of fresh pellets may be used. If you use fresh pellets that have been collected, I recommend sanitizing them by baking them first. (Directions for doing this are available on the internet.) Students should wear gloves while doing this activity. ***
23. **Read aloud the children's story "Owl Moon" by Jane Yolen** – Students of all ages enjoy this book. Interesting enough, the author does not say if the child is a boy or girl. The students

enjoy guessing which gender they think it is throughout the book. It is a great lead in to studying owls, going on an owl prowling, and also a great follow up since the students will be able to relate to the character in the book.

24. **Take Students on an Owl Prowl** – After studying and researching owls, take the students on an owl prowling in a wooded area and look for owls or evidence of owls – find their feathers, pellets, and white-wash, left over meal parts from prey, etc.
25. **Population Bean Density** – The students are predators and try to capture as much prey (beans) as possible. The students discuss the characteristics of the prey (bean) population. The population is composed of individuals who have natural variation in their color. The students are assigned feeding mechanisms. (A plastic spoon, plastic fork, plastic knife, and fingers) Explain that the predator population has variation in the type of feeding mechanism each uses. All predators have the same kind of mouth, Styrofoam cups. A strict time limit will be maintained, no eating after the time is called. All survivors double in population. See Immanuel's website for more information on this activity, along with worksheets. Concepts discussed are camouflage, adaptation, natural selection, predator/prey relationships and graphing. ***
26. **Andy Goldsworthy** – a British artist who depicts the magical relationship between art and nature. You may find some examples of his work on YouTube to show your students how he connects nature and art. ***
27. **Students Make and Present Their Own Sculptures Depicting Art and Nature** – Students visited an Andy Goldsworthy exhibit at the St. Louis Art Museum. (If an exhibit is not nearby, you may research him on the internet. DVD's of his work are also available for purchase.) Students then found items in nature to use and make their own art inspired by Andy Goldsworthy. These nature sculptures should be built so that as time passes, they can be broken down by natural occurrences and return to nature in their natural state. (Nothing was given to the students to create their art.)
28. **Volunteering and Giving Back to the Park/Community** – After spending five days in nature throughout the year, we look for ways to give back and do some volunteering. We try to do this in one of the parks or natural areas that we used for outdoor education. We always coordinate with the city or park officials any volunteering done. One year we helped by picking up trash. Another year we spread mulch around some tennis courts. There are numerous ways to give back, perhaps participating in tree plantings, or honeysuckle removal. The kids will enjoy their service project and be even more proud of the area in which they were able to learn outdoors in throughout the year.
29. **A Year of Art and Danny Brown/ Nature Frames Photography** - The 7 & 8 grades concentrated on the nature images of nationally acclaimed, free-lance photographer and retired Fisheries

Biologist for the Department of Conservation, Danny Brown. Danny writes an excellent blog post titled "Nature Frames", where he posts an image of flora or fauna from the state of Missouri along with wonderful and informative writings about his featured image. Throughout the year, I made Monday mornings, "Nature Frame Mondays" in my classroom and shared Danny's blog post with the class. Not only were the students seeing some beautiful images from the different species in our state, they were also learning about them through his creative and beautiful writings. Therefore, when we went on our outdoor education days, the students would recognize and know a little more about these species. It wasn't long before students were able to name bird species by name. The students looked forward to Monday mornings to see what "Nature Frames" was going to be about that week. You can sign up for Danny's blog at: www.dannybrownphotography.wordpress.com. After dedicating all our art for the year to depicting the photography of Danny Brown, we were able to share his and our work with the community as we held an Art Rendezvous in Forest Park, MO where most of his images had been taken. Danny and his wife were our honored guests and the students and parents of the 7 & 8 grades were invited to the evening, along with all of the Forest Park staff & donors to the park, and about 60 area teachers. It was a wonderful evening with over 200 people from the community in attendance!

30. **Large Murals of Birds** – The students (who joined art club that year) were given a large piece of subflooring. It was painted off-white with house paint. Next they drew the image of the bird onto the board. The students chose a picture of a bird from Danny Brown's website and decided on a color that they would want to emphasize. With that color they splatter painted the off-white background. After that dried, they took that colored pencil and scribbled all over the background. The final step was to look for colors in magazines and tear the pages and use a glue and water polymer to glue each piece down on the board. The students loved seeing their images come to life and look so much like the images that Danny Brown took. These were a huge hit by everyone who saw these that evening. They were kept on display in the visitor's center for several months where people asked if they could purchase them from the students. The Rendezvous was held around Earth Day in the spring.
31. **Original Image/Foil Image/Printed Image** – Here the students were given a copy of the image and they traced over it onto foil paper. The foil paper was then covered with black ink and pressed onto another piece of white paper. All three were displayed; the original picture, the foil image, and the printed image of the photograph.
32. **Canvas Squares** – Each child was given a 5 inch canvas square. One of the photographs was divided up into equal squares. Each child was given a piece (square) of the picture and was to paint it onto their square canvas using acrylic paint. All the squares were spaced apart and affixed to a large board that had bird seed around it.
33. **Black & White Photographs with Prisma Colored Pencils** – This was another project for my art club students. The students chose a picture of Danny's. I made prints of it in black and white

for them, on matte finish photo paper. The prints were sprayed with a finish to help the colored pencil to adhere to the photo. This had to be done a couple of times. The students used Prisma Colored pencils to shade over the black and white print. They were only allowed to color the featured animal. The background remained in black and white.

34. **Paper Mache Waterfowl** – The students chose a waterfowl from Danny Brown’s website and made a life-size paper Mache model of the image using balloons, cardboard, newspaper, masking tape, etc. and glue and water... After they dried, they were painted with Tempera paint to look as realistic as they could to the actual waterfowl.
35. **Table Setting Centerpiece Eggs** – Poke both ends of a washed, raw egg; carefully with a sewing needle (I did this part for them). Students then blew out the egg over a trash can. Before doing that they shook the egg vigorously to break the yolk inside, which would make it come out easier. After rinsing the egg out and letting it dry, students drew the image of their bird in pencil onto the egg. When finished they then painted the egg using acrylic paints and a very fine paint brush. Eggs were stored in empty egg cartons in between each art session. These were very fragile and we had only a couple accidental breaks. I took a needle and coarse thread to hang the eggs from some branches that were placed in a flower pot in the center of the table. Colored tissue paper helped hold the branches in place.
36. **Table Setting Bird Plates** – Students chose a bird, an image was printed out and the students drew their bird using pencil first, in the center of Chinette paper plates. I was able to find some fancy plates that had indentations of script around the edges. The students followed those indentations with gold or silver paint pens. Next the students used markers to color in their birds, using markers on their fingers to spread the colors around to make a softer image without the harsh lines of the marker point. The printed images were placed in front of each plate on the table for display.
37. **Clay Pinch Pot Owls** – Students made pinch pot owls after looking and studying various pictures of owls. (Research making pinch pots on the internet.)
38. **Water Color & Black Glue** – Here the students chose an animal and drew it on water color paper. Put some Elmer’s runny glue in the bottom of a cup. Take black tempera paint and dye their glue black, being sure to stir it well. The students used toothpicks and outlined their animals. After the glue dried, they painted their animals with water colors.
39. **Bug-O-Lympics** – Students were given a brown paper bag and one piece of yarn and were told to be creative in creating their insect/bug, using things in nature. They were to present the bug to the group when finished. They should give the name (scientific name which they can make up) and tell what adaptations the bug has. The teachers gave an Olympic score using a scale of 1 to 10 for creativity in presenting and in designing their bug. ***

40. **Suspension Bridge** – Students learned a bit about bridges and the 5 different types of bridges there are (Arch, Beam, Cable-stayed, Suspension and Truss).
41. **Soil Study** – Students were given a hula hoop and were allowed to toss them onto the land in order to do soil studies. (We did this three times in each area.) These took place in the prairie, wetlands, woodlands, and glades. They took measurements of soil depth, temperature, and how many forbs and flowers were present inside their hula hoop, if the plants had broad leaves, hairy stems, etc. Also interesting critters were recorded. Posters with findings were made and presented to the other students. Students filled in their “Terrestrial Plant Community Comparison Sheet” at the end of the activity. ***
42. **Boardwalk Reflection Time in the Wetlands** – Students sat on the boardwalk in the Wetlands observing and journaling sights, sounds, smells, etc. for approximately 10 minutes. They were asked to sit quietly and write, journal, draw...etc. in their Science notebooks. Follow up with discussion afterwards.
43. **Missouri Mammals Study** – Students were divided into groups at school and were given a MO Mammal to study and make a presentation board about. Once we were on our outdoor education day, a mammal trunk was borrowed from the MO Department of Conservation and the students were actually able to observe the skins, skull and paw prints of the mammals. They were given worksheets to fill out about their mammal and then they presented their presentation boards and mammals to their classmates. They really enjoyed learning more about mammals that they see around the state of MO.
44. **Radio Active Waste Cleanup Sight** – Students learned about how radioactive wastes were cleaned up in this area and also found out the history behind the radioactivity that had been produced there decades earlier.
45. **Stream Ecology & Playing in the Creek** – Students worked alongside a MO Department of Conservation agent to perform Macro-Invertebrate studies and water quality testing in the stream. For many kids this was the first time they have ever played in a stream. This activity is always a great time for the students. ***
46. **Trash and Run-off Flows Downstream** – How does trash and pollutants affect a community? Pollutants travel downstream. Students were divided up into 9 different groups and given one of the following topics. Farm and Agricultural Development, Neighborhoods, Shopping Center, Amusement Park, Playground/Park, City, Industry, Sports Complex, Water Park. I gave each group a poster board with a river or stream running through it and would be connected once the posters were hung side by side. They worked around the stream on each poster creating their community in which they were assigned. After ample time was given for them to create their poster, the students then wrote on smaller pieces of paper the pollutants that were caused by their land area. The students then presented to the group, discussing the possible pollutants

that would run off and pollute the stream from their piece of land. (These were written on sticky notes and added to the poster while discussing.) Also, solutions to the pollutants were discussed. One by one, each group got up and attached their poster so that the stream matched up to the previous poster. After presenting their poster, the pollutants were transferred to each poster from the previous posters (heading down stream). By the last poster, which was the water park, all the pollutants had traveled and polluted that area, making it unpopular place in which to swim. Ways to help with these pollutants and water cleanup could be discussed.

47. **Tagging Monarch Butterflies** – students spent the morning learning about butterflies and participating in the Citizen Science project of tagging monarch butterflies. Students were given nets, and were taught how to hold and tag a butterfly. They were also able to record data for the Citizen Science project, Monarch Watch associated with Cornell Lab of Ornithology. For more information: www.monarchwatch.org

48. **Hog Island Educator's Camp Bremen, Maine** – Learn practical approaches and add inspiration to your environmental education curriculum during this action-packed program. Our experienced and enthusiastic instructors share their favorite approaches, methods, and activities for engaging both children and adults with nature. Workshops using techniques in art, music, theater, journaling, and other disciplines will be presented, as well as a host of classic Audubon Camp field trips, including a boat trip to the restored Atlantic Puffin and Tern colony on Eastern Egg Rock, intertidal explorations, and hiking through Hog Island's unspoiled spruce-fir forest. These experiences provide a wonderful opportunity to be learning outside in a beautiful setting, while also considering how you can take back some of these insights and methods to your students back home. Citizen science will be explored, creating some inquiry-based lessons on birds and other topics, and demonstrating both low and high-tech methods of teaching. For more information: <http://hogisland.audubon.org/programs/registration> Registration opens October 20, 2016.

49. **How Do You Use Water?** – Have students write on a small card what they use water for. Clip them on a clothesline and discuss the importance of water. This is a great lead into a discussion on the planet's fresh water supply. Out of all the water on earth (which seems like a lot as you are looking at a globe) very little is available for our use. And out of that water some of it is polluted, or locked up in glaciers that we cannot get to. If you start out with 5 gallon jugs and say this is all the water on earth. Take 2.25 cups out of one jug and state that this is all the fresh water we have on the earth. And some of that water is in the soil, atmosphere, plant & animals, and some locked up in glaciers. Pour out from that fresh water, ½ cup and state that is all we have that is fresh and not locked up. Now out of that ½ cup of water state that some of that is polluted. Then take 5 drops of water and put it in a cup and state this is what we are left with to use. This is a lot different than what it looked like when we began isn't it? What does this tell us? When we think about how we use water we need to think about our own use of water and how it connects to the model of water available. Students may complete their "My Wise Water Use Tip Is..." sentence strip and share with the class. ***

50. **Watershed Activity** – What is a watershed? A watershed is an area of land that drains into a body of water, from an area of high elevation to an area of low elevation. Give each student a piece of plain copy paper. Have them crumple it up and open it up, but do not press it flat. Leave it with high places demonstrating the topography of an area. They should then take a Crayola Marker and highlight the high, top edges of the paper along the creases. Go by and spray each paper with water and watch the color of their marker run down the sides of the elevated areas. Storms come by and the water runs down one way to the watershed, and even into another watershed. Whatever you do to the land, you do to the water. People drink this water. Discuss an awareness campaign to help people save our watersheds. Students may create posters.
51. **Act Out Ecosystems** – Assign groups of different ecosystems for the students to act out. For example, students may act out an intertidal zone, the open ocean, a forest, a desert, a wetland.... Students will need to research what their ecosystem before acting it out for the group. Other groups guess what ecosystem or habitat they are acting out.
52. **Time for Tea** – Students are given packets of different types of tea. They can open them up and observe what is inside. (Dried flowers, leaves...etc.) Students are given a small cup (Dixie cup) and as they walk through a natural area, they may pick flowers, or leaves to make their own tea. (Be sure it to get permission to pick items on the walk.) They may pick leaves/flowers that are fragrant; they may pick up a small stick to use to stir it with. At the end of the nature walk, the students let other students smell their tea. They should also come up with a name for their tea. (Teachers may imitate the call of an Eastern Towhee songbird. Their mnemonic is “Drink Your Tea”.)
53. **Picnic** – A tablecloth is laid down on the forest floor and 6 trays are laid on the tablecloth, each having a sign of what items will be served at the picnic. Example of items: soft things, fuzzy things, wet things, prickly things, rough things, smelly things, etc. Students can be paired up or placed into groups and assigned one of the trays to make and bring to the picnic. They take the tray and fill it with the items that match their description. After a 10 minute time period, students come back to the picnic/table cloth and place their tray down. All students walk around the picnic table cloth and look at the items in each tray, guessing what the main characteristic is of that tray. Students reveal the answers after everyone has had an opportunity to guess.
54. **Devotions** – At some point and time during each of our outdoor education learning experiences we have a devotion that is related to the theme of the day. Sometimes we have the devotion in the morning before we begin, other times we have it during the middle of the day or the end of the day to wrap up our day. ***

55. **Notes of Interest** – A folder has been placed on the Immanuel website where you can have access to copies of worksheets, information and directions to most of the activities listed above, along with other activities not listed. There are also devotions and Bible verses related to God’s creation that you can use on your outdoor education fieldtrips. You can access this by going to www.immanueldayschool.org and clicking on the “forms” page, then click on the “Bringing Children Outdoors to Learn” folder.

56. **Additional Resource Books**

[A Little Bit of Dirt \(55+ Science and Art Activities to Reconnect Children with Nature\)](#) by Asia

Citro, MEd

[Creek Stompin’ & Getting’ into Nature](#) by Mary Low

[101 Nature Activities for Kids](#) by Jane Sanborn & Elizabeth Rundle

[Sharing Nature with Children I & II](#) by Joseph Cornell

[101 Things For Kids To Do Outside](#) by Dawn Isaac

57. **Citizen Science Projects** – There are many ways you and your students can become involved in citizen science. Below are listed some of the Citizen Science Projects that you can Google and find out more about. You may also contact your local zoos and natural areas and see if they have any projects you can participate in.

Monarch Watch

Audubon Christmas Bird Count

Backyard Bark Beetles

The Big Bug Hunt

Bird Sleuth K-12

Celebrate Urban Birds

eBird

eButterfly

eOceans

Frog Watch USA

Great Backyard Bird Count

Hummingbirds at Home

Ice Watch USA

Neighborhood Nest Watch

Project Road Kill

SPLASSH

Tea Time 4 Science

Volunteer Water Quality Monitoring Programs

What Do Birds Eat?

Wildlifelog.org

Project Feeder Watch

*** For resources and worksheets of these activities listed above go to the following website:
www.immanueldayschool.org. Click on Forms, and then Click on the folder titled "Bringing Children Outdoors to Learn".

Additional resources on the above website not covered in this packet:

Recipe for a Moth – Marvelous Moth Mash
Bird Behavior Search Sheet
Habitat Search Sheet for Red-Tailed Hawk
Woodpecker Habitat for Nature Search Sheet
Some "Birding 101" Resources
Help Stop Bird Deaths from Window Collisions
Vocabulary of Ecology Terminology
Where I'm From Activity
Build a Bird Kit
Team Building Activities
Ice Breakers

Teaching in the Outdoors

Safety

Visit the area prior to the visit. Even if you have been there before, go there just prior to the classroom visit. You may need to warn students of a patch of poison ivy, seed the area with tracks, plant a few items along the trail so all students have a chance at discovery, etc... This just makes the learning experience the best possible.

Appropriate Attire

Consider and anticipate weather. Make sure children are appropriately attired for the type of exploration in which you plan to engage. This also includes water, sunscreen and bug spray if needed.

Teachable Moments

Take advantage of teachable moments. There are times when a child or a group of children have expressed an interest in something or when a phenomenon unexpectedly presents itself. Seize the opportunity and expand upon the expressed interest—it may not be there when you are ready to do a unit on it.

Collections

Respect the area and all area regulations.

Quiet Please. When searching for wildlife, walk slowly and quietly to avoid scaring them. Do not approach any animal that seems sick or is seen out of its normal foraging hours (raccoons, skunks, bats, etc. out during the day). Keep a good distance from hives and nesting areas.

Discuss safe and specific items to collect. Often children are very zealous in their collection process. I always tell students “it’s okay if nature already gave it away”. This means if the leaf has fallen off the tree then it’s okay to collect. Studying insects often involves disturbing their homes (lifting a rock or board). Encourage children to “put the roof back on” the homes of bugs when they’re finished observing.

Consider alternative methods of collection. Collecting artifacts doesn’t always mean physically removing the item. Photographs or sketches are obvious possibilities, but audio recordings of sounds can also be a valuable reminder of the experience for children.

DO NOT release purchased tadpoles, insects or plants into the wild. Many of these purchased species are not native to Missouri and can create difficulties for native species, disrupting local ecosystems.

Make Sure the Students Know:

Their assignment. While going outside is fun, we all have a job to do. Give students a color or texture they are to find if this is just a hike. Each student should have some responsibility, something to focus on.

The boundaries or area of study. "From the white fence to the big oak tree" or "you should always be able to see me."

Keep them informed of time. "Five more minutes Fifth Grade!"

Know poison ivy. Leaves of three, leave it be. If it's hairy, it is scary.

Know the bee freeze. Don't swat at bees and wasps. Hold still.

Take a cell phone or walkie talkie with you if you are going to be away from the school. I always took it but never had to use it for emergencies. This makes it easier on the staff if they have to find you or your student needs to check out.

Can we teach children to look at a flower and see all the things it represents: beauty, the health of an ecosystem, and the potential for healing?"

— Richard Louv, *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*

"She was one of those exceptional children who do still spend time outside, in solitude. In her case nature represented beauty - and refuge. "It's so peaceful out there and the air smells so good. I mean, it's polluted, but not as much as the city air. For me, it's completely different there," she said. "It's like you're free when you go out there. It's your own time. Sometimes I go there when I'm mad - and then, just with the peacefulness, I'm better. I can come back home happy, and my mom doesn't even know why."

The she described her special part of the woods.

"I had a place. There was a big waterfall and a creek on one side of it. I'd dug a big hole there, and sometimes I'd take a tent back there, or a blanket, and just lie down in the hole, and look up at the trees and sky. Sometimes I'd fall asleep back there. I just felt free; it was like my place, and I could do what I wanted, with nobody to stop me. I used to go down there almost every day."

The young poet's face flushed. Her voice thickened.

"And then they just cut the woods down. It was like they cut down part of me."

— Richard Louv, *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*

Awakening The Senses:

Choose any or all of the following activities to warm up your students and increase their nature awareness.

1. Still Hunting:

- a. Still-hunting was practiced by the American Indians. A brave who wanted to still hunt would go to a place he knew well and felt attracted to. There, in the forest or on a hillside, he would sit down and let his mind settle into a still and watchful mood. If his arrival had caused a disturbance among the creatures around him, he waited patiently until the world of nature returned to its normal, harmonious routine. Usually, his only desire in still-hunting was to observe and learn.

When you go still-hunting, let your sitting-place choose you. You may be intuitively guided to a specific place in order to learn a certain lesson. For the first part of your stay, remain motionless, not even turning your head. Be as unobtrusive as you can, letting the world around you go on as it does when you aren't there. Feel that you are part of the natural surroundings; mentally move with the shimmering leaves, or dance with the butterfly as it darts and dodges through the air. Because you are still, curious animals may come close for a look at you.

2. Sound Map:

Distribute a 4 X 6 note card to each student and ask them to put an X in the center. The Card is a map and the X represents where you are sitting. When you hear a sound, make a mark on the card that describes the sound. The mark's location should indicate as accurately as possible the direction and distance of the sound. The marks should be interpretive, not literal: the players don't have to draw pictures of plants and animals, just a few lines that represent the sound—for example, two wavy lines indicating wind, or a musical note indicating a songbird. Encourage them to spend a little time drawing and most of the time listening.

Encourage them to close their eyes while they listen. Explain that cupping their hands behind their ears provides a reflective surface for catching sounds, creating a shape like the sensitive ears of a fox or kangaroo. To hear sounds behind them, they needn't turn their heads, just cup their hands in front of their ears.

Select a site where the group is likely to hear a variety of sounds. It is important to have everyone find a special "listening place" quickly, so that some aren't walking around while others are already listening. I usually give the group one minute to find a spot and tell them to stay in the same spot until the end of the game. Giving them enough time to disperse fairly widely will ensure a diversity of sound maps and greater interest in sharing. How long you keep them listening will vary based on the group's age, attention span, and how well-supplied the environment is with sounds. It is often hard to find a site that's protected from the sounds of cars and machinery, but these noisy areas are ideal for teaching lessons about noise pollution. One variation is to have students make two sound maps, the first one near a busy street and the second in a quiet, natural spot. After the game, ask them where they felt more comfortable. This is a fine way to build children's conscious appreciation of natural areas.

After the children have drawn their maps and shared them, you can ask questions such as:

How many different sounds did you hear?

Which sounds did you like best? Why?

Which sounds did you like least? Why?

Which sounds had you never heard before? Do you know what made the sounds?

You can ask them to answer aloud and have a discussion or you can ask them to circle the sounds they'd never heard before, draw one line under sounds they liked best and two lines under the sounds they liked least.

Nature Meditations

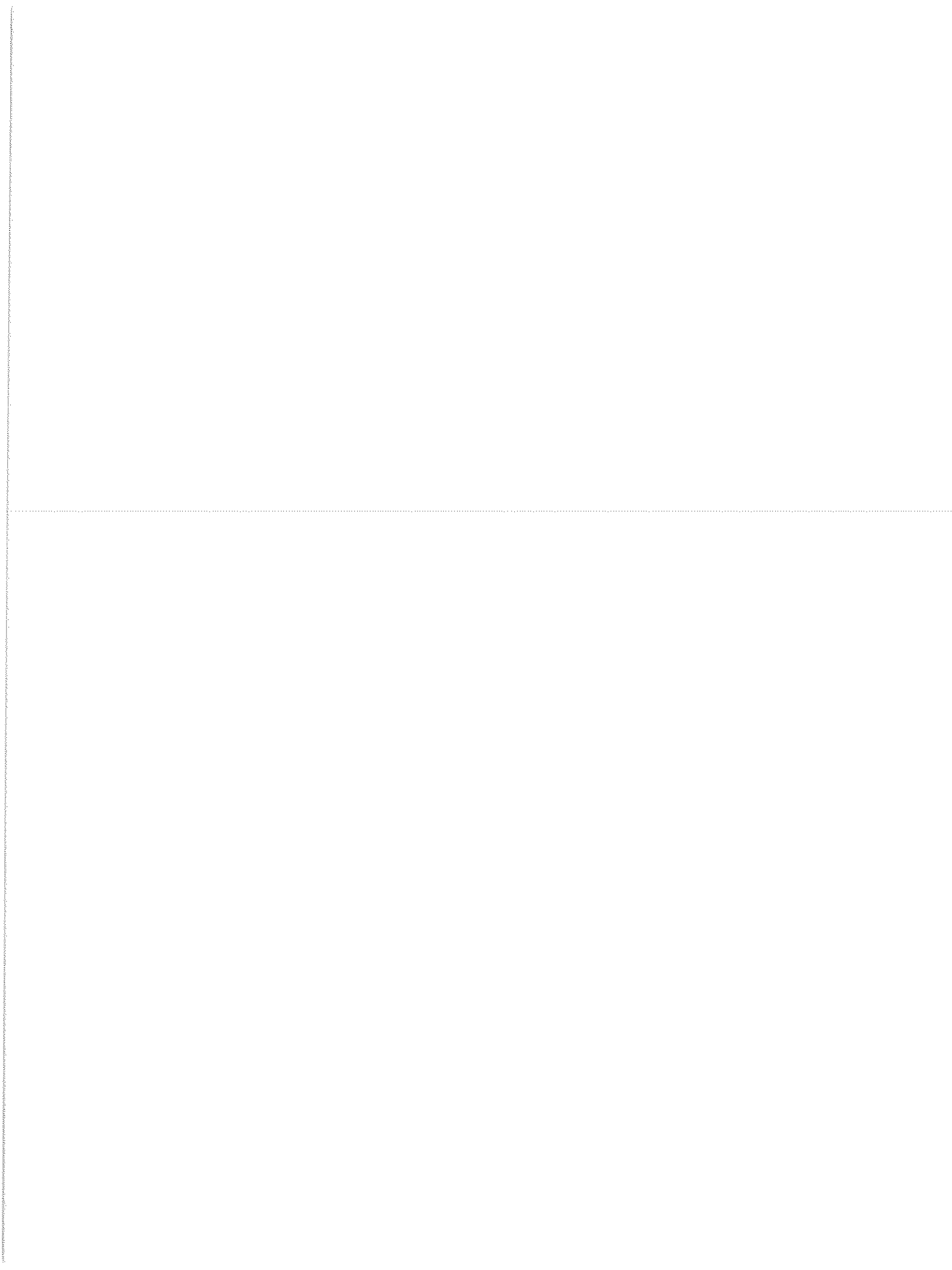
Hand each student a card with an inspirational saying on it with an accompanying activity that helps the reader translate the idea into personal experience. Have each student find a quiet place where they can be alone. Remind the students to remain silent. Allow 10-15 minutes for reflection and then call the group back together to share their insights.

Variation: Have a printed card that has several quotations and meditations and let the students choose their own.

Observation Chart

Ask students to look closely for interesting shapes and patterns as they walk through the natural area.

Record each shape or pattern in one of the grids on the chart.



A "Get the Connection" Post-Visit / Activity

A Food Web "Yarn"

Introduction

During this "yarn", or tale, students learn about the interconnectedness of many creatures in a Missouri community. Students pass a ball of yarn as a story is read which emphasizes this interconnectedness.

Objectives

Students will visualize the interconnectedness of organisms in a story, then see how the food web is effected when a disturbance occurs within the community.

Materials

Story: "A Food Web Yarn"

2 balls of yarn, in different colors

List of characters (character names could also be written on cards and hung around students necks or pinned on shirts)

Teacher Instructions

1. Have two balls of yarn ready to pass. Before beginning the story, assign each student an identity. It may help if you write the names of these characters on cards to string on student's necks or pin to shirts. You may have to modify the story if you have more or fewer students in your class (the story is written for 24 students).
2. Seat students in a large circle. Explain that as you read the story, they should pass the ball of yarn to each character as their name comes up. They should hold onto a piece of the string as they pass it so that a web is formed. The string represents the flow of energy from organism to organism. Students may receive the ball of yarn more than one time, or get different colors to hold since most organisms can eat (and be eaten by) different organisms.

3. After completing the story, the two balls of yarn will form two interconnected webs. Emphasize to the students that organisms depend on each other for food. Note that each of the webs begins with the sun. In the end, decomposers such as fungus and bacteria break down, or decay organisms.
4. Discuss what happens when a pollutant enters the system, or if one type of organism drops out of the web. For example, migratory birds like wrens are in decline due to habitat loss. The student with the "WREN" card drops his string. The web sags. How might this effect the organisms around the wren? (Without the wren to eat them, spiders might increase in number; and snakes might go hungry without wrens to eat, and decrease in number. This will also effect the next organisms in the web). Students who are effected can drop their string until the webs have completely fallen.

A Food Web "Yarn"

First Yarn Ball (11 characters)

It was a lovely fall day. The SUN shined brightly on the leaves of a huge old OAK TREE. The trees branches blew lightly in the wind, and some of it's acorns tumbled to the ground. A SQUIRREL, who was trying to save up energy for winter, was happy to eat the largest of the acorns. Unfortunately for the squirrel, a HAWK was also hungry. He saw the fat squirrel and swooped down to eat him. After a long life of chasing and eating squirrels, the hawk finally died, and part of his body was decomposed into soil by a FUNGUS. This soil fertilized a WILDFLOWER, who lived in the shade of the oak. A BUTTERFLY floated by and stopped to rest and sip nectar from the brightly-colored flower. The butterfly moved her multi-colored wings slowly as she drank, but this movement was spotted by a FROG, who captured her with his long, sticky tongue. He hopped away and ended up near a nice, cool stream. The frog did not see the Great Blue Heron, who stood motionless on the stream bank. Suddenly, the HERON struck with his sharp beak and swallowed the frog in one gulp. The heron began to fly off, but her long, graceful wings got stuck in fishing line that a careless

fisherman left behind. The heron struggled to get free, but she could not. She died by the stream, where a CRAYFISH, not wanting the heron to go to waste, munched on her. The crayfish loved to sit in the bottom of the stream. He could use his gills to breathe. He figured he was pretty safe, but one day, a hungry FISH ate him in one gulp! The fish lived to be quite old, but finally died. BACTERIA broke down his scaly body.

Second Yarn Ball (13 characters)

Also growing by that stream, in the bright SUN, was a large MAPLE TREE. A DEER was under the tree munching on some twigs and leaves. While he ate, a MOSQUITO landed on his back and she drank a little bit of his blood. The mosquito flew off when the deer swatted at her with his tail. The mosquito was in such a hurry, she didn't notice the spider's web in her path. The mosquito struggled as the SPIDER came over and wrapped her up for a late-night snack. The spider never got to finish the mosquito, since a WREN spotted him and captured him in her beak. She flew back to her nest where her babies rested. She fed the spider to one of the babies, and after she left, the baby decided to try his wings and fly. His wings weren't strong enough and he tumbled to the ground. A SNAKE heard the commotion and slithered over, caught him, and swallowed. His stomach full, the snake slithered away. Several days later, he was still digesting the baby wren, and moving pretty slow. He could not get away when the HAWK swooped down and captured him. When the hawk eventually died, he began to smell, and this smell attracted the attention of a TURKEY VULTURE, who ate part of him. Even a scavenger like the turkey vulture eventually dies. His body was decomposed by MOLD. An EARTHWORM tasted some of this mold as he crawled on the moist soil. A BOX TURTLE noticed the worm and walked as fast as he could to capture it. The box turtle laid several eggs later that year, but the nest was raided by a young RACCOON. The racoon feasted on the turtle eggs. When the racoon got older, he was not quick enough to escape when he was spotted by a COUGAR. It was a big kill for the cougar, and even though the racoon injured scratched him in the eye when he caught him, he managed to eat almost all of the racoon. Unfortunately, the cougar's eye got infected, and that racoon was his last meal. He died of starvation and disease, and was decomposed by FUNGUS.

List of Characters

(NOTE: STUDENTS SHOULD NOT SIT IN THIS ORDER IN THE CIRCLE)

SUN
OAK TREE
SQUIRREL
HAWK
BACTERIA
BUTTERFLY
WILDFLOWER
FROG
HERON
CRAYFISH
FISH
MAPLE TREE
DEER
MOSQUITO
SPIDER
WREN
SNAKE
TURKEY VULTURE
MOLD
EARTHWORM
BOX TURTLE
RACCOON
COUGAR
FUNGUS

A "Get the Connection" Post-Visit/Activity

Food Web "Yarn" Activity

Introduction

During this "yarn", or tale, students learn about the connections of many creatures in a Missouri community. Students pass a ball of yarn as a story is read which emphasizes these connections.

Objectives

Students will visualize the connections of organisms in a story, and then see how the food web is affected when a disturbance occurs within the community.

Materials

Story: "A Food Web Yarn"

2 balls of yarn, in different colors

List of characters (character names could also be written on cards and hung around students necks or pinned on shirts)

Teacher Instructions

1. Have two balls of yarn ready to pass. Before beginning the story, assign each student an identity. It may help if you write the names of these characters on cards to string on student's necks or pin to shirts. You may have to modify the story if you have more or fewer students in your class (the story is written for 28 students).
2. Seat students in a large circle. Explain that as you read the story, they should pass the ball of yarn to each character as their name comes up. They should hold onto a piece of the string as they pass it so that a web is formed. The string represents the flow of energy from organism to organism. Students may receive the ball of yarn more than one time or get different colors to hold since most organisms can eat (and be eaten by) different organisms.
3. After completing the story, the two balls of yarn will form two interconnected webs. Emphasize to the students that organisms depend on each other for food. Note that each of the webs begins with the sun. In the end, decomposers such as fungus and bacteria break down, or decay organisms.
4. Discuss what happens when a pollutant enters the system, or if one type of organism drops out of the web. For example, migratory birds are on the decline due to habitat loss. The student with the "WREN" card drops his string. The web sags. How might this affect the organisms around the wren? (Without the wren to eat them, spiders might increase in number; and snakes might go hungry without wrens to eat, and decrease in

number. This will also affect the next organisms in the web). Students who are affected can drop their string until the webs have completely fallen.

Characters:

- | | |
|------------|----------------|
| Ants | Heron |
| Bacteria | Maple Tree |
| Beaver | Mold |
| Box Turtle | Mosquito |
| Butterfly | Oak Tree |
| Clover | Rabbit |
| Cougar | Raccoon |
| Crayfish | Snake |
| Deer | Spider |
| Earthworm | Squirrel |
| Fish | Sun |
| Frog | Turkey vulture |
| Fungus | Wildflower |
| Hawk | Wren |

First Yarn Ball (16 characters)

It was a lovely spring day. The SUN shined brightly on the leaves of a MAPLE TREE. The new tender leaves were a treat for a DEER passing by. A MOSQUITO landed on the deer and bit it. As the mosquito was flying away, a FROG grabbed it with its long sticky tongue. The frog hopped back into the water for a swim. Unfortunately for the frog, a CRAYFISH was waiting and easily grabbed the frog with its large claws. While the crayfish was finishing up the frog, a hungry FISH spotted it and swallowed the crayfish in one gulp. The fish swam away towards a great blue heron, which stood motionless on the stream bank. Suddenly, the HERON struck with its sharp beak and swallowed the fish whole. The heron began to fly off, but her long graceful wings got stuck in fishing line that a careless fisherman left behind. The heron struggled to get free, but it could not. It died on the stream bank and started to smell. The smell attracted a TURKEY VULTURE, who ate part of the heron. The turkey vulture lived to be quite old but eventually died. Its body was decomposed by an EARTHWORM. The earthworm released all of the turkey vulture's nutrients back into the soil. Roots from nearby WILDFLOWERS sucked up the nutrients to help it bloom. The bright flowers attracted a BUTTERFLY that stopped to drink some nectar. The butterfly, now full and happy, was not paying attention while flying away and got caught in a spider web. The SPIDER wrapped the butterfly up for a late night snack. The spider never got to eat that butterfly because a WREN spotted it and swooped down to snatch it up. Later that year, while preparing to fly south for

the winter, the wren was caught by a HAWK, who was also trying to fatten up for the migration. The hawk did not have enough energy to make the lengthy flight and died along the way. FUNGUS decomposed the hawk's body.

Second Yarn Ball (15 characters)

Also growing by that stream, in the bright sun, was a huge old OAK TREE. A RABBIT was under the tree munching on some leaves and branches. While it ate, a SNAKE slithered up behind it, caught it and swallowed it whole. The snake decided to bask in the sun while digesting the rabbit. A HAWK circling above spotted the snake and dove down to grab it. The snake manages to bite the hawk, but eventually gets eaten. The snake bite on the hawk got infected and that snake was its last meal. The hawk died and was decomposed by bacteria. The hawk's nutrients were returned to the soil where a CLOVER plant absorbed them through its roots. A BOX TURTLE passing by decided to munch on the clover. The box turtle lived a long and happy life but eventually died. MOLD decomposed the turtle. WILDFLOWERS used the turtle's nutrients to grow. The sweet smell of the nectar attracted ANTS. After feeding on the nectar, the ants returned to their colony. Later that night, the ant hill was raided by a young RACCOON. When the raccoon got older, it was not quick enough to escape when he was spotted by a COUGAR. It was a big kill for the cougar, and even though the raccoon scratched him in the eye, he managed to eat almost all of it. The cougar's eye got infected and that raccoon was his last meal. He died of starvation and disease, and was decomposed into soil by FUNGUS. The cougar's nutrients in the soil fertilized a nearby OAK TREE. A hungry BEAVER passing by decided to make a meal of the oak tree's bark and wood. The oak tree fell into the stream, creating a new pool of water.

Voyage of Learning

Andy Goldsworthy Project

Forest Ecology

Focus: This lesson teaches an appreciation of nature. We will create a work of art by using only materials found in nature – sticks, acorns, leaves. The work of art will be left in nature for others to enjoy. We will find inspiration in the universal shapes found in nature – spirals, concentric circles, holes, arches, etc.,..

Objectives: Students will be able to create a piece of art from all natural materials found in Kennedy Forest.

Students will be able to work in small groups to create pieces of eco-art.

Show Me

<u>Standards:</u>	<i>Process Standards</i>	<i>Content Standards</i>
	1.3	FA2
	2.3	FA4
	2.5	SC3
	3.3	SC4
	3.6	SC5

Lesson Content:

Each small group of students will create a piece of art from natural materials in Kennedy Forest. To begin, ask students “What is Art?” Discuss the challenge of defining art. Introduce and offer examples of eco-art. View pictures of Andy Goldsworthy’s artworks.

Topics to discuss when viewing Andy Goldsworthy’s artworks or other eco-art:

- a. the impermanence of the work.
- b. Possible obstacles when creating eco-art.
 1. weather, temperature
 2. unpredictable circumstances outdoors
 3. structural failure- many natural materials are very fragile
 4. social interruptions – curious bystanders
- c. environmental responsibility: using only natural, non-living materials or those which may be removed from an area without disruption
- d. the necessity of photography to document art

Divide the class into smaller groups. Tell them they are going to create a piece of eco-art. Take the class into the forest to find a location for their artworks. When each group is finished, have them explain their piece to the other groups. Have each group photograph their work.

Lesson Reflection:

Have students discuss and journal responses to any of the following:

- a. What do you think about this kind of artwork? Was it easier or harder than Art you're used to making?
- b. How do you think this kind of art has affected environmental awareness?
- c. How do you feel about the impermanence of this work?
- d. What do you think will happen to your art piece over time?

Bibliography

- a. Goldsworthy, Andy. *A Collaboration with Nature*. New York: Harry N. Abrams, Inc. 1990.
- b. Center for Global Environmental Education website: http://cgee/hamline.edu/see/goldsworthy/see_an_andy.html.
- c. Smithsonian Magazine website <http://www.smithsonianmag.com/smithsonian/issues97/feb97/golds.html>.
- d. Reidelsheimer, Thomas. *Rivers and Tides*. Cambridge., UK: Electric Sky. 2003. www.electricsky.com.

Voyage of Learning
Andy Goldsworthy phrases excerpted from *Rivers and Tides*

I've shook hands with the place and begun.

Seeing something you never saw before that was always there but you were blind to it.

Markers to my journeys and places I feel an attachment towards.

The idea of flow in nature

Art for me is a form of nourishment. I need the land, I need it.

Photography is the language I use to describe my work.

Taut control can be the death of a work.

We misread the landscape when we think of it as pastoral and pretty; there is a darker side.

Evidence of that heat within the ground

There are always these obsessive forms that you cannot get rid of.

The stone's speaking; growth expressed in the seed in stone.

You would think time would be more compatible with the tide.

This is the fourth time it's fallen, and each time I've gotten to know the stone better.

All that effort is ultimately going to try to make something that appears effortless.

To have that liquid movement backward and forward

The work has been given to the sea as a gift. The sea has made more of it than I could ever hope for.

Never shake someone's hand with a glove on.

The river is that line that I follow.

The very thing that brings the work to life is the thing that will cause its death.

The connection the form has with the seed, very full and ripe.

Voyage of Learning

1. Map and Compass, Pacing, Basic Orienteering
 - a. Time needed:
 - i. Part one: 20 minutes
 - ii. Part two: 10 minutes
 - iii. Part three: 40 minutes
 - iv. Part four: 40 minutes
 - b. # of students: 20 per instructor, up to 40 max.
 - c. Students will be broken into small groups for a portion of the lesson.
2. Lesson Objectives:
 - a. Students will be able to use a compass to set a bearing and take a bearing.
 - b. Students will be able to use an orienteering compass and map of Forest Park to follow a basic orienteering course.
 - c. Students will be able to set up a basic orienteering course.
 - d. Students will be able to understand basic features on an orienteering map.
 - e. Students will be able to measure short distances with their walking pace.
3. Summary
 - a. Knowing how to read and draw maps is a basic skill that people need to have in everyday life. Knowing how to use a compass and map together will help students be able to find their way around the park, their neighborhoods, and when they recreate outdoors. Once students have the basic skills, they can mark and find locations in the park, use an orienteering map of the park and be able to measure distances with their walking pace.
4. Materials needed for all parts:
 - a. Orienteering compasses (1 per student is best; students can pair up)
 - b. 50 foot measuring tape
 - c. Topographic Model (for extension activity)
 - d. Pencils
 - e. Colored Index Cards (different color for each small group of 4 students)
 - f. Paper
 - g. Clipboards
 - h. Topographic Maps (for extension activity)
 - i. Orienteering Maps of Forest Park
 - j. Marker Cones
 - k. Popsicle sticks
 - l. Orienteering punches, colored tokens, colored markers, or various stickers
 - m. Orienteering punch cards or blank index cards
 - n. Orienteering control flags, flagging tape or colored bandanas
5. Before the activities:

- a. **For part two**, measure a 50' distance on a field or in a gymnasium with measuring tape and marker cones.
- b. **For part three**, select the area of Forest Park where your class will be going, and plan a small orienteering course of no more than 5 points (if you are going to Kennedy Forest, you can use the map and compass course provided in this lesson). Map out the course, complete with degree measurements of how to get from point to point, and the distances in feet between each point. Make up one index card for each point with the degree measurement and distance between each point. To make it more fun, choose an animal with 4 or five letters (like SNAKE) and put one letter from the animal name on each card (as the students proceed through the course, they will have to remember each letter so they can name the 'mystery animal' at the end).
- c. **For part four**, you will need to follow steps a and b using the Forest Park orienteering maps and create a score card with point totals for each control (or stopping point) on the course if you want a little competition (see activity #7 on pp. 8.17 – 8.18 in Map and Compass module).
- d. Upon arrival at the park for the field trip, quickly set out the controls for the orienteering course. You can use actual punch controls, punch cards and flags like a real orienteering course, or some other unique marker at each control so you know students went to each site (like a unique stamp at each point, a colored marker to draw a picture, a sticker, puzzle pieces, or clues that will answer a riddle or puzzle. The main point is to have a different thing at each control.

6. PART ONE: COMPASS BASICS

Materials needed: compasses

Before the lesson: no preparation needed; outdoors is preferable setting

- a. Ask students why maps are important. How do we use them? How many different kinds of maps can they name? What do compasses do? Ask them who they think uses compasses.
- b. Discuss the many different reasons why map and compass skills are taught:
 - i. Safety – many other outdoor skills require the use of a map and compass (hiking, backpacking, canoeing, fishing, hunting); getting lost can be annoying or tragic
 - ii. Better Recreation – can mark favorite hunting, fishing spot, can allow for off-trail hiking
 - iii. Careers – many conservation careers use map/compass such as forestry, engineering, endangered species scientists; also non-conservation related like surveying
 - iv. Orienteering – outdoor hobby/sport that attracts many people to conservation areas, and outdoor areas in general
 - v. School skills – applications to math (geometry, distance, measurement, angles, degrees), social studies (map reading, location, latitude and longitude), science (magnetic fields)

- vi. Life skills – Important to learn to read and draw maps in everyday life; vital skill for people to have, whether you're going to enjoy the outdoors or not. GPS units are great, but batteries can die, clouds or thick tree cover can block satellite signals.
- c. Teach students how to properly hold a compass, the parts of a compass and how they work (p. 5.1 – 5.3 in Map and Compass module). This can be done at school.
- d. Have students practice using a compass to find a bearing. Give them a degree measurement, students will turn their dial (compass housing) so that degree lines up with the direction of travel arrow on the base plate, then students turn their bodies around until the red magnetic needle is inside the red orienting arrow underneath ('put red Fred to bed'). Students should now be facing in the direction of that degree. Do this a couple of times using different degrees.
- e. Have students practice using a compass to take a bearing. Students should select an object like a tree that is some distance away. They should face the object, pointing the direction of travel arrow at the object. Then have students turn the dial (compass housing) until the red magnetic needle is inside the red orienting arrow underneath (put red Fred to bed). Have students look at the degree measurement that is lined up with the direction of travel arrow on the base plate; that degree measurement is the bearing for that tree from their present location. If students are spread out for this activity, their bearing measurements could be slightly different. Do this a couple of times using different objects.

7. PART TWO: PACING

Materials needed: 50' measuring tape, marker cones; outdoors is preferable setting

Before the lesson: Measure a 50' distance on a field or in a gymnasium with measuring tape and marker cones.

- a. Take students to the field you marked with a 50' distance.
- b. Tell students they will have to learn their measuring pace. This is a pace that helps in the sport of orienteering, and just in measuring distances in general when you don't have a measuring tape.
- c. Line students up at one end of the 50' mark. Tell them to walk towards the other end of the 50' distance using their regular stride. Students should count each pace as they walk (note: one pace is two steps; left foot, right foot counts as one pace). Some people like to count only when their left foot hits the ground. When they reach 10 paces they should stop walking and stand still. Some people will have walked past the 50,' some will not be there yet.
- d. Tell students they must adjust their stride to fit a "measuring pace." They want to be able to have a stride that will get them to the 50' distance in exactly 10 paces. Some people will need to take bigger steps than their regular stride, some will need to take shorter steps.

- e. Line students up again and practice the 50' walk with their "measuring pace." Practice a few times until students are making it 50' when they reach 10 paces.
- f. Now students have sort of a muscle memory, or a feeling of what their measuring pace is. Each pace equals five feet, so as students walk, they can count by fives each time their left foot touches the ground.

8. PART THREE: MYSTERY ANIMAL ACTIVITY

Materials needed: Pencils, colored index cards (different color for each small group of 4 students), paper, compasses, clipboards, popsicle sticks; outdoors at Forest Park is preferable setting

Before the lesson: Select the area of Forest Park where your class will be going, and plan a small orienteering course of no more than 5 points (if you are going to Kennedy Forest, you can use the map and compass course provided in this lesson). Map out the course, complete with degree measurements of how to get from point to point, and the distances in feet between each point. Make up one index card for each point with the degree measurement and distance between each point. To make it more fun, choose an animal with 4 or five letters (like SNAKE) and put one letter from the animal name on each card (as the students proceed through the course, they will have to remember each letter so they can name the 'mystery animal' at the end).

Upon arrival at the park for the field trip, quickly set out the index cards for the course at the points you mapped out earlier. Put popsicle sticks through the cards to anchor them to the ground. Even if students see you placing the cards, they still do not know what order you hid them in, or what the mystery animal name is.

- a. Take students to the starting point for the practice course you set up. Break them up into small groups (3 or 4 works best).
- b. Tell students they are going to have to follow this course to find the hidden cards and name the mystery animal. You can do this as a race if you want. Have students all practice setting their compasses to the first bearing together, and then let the small groups work together to complete the course and name the mystery animal.
- c. When all groups have completed the course, talk to them as a large group again. Show them your map of the course.
- d. Tell the class that each group is now going to create its own course. Tell them that after the courses are completed, groups will switch and try each others courses. Give each group a clipboard with a blank piece of paper for a map, a pencil, and a set of colored index cards (giving each group a unique color works best). Tell them to choose a mystery animal with 4 or 5 letters. Each course should have 5 points total; if the animal only has 4 letters, the first card won't have a letter on it. They should work on the map of their course as they are setting the course.

- e. When groups are done, gather them together. Collect the maps, and assign each group to follow a different group's course. Do not hand out the maps at this point.
- f. Depending on time, groups can follow more than one course.
- g. Gather groups together and talk to them about how the activity went. Give them the map from one of the courses they followed, and ask them how accurate the map was for where the index cards were hidden.

9. PART FOUR: ORIENTEERING

Materials needed: Compasses, orienteering maps of Forest Park, pencils, controls (like orienteering punches, colored tokens, colored markers, or various stickers), flags (like orienteering control flags, flagging tape or colored bandanas), punch cards or index cards

Before the lesson:

- a. Hand out orienteering maps of Forest Park. Give students a minute to observe the maps, and figure out where they are. If you have a topographic model, hold that up to illustrate how the landforms are represented on paper.
- b. Talk about the competitive sport of orienteering (p. 7.1 and activity #7 on p. 8.17 – 8.18 in Map and Compass module). Tell students they will practice orienteering.
- c. Have students copy down the locations of the controls from a master copy (or you could pre-mark the locations of the controls on each map in advance).
- d. Have students locate where they are and the location of the first control.
- e. Students place their compass on the map and line up the long edge of the base plate so it connects the two points on the map they want to travel, with the direction of travel arrow pointing in the direction they want to go (see p. 5.3 in Map and Compass module). Next students should turn the compass housing dial so that the 'bed,' the red arrow on the compass housing (NOT the magnetic needle) lines up with the north marked on the map legend (at this point students should ignore the magnetic needle). The degree that is lined up with the direction of travel arrow is the bearing (the direction that students should travel to get to the first point). Students then stand up and put red Fred to bed; they should be pointing in the correct direction to take them to the first marker.
- f. Have students practice this again to find the bearing between their first and second control. Make sure all groups are able to do this correctly. If you are having students travel out of sight of the starting point, you might send a chaperone with each group to make sure they don't get lost.
- g. Start groups out on the orienteering course, marking down each group's start time; you can either start them 3 minutes apart to keep them from bunching up and following each other, or you can give each group a different order of controls to follow (for example group A goes 1-2-3-4-5, group B goes 5-3-2-1-4).

- h. When groups return, check their cards or tokens or whatever they were collecting at each control. Score them on the chart you created. You could award the winning group with a prize, with runner-up prizes for all participants who didn't get lost (hopefully everyone!).

10. Extensions

- a. Get a topographic map for students to look at from the Missouri Department of Natural Resources or the U.S. Geological Survey. Students can study the map, and then create a topographic map of their school, or for a part of Forest Park. The Map and Compass module demonstrates how to read a topographic map.
- b. Students could create orienteering courses for other classes or schools. Schools could have an orienteering course exchange in Forest Park, where they each create a course and share it with another school.
- c. Students could teach map and compass concepts to younger grade levels.
- d. Students can use their map skills to mark all the places in Forest Park where they have visited, and create their own personal orienteering map of Forest Park (like another type of journal – recording their experiences in the park).

11. Bibliography

“Map and Compass: *Outdoor Skills Education Series.*” Missouri Department of Conservation, free publication, copyright 2003.

Voyage of Learning

Title: Upland Forest – Migratory Birds Rotation

Time Needed: 60 minutes

Number of Students: up to 15

Number of Instructors: 1-2

Setting: Kennedy Forest in Forest Park, an example of Upland Forest or any other forest with large trees and a population of migratory songbirds. Also need a small flat open space for playing “Cowbird Capers”.

Lesson Objectives:

Students will be able to:

- List at least three distinctive markings to look for when identifying birds
- List three additional behaviors to watch for when identifying birds
- Demonstrate the proper use of binoculars
- Explain a good technique for finding and observing migratory birds
- List at least three Missouri songbirds
- Explain how humans have altered forest and the effect that forest fragmentation has on migratory songbirds
- Define brood parasitism

Lesson Summary:

Lesson Content:

This lesson is part of the “Upland Forest” rotation. The overall objective is for participants to gain an interest in migratory birds and to begin to understand some of their behaviors and the techniques for finding and observing them. This new understanding will then help them to gain a connection with these birds, sparking an interest in wanting to learn more about forest fragmentation and its effects on the songbird population.

Supplies/Materials:

- Supplies for Songbird Hunt:
- binoculars (1 per participant if possible)
 - Laminated cut-out of birds from MDC Missouri Songbirds poster
 - String/coat hangers to attach the cut-outs to trees
 - One Missouri Songbird clue card for each participant
 - One Missouri Songbird poster for identifying birds
 - One poster-sized picture of bird with markings labeled
 - One Missouri Songbird poster for each participant (give-away)
 - Once Copy of "Enjoying Missouri's Birds" (MDC publication) for each participant
- Supplies for Cowbird Capers:
- 5 paper or plastic cups
 - 5 three foot pieces of string
 - popcorn
 - large plastic container (like a shoebox-sized Rubbermaid)
 - One blindfold

Teaching the Lessons:

Facilitator input: This lesson is a "basic bird identification primer" and should be taught with the understanding that many of the participants may have never done any bird watching in the past. Time should be taken to allow the students to really learn some of the identifying features to look for when identifying birds, as well as to gain an appreciation for their diversity in appearance, song and behavior.

Student experience:

- (1) Participants are led into the forest for a few minutes of listening for bird sounds. They should be reminded to use their "deer ears", where they cup their hands behind their ears for more focused listening.
- (2) Participants are led in a discussion about why they are learning about migratory birds and the importance of the forest to these birds.
- (3) Students are then briefed on how to observe birds and some of the features to look for when identifying them. When they are ready, they are given a clue card that has clues to the marking on the bird that they are to look for

along the path in the forest. They are challenged to walk down the path and find as many birds as they can while also picking out the bird that is described on their clue card.

- (4) Participants are gathered together when they have all finished their songbird hunt. They share their experiences and each point to the bird on the songbird poster that they thought was the one that they were supposed to find.
- (5) participants are led in a discussion about forest fragmentation and the effects that it has on the songbird and migratory bird population. They play "Cowbird Capers" which demonstrates that the increased amount of forest edge increases the population of cowbirds which invade the nests of songbirds (brood parasitism), thus lowering the songbird population. They learn that humans have altered the forest, creating more of an edge effect, which has put forest birds in close proximity to the cowbird

Lesson Debriefing:


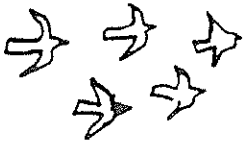

















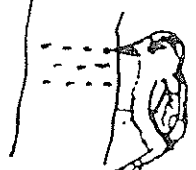
After the Songbird Hunt, participants should be asked:

- Why didn't we see more "real" birds in the forest this afternoon?
- What time of day do you think we would see the most birds?
- How do you think the alteration of the forests in Forest park might affect the forest bird population?








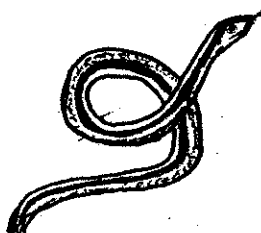






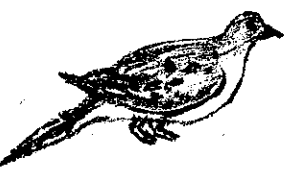



The "Cowbird Capers" game can be debriefed by asking the questions listed under the "Discussion" section of the lesson plan. Also, questions and a discussion about what is happening to the forests in Forest park should wrap up the activity.

Note: There will be little time for lesson debriefing at the end of this session. Additional debriefing and reflection will come at the end of the Upland Forest day.

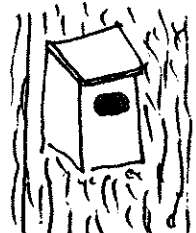
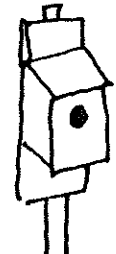
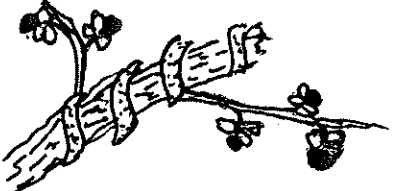
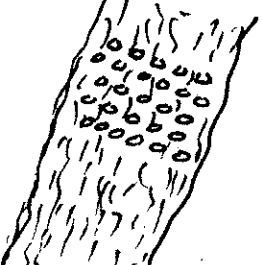
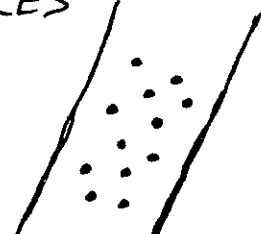


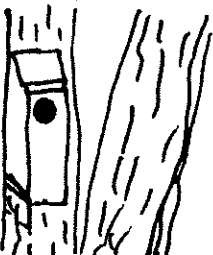





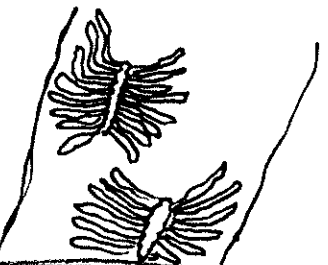
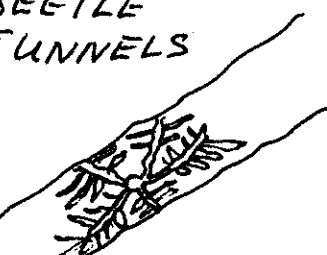


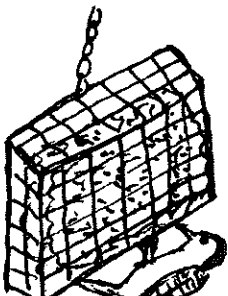
BIRD BEHAVIOR SEARCH SHEET

<p>DRINKING</p> 	<p>WILD CARD</p>	<p>FLOCKING</p> 	<p>SINGING</p> 
<p>BIRD COLORS</p> <p><input type="checkbox"/> RED <input type="checkbox"/> BROWN</p> <p><input type="checkbox"/> BLUE <input type="checkbox"/> ORANGE</p> <p><input type="checkbox"/> YELLOW</p> <p><input type="checkbox"/> BLACK <input type="checkbox"/> GREEN</p> <p><input type="checkbox"/> BLACK+WHITE</p>	<p>Catching Worms or Grubs.</p> 	<p>PREENING</p> 	<p>Chasing Another Bird</p> 
<p>Feeding Upside down</p> 	<p>HIDING</p> 	<p>SORRING IN CIRCLES</p> 	<p>PECKING ON TREE</p> 
<p>BATHING IN DUST</p> 	<p>FEEDING YOUNG</p> 	<p>WILD CARD</p>	<p>ROLLER COASTER FLIGHT</p> 
<p>WILD CARD</p>	<p>Begging for Food</p> 	<p>CRACKING SEEDS</p> 	<p>ALARM CALL</p> 
<p>BATHING IN WATER</p> 	<p>SCRATCHING GROUND</p> 	<p>Flying Straight</p> 	<p>SAPSUCKER HOLES</p> 

HABITAT SEARCH SHEET FOR RED-TAILED HAWK

<p>FROG</p>  <p>Frog sounds <input type="checkbox"/></p>	<p>Woodland</p> 	<p>Birds "Mobbing" or chasing a hawk</p> 	<p>WILD</p>
 <p>DID YOU HEAR HIM CHIPPING? (chipmunk)</p>	<p>HAWK Kiting into wind</p> 	<p>Hunting Perch Trees</p> 	<p>Wetland</p> 
<p>Garter Snake</p> 	<p>Field</p> 	<p>Cottontail Rabbit</p> 	<p>Seeds or Nuts Chewed by Rodents</p> 
<p>Rabbit Droppings or "Scat"</p> 	<p>CROW</p> 	<p>Squirrel Nest</p> 	<p>Mourning Dove</p> 
<p>WILD</p>	<p>Grasshopper</p> 	<p>Hawk Soaring in Circles</p> 	<p>Meadow Vole or "Meadow Mouse"</p> 

WOODPECKER HABITAT NATURE SEARCH SHEET

<p>WOOD DUCK NEST BOX</p> 	<p><u>WILD CARD</u></p>	<p>BIRD HOUSE</p> 	<p>BITTERSWEET VINE + BERRIES</p> 
<p>SAPSUCKER HOLES IN NEAT ROWS</p> 	<p>SHOT HOLE BORER BEETLE HOLES</p> 	<p>PILEATED WOODPECKER FEEDING HOLES</p> 	<p>WOODPECKER FLYING (Roller Coaster Pattern)</p> 
<p>WOODPECKER NEST BOX</p> 	<p>GRAPE VINES</p> 	<p><u>WILD CARD</u></p>	<p>DOWNY WOODPECKER HOME</p> 
<p>DOWNY WOODPECKER FEEDING HOLES</p> 	<p>CARPENTER ANT TUNNELS</p> 	<p>POISON IVY VINE WITH BERRIES</p> 	<p>ENGRAVER BEETLE TUNNELS</p> 
<p>PINE TREE ENGRAVER BEETLE TUNNELS</p> 	<p>GOLDENROD BALL GALL</p> 	<p>PILEATED WOODPECKER HOME</p> 	<p>SUET FEEDER</p> 

Some 'Birding 101' Resources

BIRD : Eyewitness Books by David Burnie; Alfred A. Knopf, New York, 1988.
Excellent text and photographs of birds, their skeletons, feathers, eggs, beaks, feet, etc..

Bird Life: A Guide to the Behavior and Biology of Birds (A Golden Guide)
by Stephen W. Kress; Golden Press, New York, 1991. A simplified layman's text on
bird study, including information on bird research and conservation efforts.

The Audubon Encyclopedia of North American Birds by John K. Terres; Alfred A.
Knopf, New York, 1980. An amazing compilation of facts about birds in general and
species accounts for every species in North America. Often the first book naturalists
reach for when answering people's questions about birds.

Bluebird Rescue by Joan Rattner Heilman; Camden House Publishing, Inc.; Charlotte,
VT, 1992. A richly illustrated book with lots of color photos showing how people help
bluebirds by erecting nest boxes..

The World of Birds by James Fisher and Roger Tory Peterson; Doubleday and Company,
New York, 1964. This volume contains a rich, readable text and many great color
illustrations showing bird anatomy, feathers, migration routes, etc..

Bird Behavior: Volumes I, II, III by Donald and Lillian Stokes; Little, Brown & Co.,
Boston. Great resources each covering about 20 common species. For each species a
chapter covers basic natural history, common behaviors (with drawings), calls, songs,
and a calendar of behaviors. Gives an in-depth view of the lives of common birds.

Flute's Journey: The Life of a Wood Thrush by Lynne Cherry; Harcourt Brace & Co.,
New York, 1997. Children's story with lovely color illustrations depicting the life
history and migration adventures of a wood thrush alternating between Maryland and
Costa Rica.

The Birder's Handbook by Ehrlich, Dobkin and Wheye; Simon & Schuster, New York,
1988. An amazing amount of information on many aspects of birds, as well as a natural
history account for each species of North American bird. Includes updated information
on wintering area for many neotropical migrants.

On Watching Birds; by Lawrence Kilham Chelsea Green Pub., VT, 1988. Provides
wonderful bird behavior descriptions by a biologist who goes out into the field with
just his binoculars, a notebook, pencil, camp stool and watchful curiosity.

Citizen Science Projects

Go to Birdsource.org for details on a variety of projects including:

Project Feederwatch

Audubon Christmas Bird Count

Great Backyard Bird Count

Posters:

Pennsylvania Game Commission Bird & Mammal Charts
- excellent color charts of common birds organized by habitat, ecological role or season
web link:

<http://www.theoutdoorshop.state.pa.us/FBG/game/GameProductSelect.asp?ShopperID=D7A0C5721B604D05A1BB8710C74C6051&catid=WCH> >

Project FeederWatch - "Eastern Feeder Birds" can be downloaded for free:

< <http://www.birds.cornell.edu/pfw/FreeDownloads.htm> >

Websites:

Cornell Laboratory of Ornithology website segment - "All About Birds"

< <http://www.allaboutbirds.org/NetCommunity/Page.aspx?pid=1189> >

Woodcreeper.com - provides radar images of birds migrating at night in the New Jersey, New York, Southern New England Region and interpretation of the images.

< <http://www.woodcreeper.com/> >

Dendroica - site provides photo images and multiple recordings of songs and calls of birds of North America.

< <http://www.natureinstruct.org/dendroica/> >

Birdsource - provides information on a wide variety of citizen science programs

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

HELP STOP BIRD DEATHS FROM WINDOW COLLISIONS!!



Each year millions of birds die as a result of flying into windows both on homes and office buildings.

Birds cannot tell the difference between the reflection on the outside of a window, of an outdoor scene, and the real thing and, consequently, they will fly into the window at full speed and injure or kill themselves.

They may also see light coming through a window from another window on the opposite side of a room and see it as a clear flight path.

THERE ARE A VARIETY OF METHODS OF COVERING THE OUTSIDE OF A WINDOW TO PREVENT BIRD WINDOW COLLISIONS:

- PLASTIC NETTING
- DECALS OR TAPE WHICH REFLECT ULTRA-VIOLET LIGHT
- STRING CURTAINS LIKE THE 'ACOPIAN BIRD SAVERS'
- SCREENS
- NON-REFLECTIVE DECALS PLACED IN A TIGHT GRID
- PULLING INDOOR SHADES TO BLOCK VIEW OF LIGHT FROM OTHER WINDOWS ACROSS THE ROOM

***** SEE THE BACK OF THIS SHEET FOR A VARIETY OF WEBSITES WITH MORE INFORMATION**

Resources on preventing bird window collisions:

Cornell Laboratory of Ornithology

<http://www.allaboutbirds.org/Page.aspx?pid=1184>

http://www.birds.cornell.edu/AllAboutBirds/faq/attracting/challenges/window_collisions

The Humane Society of the United States

http://www.humanesociety.org/animals/resources/tips/bird_safe_windows.html

American Bird Conservancy

http://www.abcbirds.org/abcprograms/policy/collisions/pdf/collisions_flyer.pdf

Acopian Bird Savers

<http://www.birdsavers.com/>

<http://www.birdsavers.com/buildyourown.html>

Fatal Light Awareness Program (Canada)

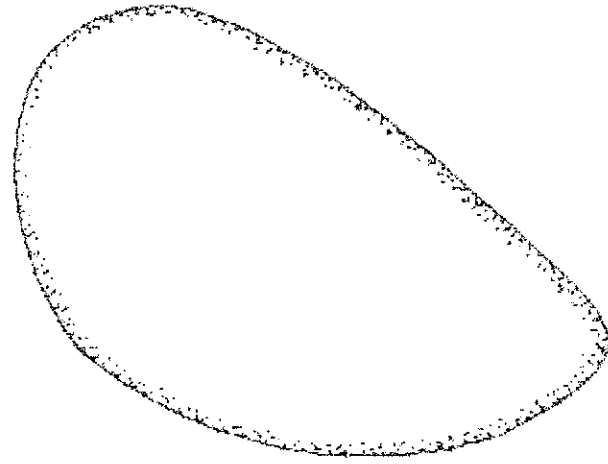
<http://www.flap.org/>

New York City Audubon Society

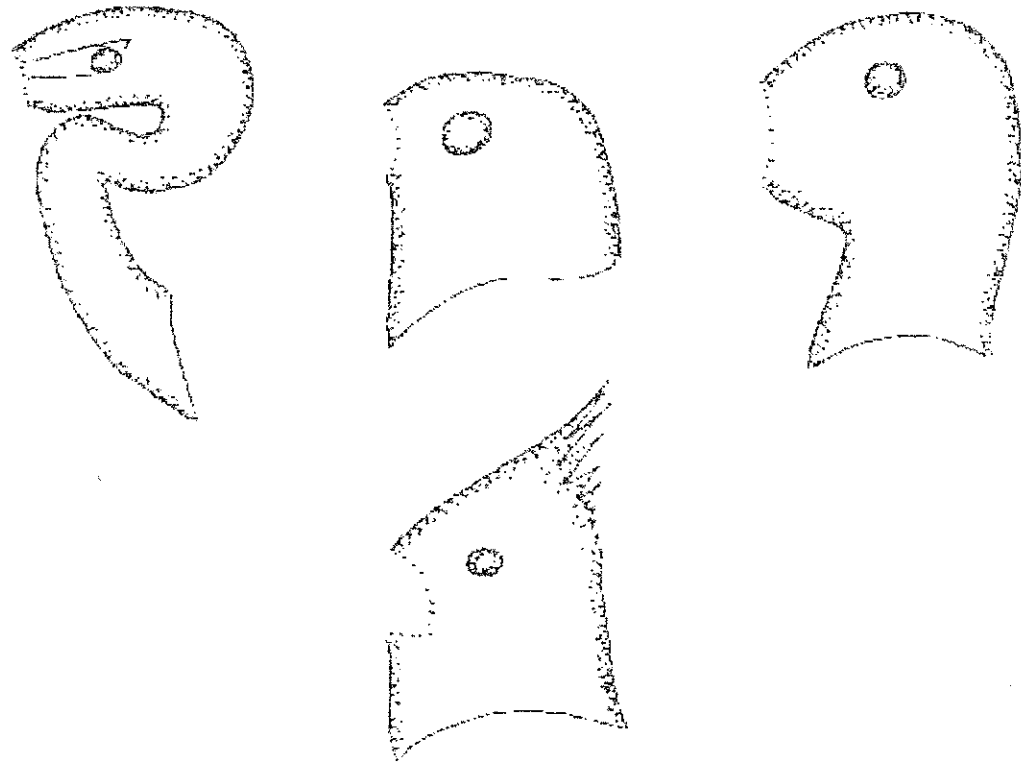
<http://www.nycaudubon.org/project-safe-flight>

BUILD A BIRD KIT

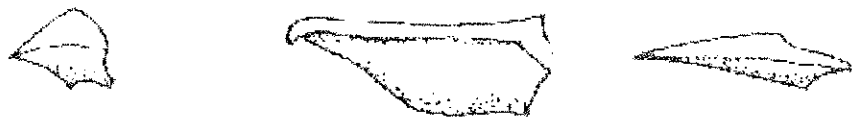
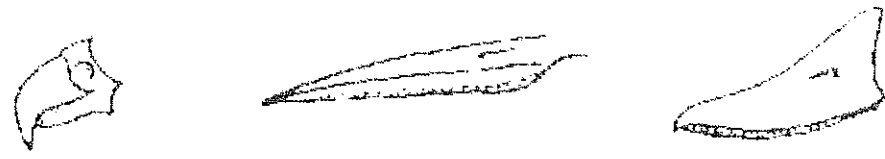
Body Forms To Be Used For All
Birds:



Heads:



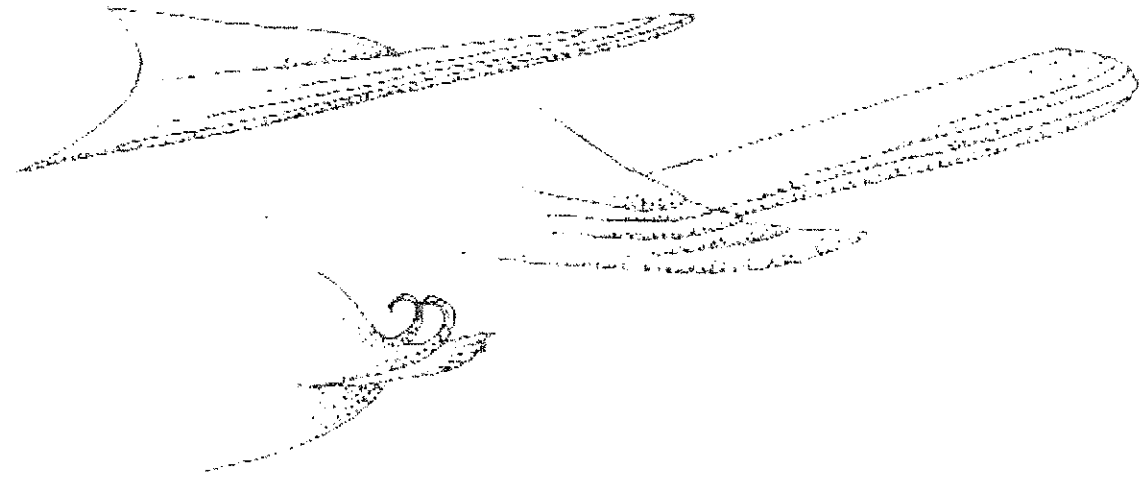
Beaks:



Feet:



Tails:



Team

Building

Activities

Blind Pick- Up

Teams:

One truck (blind-folded person)

One driver

Any number of direction givers

Materials: Blind-fold, the "package"(a stuffed animal, foam ball, etc.).

Objective: To have the truck pick up the package.

The driver has his/her back to the truck. The direction-givers are facing the driver and can see the truck. The direction-givers can NOT talk to the driver, they can only use hand signals. Each team will have two minutes to decide on their hand signals. Using oral direction the driver will direct the truck towards the package and have the truck pick the package up. Do a debriefing with the team.

Tank Battle

Two teams:

Each team has:

One tank (blind-folded person)

One tank commander

Any number of gunners

Materials: Blind-fold, Ammunition (stuffed animals, foam balls, rag balls, etc).

Objective: To have the tank find ammunition and hit the other tank.

The commander has his/her back to the tank. The gunners are facing the commander and can see the tank. The gunners can NOT talk to the commander, they can only use hand signals. Each team will have two minutes to decide on their hand signals. The commander will verbally direct the tank to find some ammunition and pick it up. Then the commander will verbally direct the tank towards the other tank and to fire (throw the ammunition towards the other tank). When either tank is hit the game is over. Do a debriefing with the team.

Calculator

Time of the Activity: Variable

Materials Needed:

- Rope
- Dots with numbers (1 per group member plus a few extra)
- Timer (a watch with a stopwatch will also work)

Objective:

- The group must work together to step on all the numbers in ascending order. This must also be accomplished without talking.

Synopsis of Activity:

The numbered dots will be randomly spread out within a perimeter of rope. Each dot will be placed in such a way that it presents a challenge to reach all of them. The group members will each step on a number in ascending order, but only one person is allowed inside the circle at a time. One person will step on the number 1, step outside of the circle, and then another member can step on number 2. Also, the group members are not allowed to talk.

Steps of the Activity:

1. Set out the course using the rope as a perimeter around the numbered dots (2-3 minutes).
2. Gather the group and go over directions (2 minutes).
 - All numbers must be touched one at a time and in ascending order
 - Only one person is allowed inside the circle at a time
 - If a number is touched out of order, the group must start over
 - Group members can stand wherever they want around the circle
 - Absolutely no talking
 - The group will get three timed chances to see which is their best time
3. Start the activity (7-8 minutes).
4. Debrief by talking about nonverbal communication and listening to other group members' ideas

Safety Concerns:

None

Chocolate River

(AKA: Acid river)

Materials Needed:

- Cones or rope to mark the Take-off point "A" and the Safe Zone "B"
- Props can be any of the following:
 - Rug pads – 12" squares work well
 - 18" lengths of 4" x 4" lumber
 - Poly dots

Objective:

The group must get from point "A" to point "B" without touching the ground in between. The group is assembled at point "A", given one prop less than their number; i.e. nine people get eight props.

Rules:

- Anyone touching the ground in the space between the boundaries, must start over.
- The prop must be in contact with a person at ALL times.
- Be extremely watchful for untouched props, they should be taken away as soon as they are untouched.

Variation:

Stepping Stone

The props are preset between the boundaries and cannot be moved by the group. The distance between the props varies, making it more of a challenge for the group.

Electric Fence

Time of the Activity: Variable

Materials Needed:

- A large piece of webbing

Objective:

- The entire group must traverse across the “electric fence” without coming into contact with it

Synopsis of Activity:

The webbing will be stretched low to the ground, and the group must get everyone from one side to the other without touching any part of the webbing.

Steps of the Activity:

1. Spread out the webbing, and go over the directions for this activity (3 minutes).
 - All members must reach the other side without touching the webbing
 - If a group member is lifted off the ground, he must be in contact WITH AT LEAST TWO PEOPLE until he reaches the ground again
 - If someone touches the fence, the group must start from the beginning
2. Start the activity (8 minutes).
3. Debrief by talking about the importance of teamwork, what it took to complete this activity, and how the order of going across was decided (2-3 minutes).

Safety Concerns:

- Someone could be dropped when picked up so spotting is very important

Human Knot

Time of the Activity: Variable

Materials Needed:

- None or short ropes

Objective:

- To undo the knot without letting go of each other's hands

Synopsis of Activity:

The group will stand in a circle and put their hands in the middle. They will then grab a left hand of someone not standing right next to them with their left hand, and the same with their right hand. Now that everyone is holding two different hands, they have created a human knot. Their goal is to get out of this knot and back into a circle by weaving in and out of each other's arms

Steps of the Activity:

1. Gather the group and go over directions (2 minutes).
 - Hands must remain clasped during the entire activity
2. Put the group in a circle and have them grab hands as described above (1-2 minutes).
3. Start the unknotting process (4-8 minutes).
 - For a **variation**, have the group do this activity without speaking or have specific group members close their eyes
4. Debrief by talking about what it took to undo the knot and whether all group members worked together (2-3 minutes).

Safety Concerns:

- Make participants aware that shoulders, elbows, and wrists are not meant to be pulled in specific directions, so they need to be careful not to dislocate something by pulling on someone's arm

Map Quest

Teams:

One map-reader

Any number of travelers

Materials: One tarp with 48 squares on it, a map with the pattern marked on it.

Objective: To have the whole team of travelers (one at a time), cross the tarp as quickly as possible following the correct path.

One traveler will step on a square on the tarp. If it is a square that is not marked on the map, the map-reader will say "no". The traveler then goes to the end of the line and another traveler has a turn. The traveler will stay on the tarp as long as he/she steps on "yes" squares. The team must use only "yes" squares to travel across the tarp. When a traveler makes it across the tarp, all members must follow in the same pattern. If anyone steps on a "no" square, the whole team must start over. Do a debriefing with the team.

The Overturned Raft

Team: Any number of people

Materials: one tarp

Objective: With the team standing on the tarp, they must turn the tarp over without stepping off the tarp. Do a debriefing with the team.

Mine Field

Time of the Activity: Variable

Materials Needed:

- Blindfolds (enough for half the group)
- 2 Ropes to make a boundary
- Various objects to act as mines (balls, bandanas, Frisbees, etc)

Objective:

- Group members must rely on the communication of others in order to get through the mine field while blindfolded.

Synopsis of Activity:

The group will be divided into pairs with one member of each pair being blindfolded and going through the mine field while the other member must communicate the correct way to get through the mine field.

Steps of the Activity:

1. Gather the group, divide into pairs, and go over directions (3-4 minutes).
 - The blindfolded individual must keep the blindfold on at all times
 - The one giving directions is not allowed to touch the blindfolded person, just verbally communicate. She must also stand at the opposite end of the mine field
 - If the person going through the field touches a mine, he must start back at the beginning of the field
2. Have group members put on blindfolds (only those that are going through the mine field) and then set up the course with the mines (2-3 minutes).
3. Start the activity (10-15 minutes).
 - Once a group has made it through, have the pairs switch roles so that everyone gets a chance to go through the mine field
 - If one person is going through at a time, have the rest of the group stand around the boundaries and try to be a distraction
 - For **variations**, have everyone go at the same time and see who makes it out first or time them individually and see who can make it through the mine field the fastest
4. Debrief by talking about communication, distractions, listening skills, having faith in the person giving directions, etc (3-4 minutes).

Safety Concerns:

- Tripping over objects

Nuclear Waste / Toxic Waste

Materials Needed:

- # 10 tin can
- Tire inner tube cut into section
- 10 pieces of line, each 10 feet long

Objective:

The group must work together to move the nuclear/toxic waste from point "A" to point "B" without spilling any of the waste.

Rules:

- Everyone must hold the every end of their line.
- Everyone must use ONLY one hand.
- NO rapping the line around your hand.
- If any of the waste spills, it's back to the beginning.

Pipeline

Materials Needed:

- Lengths of half pipe
- Marbles or balls
- Some type of container to place marble in at the end

Objective:

A teambuilding activity where each participant gets one short length of half pipe, and the group must work together to deliver a marble down the pipes from start point to finish. This activity requires a high level of communication and teamwork.

Rules:

- Brief the participants on the start line and the finish point (a distinctive container is helpful);
- every person must roll the marble at least once;
- participants need to take turns in a certain order;
- both feet must remain on the floor at all times;
- If the marble or ball falls off, back to the beginning;
- NO one may carry the marble in the pipe;
- NO one person may lower the marble in the pipe;

Variation:

Try adding obstacles to the course.

Rope Tricks

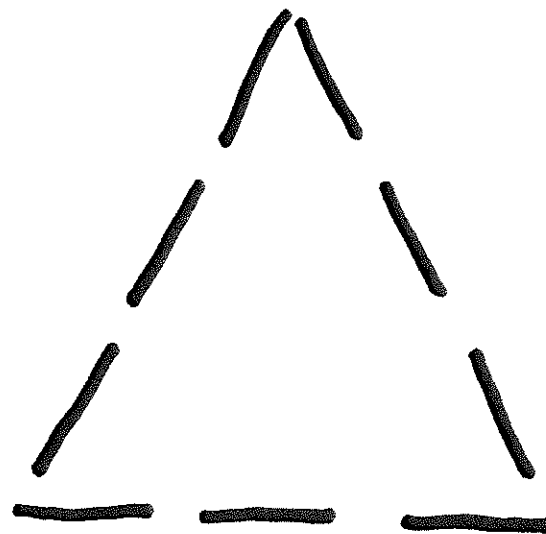
These activities are a combination of mental and physical challenges, all of which emphasize creative problem solving. Typically the following issues can emerge when using these activities:

- Out of the box thinking
- Dealing with managing frustration
- Effective use of resources (i.e. people's ideas)
- Problem solving skills and thinking

Five Triangles

Materials needed:

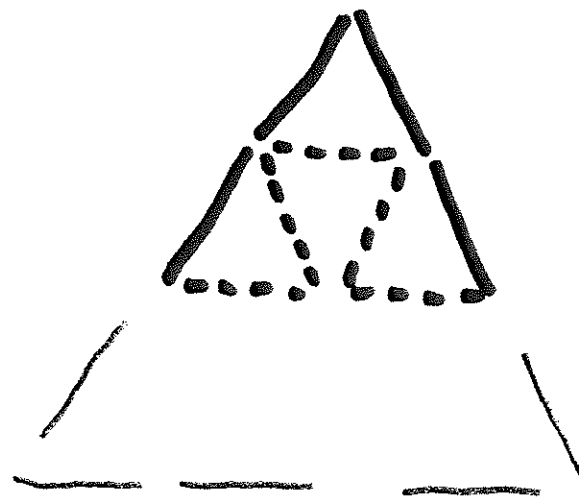
- Nine rope pieces
- All equal length
- Set up in triangle pattern as shown in diagram to right



Objective: Moving only five of the nine rope pieces, create **five triangles**.

All ropes/lines must be straight.

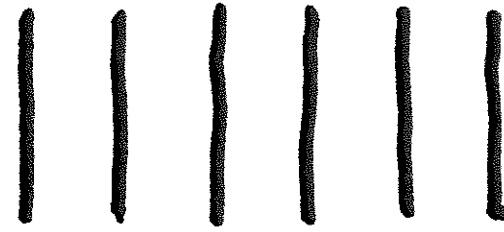
Solution: Move the dotted lines to the thin black lines are in the middle of the triangle creating four small triangles contained within a fifth larger one.



Nine Lines

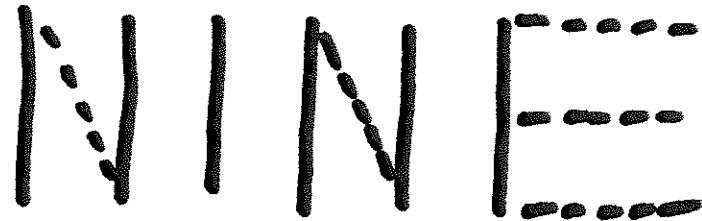
Materials needed:

- Eleven rope pieces
- Six pieces set up in the pattern shown in diagram



Objective: Add five lines to the six on the floor to make a total of nine.

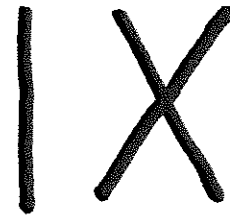
Solution: Place the five unused rope pieces in the position marked by the dotted lines.



6 From 9

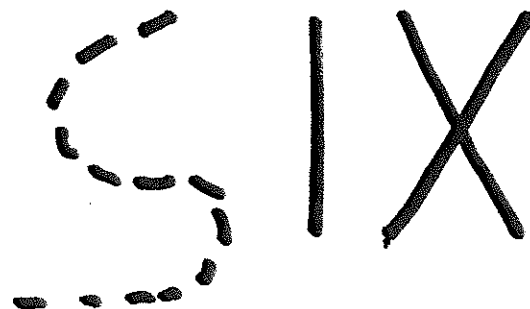
Materials needed:

- Four rope pieces
- Three pieces positioned to make the Roman Numeral IX (9)
- One extra piece available for the solution



Objective: Making only one line with the rope, make the number 6 from the Roman Numeral IX (9).

Solution: Use the extra rope to make the letter "S" as shown.



Tank

Time of the Activity: Variable

Materials Needed:

- Blindfolds for half the group
- Soft balls or gator balls to throw
- A long rope or something else to make a boundary

Objective:

- To be the last team standing while getting other teams out

Synopsis of Activity:

The group will be divided into pairs with one person being blindfolded (the thrower) while the other person gives the verbal commands. The person giving the directions must stand behind the blindfolded person and tell them where to find balls and where to throw them. If a team gets hit three times then they are out.

Steps of the Activity:

1. Gather the group, divide into pairs, and go over directions (3 minutes).
 - The sighted person is not allowed to dodge balls
 - The sighted person is not allowed to touch balls
 - The blindfolded person must follow the commands of his partner
 - Everyone must stay inside the boundary
2. Lay out the rope as a boundary and place all balls inside the rope (2 minutes).
3. Start the activity (8-10 minutes).
4. Debrief by talking about communication, giving directions, and trust (1-2 minutes).

Safety Concerns:

- Discourage headshots

TROLLEY

Materials needed: A pair of trolleys

Objective: Team walking

Steps of the Activity:

The team attempts to coordinate their steps and walk their boards down to the designated spot and return to the starting line. They must coordinate their movement as a team or they will find the task impossible. Players prepare themselves for this activity by placing one foot on each board. They grasp the ropes provided and make any adjustments so that their rope is tight in both hands.

Safety Concerns: Slow and steady helps to keep from falling.

Trolley Instructions

Materials Needed:

2 – 2x6 pieces of wood cut 5 feet long

10 washers and bolt screws

50 feet of nylon rope

Instructions: (Makes one pair of Trolleys)

Cut the rope into 3 foot pieces. The ropes are tied to a bolt screw which is held in place by a bolt washer. These are placed every foot on the 2x6, five foot long board.

Five students stand on the 2x6 with the left foot on one of the boards and one foot on the other. They should all lift up the same leg together while holding onto the rope. They should practice walking forward together. This takes a lot of effort and teamwork.

Trust Walk

Time of the Activity: Variable

Materials Needed:

- Blindfolds for each participant
- A length of rope long enough for everyone to hold on with at least two feet of space between each participant

Objective:

- The group must trust each other and get to an unknown location by following the leader

Synopsis of Activity:

Each group member will be blindfolded and told to hold onto a portion of the rope. They must then follow the facilitator and the person in front of them to an undisclosed location.

Steps of the Activity:

1. Gather the group and go over directions (1-2 minutes).
 - You need to be quiet so you can hear directions
 - Please keep your hands on the rope at all times, unless you feel like you are going to fall, then let go
2. Give participants a blindfold to put on, and then have them grab the rope (2 minutes).
3. Start the activity (5-7 minutes).
 - As the facilitator, make sure you go slowly so that no one falls. Also be sure to announce specific obstacles that need to be avoided.
4. Debrief by talking about trust, the most difficult part of this activity, and what can be carried on to other activities (1-2 minutes).

Safety Concerns:

- Participants falling if they are not paying attention and following directions

Debriefing the Activity

1. Safety first! This is not only physical safety but emotional and spiritual safety as well.
2. Apply the "Challenge by Choice" philosophy: Allow each individual to communicate to his/her comfort level with the activity and to join in, rather than to be coerced into participating. Do not force answers from the team, lead them to the answers.
3. Encourage the team to review both the task and the process.
4. Clarify and focus the comments of the team and provide helpful information.
"NO PUT-DOWNS"
5. Call attention to details that may have been over looked.
6. Assist the team in discovering what they have experienced as opposed to **telling** them what they experienced.
7. Be comfortable with the time between the question you ask and the often quiet period before someone responds.
8. Help the team see the link between their behavior (their choices) and the outcomes.

Question to Ask for Debriefing

1. How did your team involve everyone in solving the challenge?
2. Did your team use negative pressure or put-downs during the challenge?
3. Did your team listen to one another and use the ideas that you shared?
4. How many and which team member used "Praise Phases" or positive encouragement? What were some of them?
5. Did your team use "Challenge by Choice"?

References

1. Fluegelman, Andrew (Edited by), *The New Games Book*. Headlands Press Books, Garden City, NY. 1976.
2. Glover, Donald and Midura, Daniel, *Team Building through Physical Challenges*. Human Kinetics Publishers, Champaign, IL. 1992.
3. Heck, Tom, *Grouploop Activity Guide*. Sportime International. Atlanta, GA. 2000.
4. Midura, Daniel and Glover, Donald, *More Team Building Challenges*. Human Kinetics Publishers, Champaign, IL. 1995.
5. Rohnke, Karl and Butler, Steve, *Quick Silver*. Kendall/Hunt Publishing Co. Dubuque, Iowa, 1995.
6. Rohnke, Karl, *Cowstails and Cobras*. Project Adventure. Hamilton, MA. 1977
7. Rohnke, Karl, *Silver Bullets*. Kendall/Hunt Publishing Co. Dubuque, Iowa 1984.
8. Rohnke, Karl, *Cowstails and Cobras II*. Kendall/Hunt Publishing Co. Dubuque, Iowa, 1989.

Ice

BR

EA

K

ER

S

ICE BREAKERS

Find Your Partner

Team: Any number of people

Materials: None

Objective: Everyone finds a partner, shake hands and take turns introducing your selves to each other. When you hear, "Find a new partner", you find a new partner and give this partner a high five and taking turns introducing your selves. You can have as many new partners as you want, each with something different, a hug, hip bump, etc. Then when you hear, "hand shake partner", you find that partner (by the count of three) and shake hands. The partner calls will keep changing. This activity should last about five minutes.

Name Game

Team: Any number of people

Materials: Carpet squares, poly disc, or anything to mark a spot to return to.

Objective: There should be one less carpet square than participants. Form a circle with the squares. One person stands in the center of the circle. Everyone else stand on a square. The center person will say, "Hi! My name is and I like people who like.....". Example: "Hi! My name is Steve and I like people who like chocolate". If you are on a square and you like chocolate, you must change squares with someone else. You **MAY NOT** go to a square next to you. The center person is also going to a square. If you do not get to a square, you are in the center. This activity should last about eight minutes.

Finger Tag

Team: Any number of people

Materials: None

Objective: Find a partner and shake hands, leave your pointer finger straight out. Now try and tag your partner. Remember – they are trying to tag you. As soon as game is over, find a new partner and play again. This activity should last about five minutes.

Factory Game

Team: Any number of people

Materials: 10 to 12 objects to throw (tennis balls, foam balls, stuffed animals, etc.)

Objective: Form a circle with the group. Give one ball to anyone in the group, they must say their name and throw the ball to anyone in the group, except the person on either side.

The person catches the ball and say, "Thank you (name). My name is" and throw the ball to someone who has NOT had the ball yet. After the pattern has been determined and practiced a couple of time, start adding more balls. Always start the ball with the same person. You can also add a rumor ball – just toss a different colored ball to anyone in the partner and see what happens.

Variation: Just use one ball and time the pattern. Can the team better their time?

Debriefing the Activity

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References

1. Fluegelman, Andrew (Edited by), *The New Games Book*. Headlands Press Books, Garden City, NY. 1976.
2. Glover, Donald and Midura, Daniel, *Team Building through Physical Challenges*. Human Kinetics Publishers, Champaign, IL. 1992.
3. Heck, Tom, *Grouploop Activity Guide*. Sportime International. Atlanta, GA. 2000.
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5. Rohnke, Karl and Butler, Steve, *Quick Silver*. Kendell/Hunt Publishing Co. Dubuque, Iowa, 1995.

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8. Rohnke, Karl, *Cowstails and Cobras II*. Kendell/Hunt Publishing Co. Dubuque, Iowa, 1989.

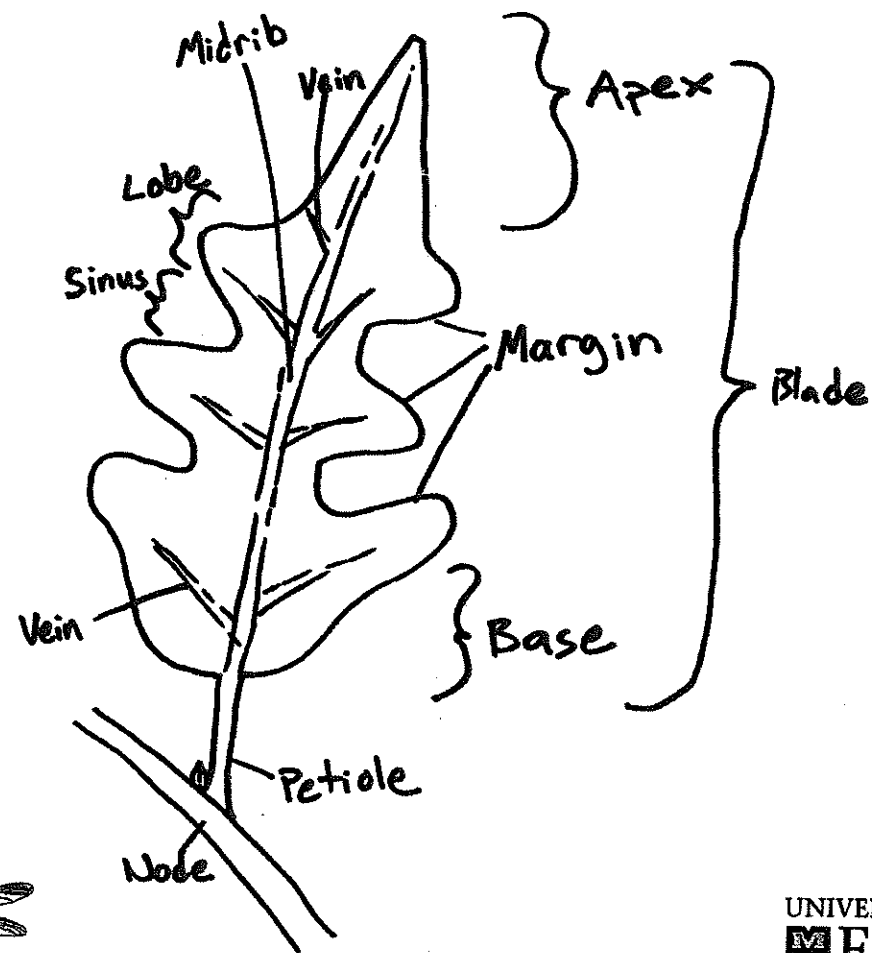
TERRESTRIAL PLANT COMMUNITY COMPARISON

	PRAIRIE	WETLAND	WOODLAND	GLADE
Soil Characteristics	Depth _____ Color _____ Texture _____ Odor _____	Depth _____ Color _____ Texture _____ Odor _____	Depth _____ Color _____ Texture _____ Odor _____	Depth _____ Color _____ Texture _____ Odor _____
Detritus present (depth and %)	?	?	?	?
Coverage by plant growth forms? (%) (Can total >100%)	Grass (%) Forb rosette Forb w/ stem Fern Shrub Tree	Grass (%) Forb rosette Forb w/ stem Fern Shrub Tree	Grass (%) Forb rosette Forb w/ stem Fern Shrub Tree	Grass (%) Forb rosette Forb w/ stem Fern Shrub Tree
Percentage of hairy plants	?	?	?	?
Sunlight reaching soil (%)	?	?	?	?
Estimated number of plant species	?	?	?	?
GPS points of hula hoop sample	?	?	?	?
Other notables	?	?	?	?

Things to observe when trying to identify a plant:

- Growth type: tree, shrub, vine, forb, grass, fern, moss
- Deciduous or Evergreen?
- Plant height and width
- Distance between nodes
- Annual growth rate (use bud scale scars)
- Leaf qualities: size, shape, placement, veins, thickness, surface, hairs, color (early spring and late fall too), scent, scar shape, petiole length, color etc.
- Bud qualities: size, shape, color, location
- Flower qualities: size, shape, color, scent, etc., time of year,
- Fruit qualities; type, time of year, size, shape, color etc.

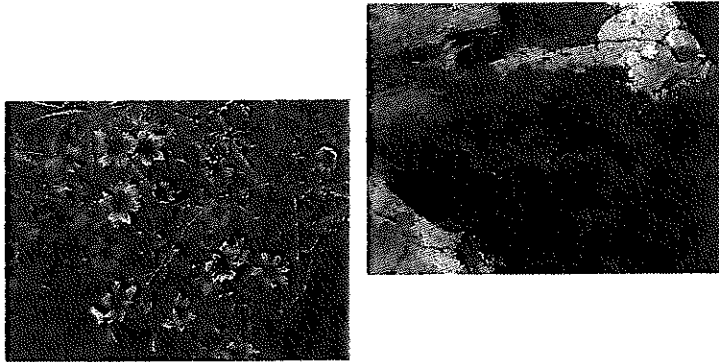
Anatomy of a Leaf



Plant Growth Types

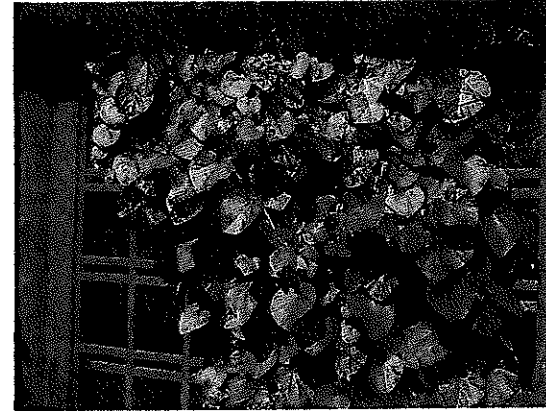
Forb- an herbaceous flowering plant- not a grass
-annuals complete life cycle in one growing season
-biennials complete life cycle in two growing seasons
-perennials die back to the ground at end of a growing season but regenerate the following year; capable of setting seed multiple times

Examples (right to left) *Coreopsis tinctora*, plains coreopsis (annual), *Asclepias tuberosa*, butterfly milkweed (perennial)



Vine- herbaceous or woody flowering plant that has a climbing or trailing growth habit

Example: *Aristolochia tomentosa*- Dutchman's pipe



Tree- plant with a single woody stem (trunk) that does not die back to the ground each year; generally taller than 15 feet at maturity; may have multiple trunks

Example: *Nyssa sylvatica* – black gum



Shrub- plant with multiple woody stems that do not die back to the ground each year; generally shorter than 15 feet at maturity

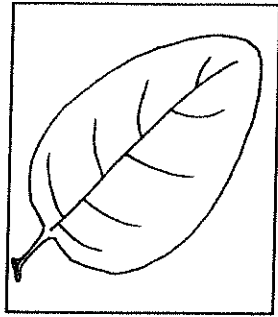
Example: *Viburnum prunifolium* - blackhaw viburnum



Other plant categories include grasses, ferns, mosses

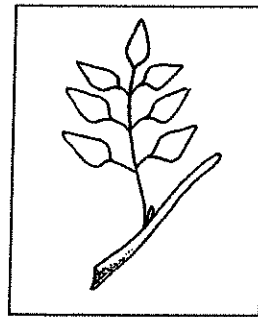
Leaf Terminology

Simple:
undivided



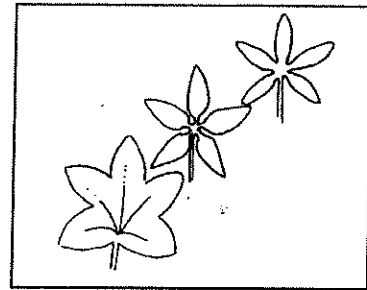
Examples: oak, maple, cottonwood, dogwood

Compound:
with two or more
parts in an organ



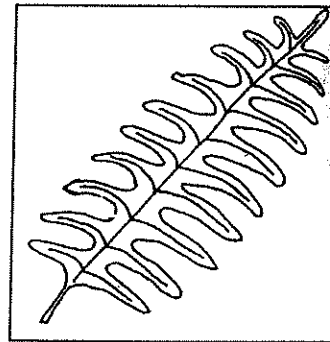
Examples: ash, hickory, Kentucky coffeetree,
boxelder

Palmate:
Lobed,
veined, or
divided from
a common
point, like the
palm of the
hand



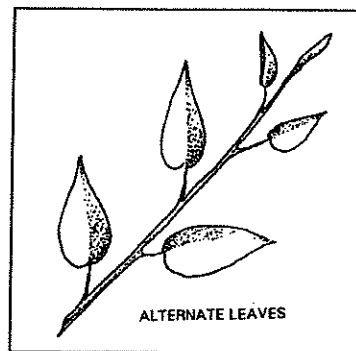
Examples: maple, Ohio buckeye,

Pinnate:
Lobed, veined,
or divided
from opposite
sides of an
elongated axis



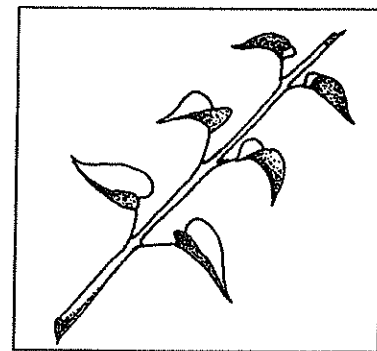
Examples: ash, hickory, Kentucky coffeetree,
boxelder

Alternate:
Borne singly
at each node



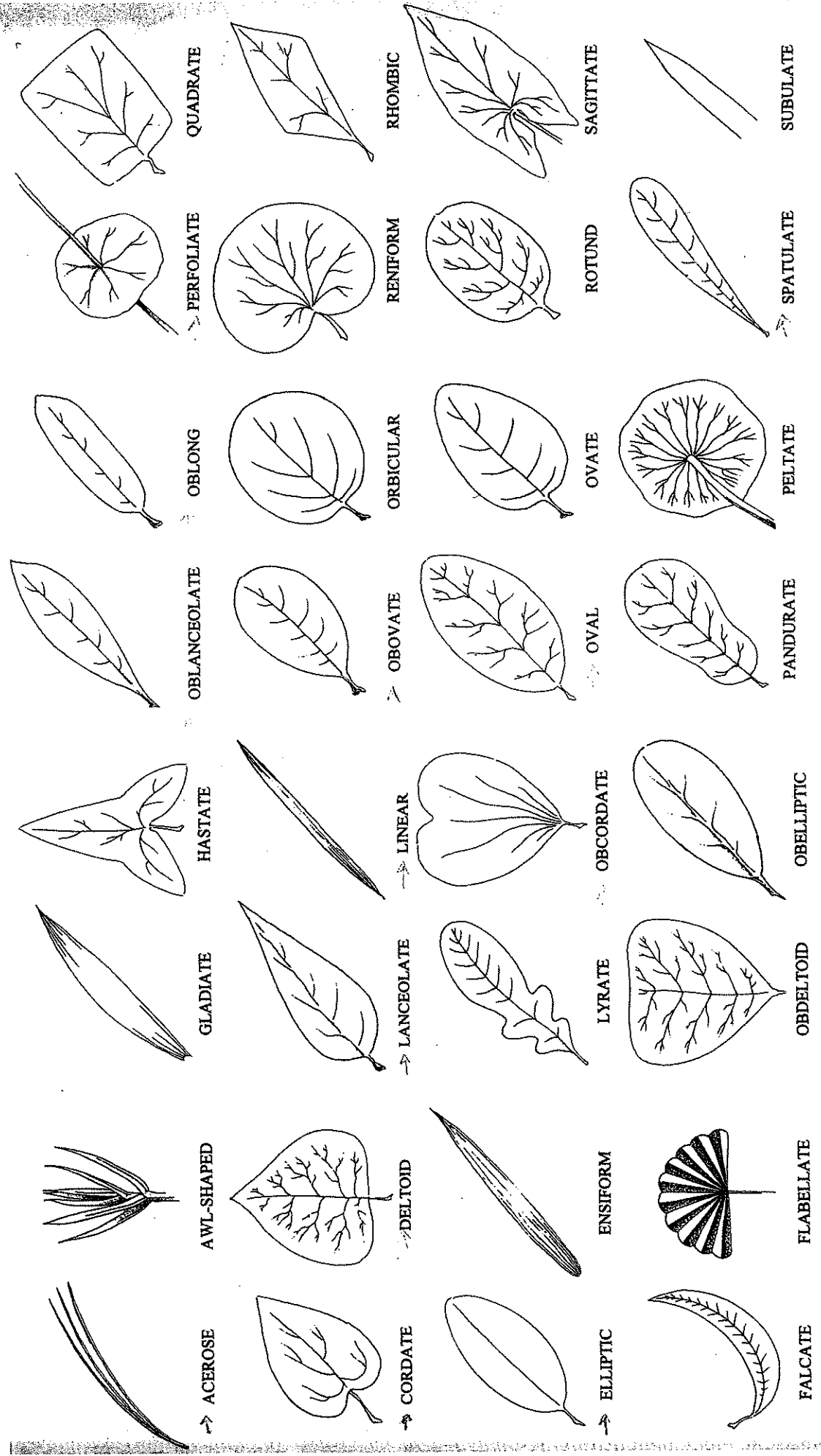
Examples: most of our native trees

Opposite:
Borne across
from one
another at
each node



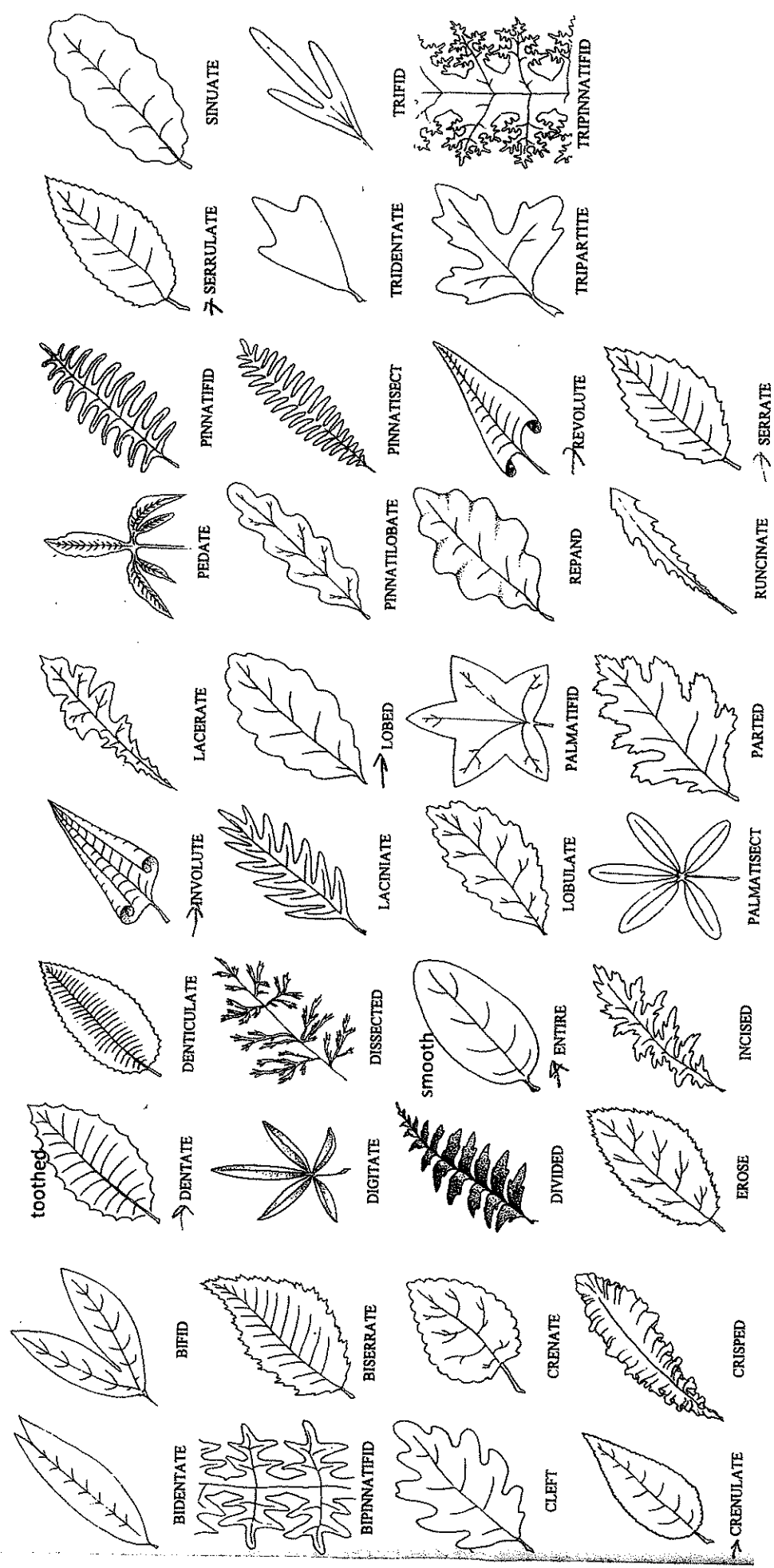
Examples: maple, ash, dogwood, buckeye,

Leaf Shapes

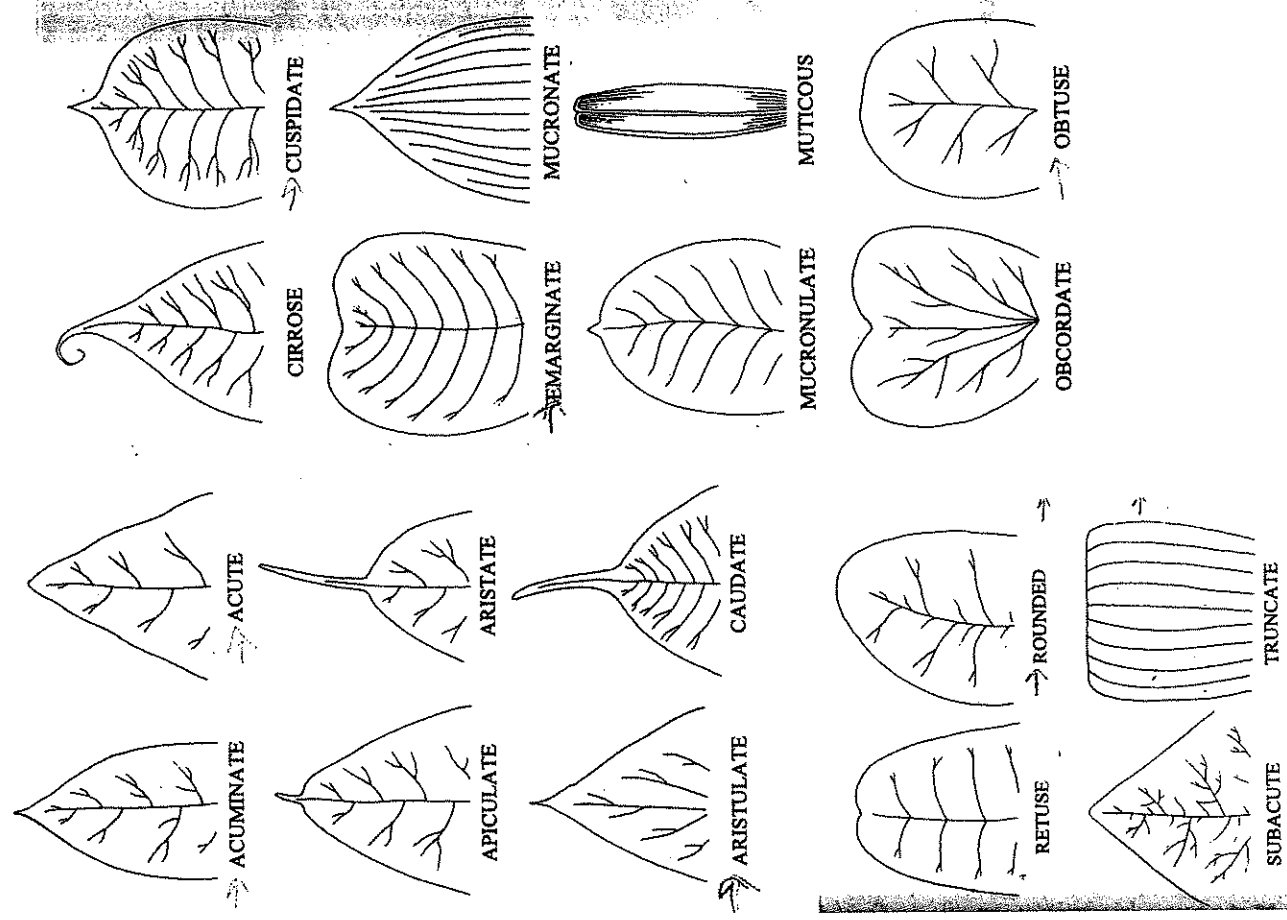


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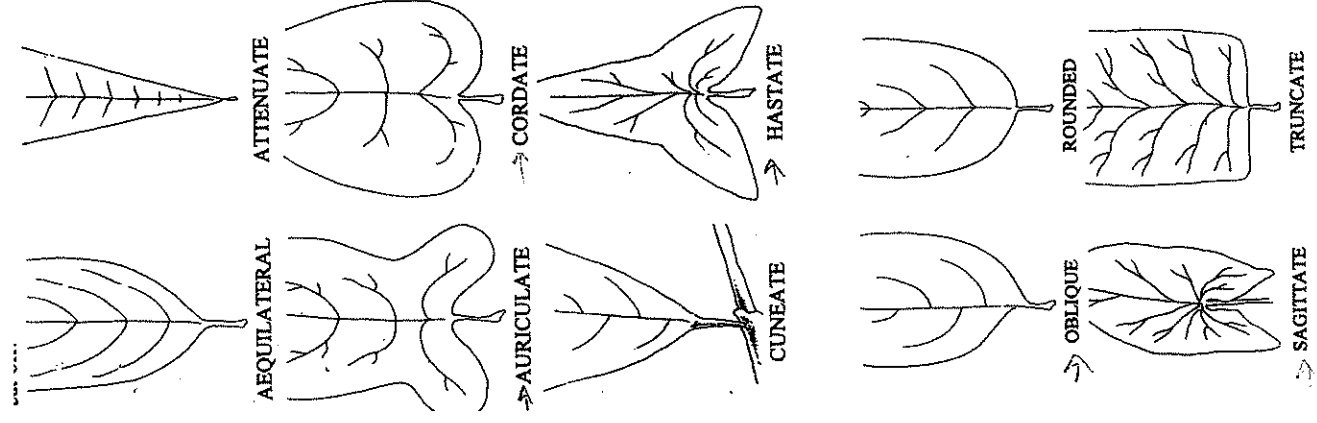
Leaf Margins (edges)



Leaf Apices (tips)



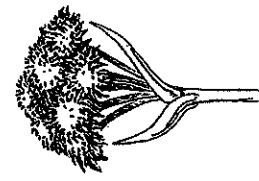
Leaf Bases



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Inflorescences (flowers)

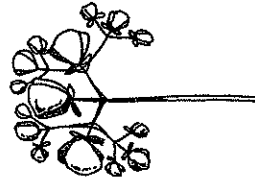
IRISE WILDL.



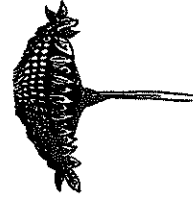
CAPITULUM



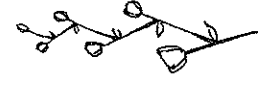
CATKIN



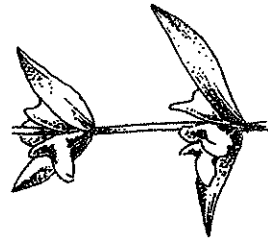
DICHASIAM



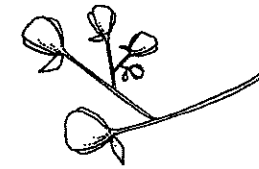
HEAD



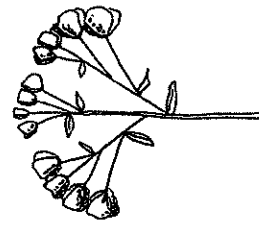
CORPIOID CYME



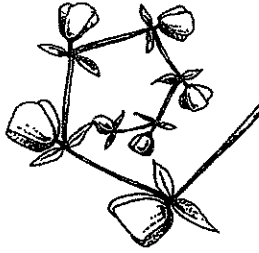
VERTICILLASTER



CINCINNUS



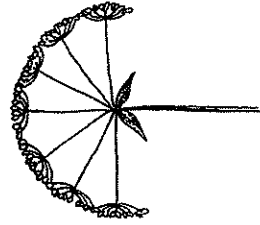
COMPOUND CORYMB



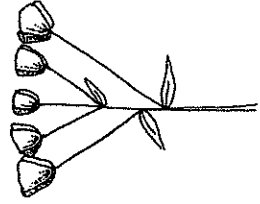
HELICOID CYME



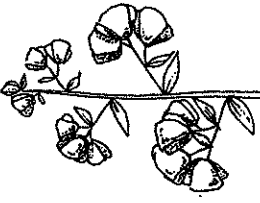
MONOCHASIAM



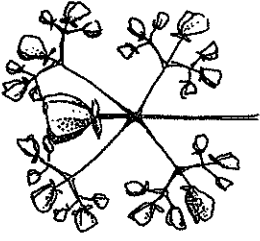
COMPOUND UMBEL



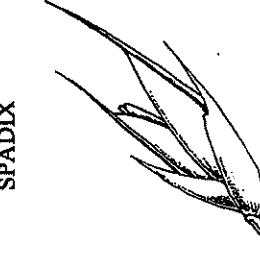
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PANICLE



PLEIOCHASIAM

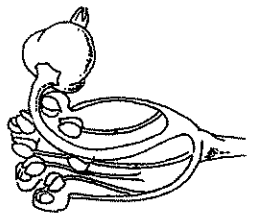


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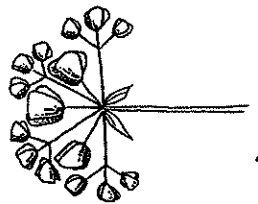


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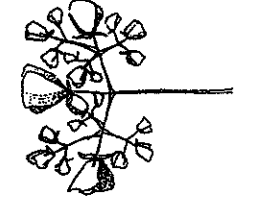
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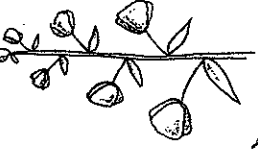
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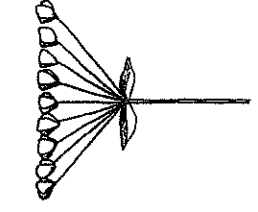
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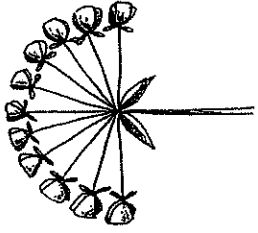
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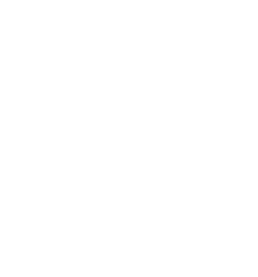
RACEME



SPIKELET



UMBEL, ROUND



UMBEL, FLAT

Copied with permission: *Plant Identification Terminology: An Illustrated Glossary*- Spring Lake Publishing, Payson UT

Fruits

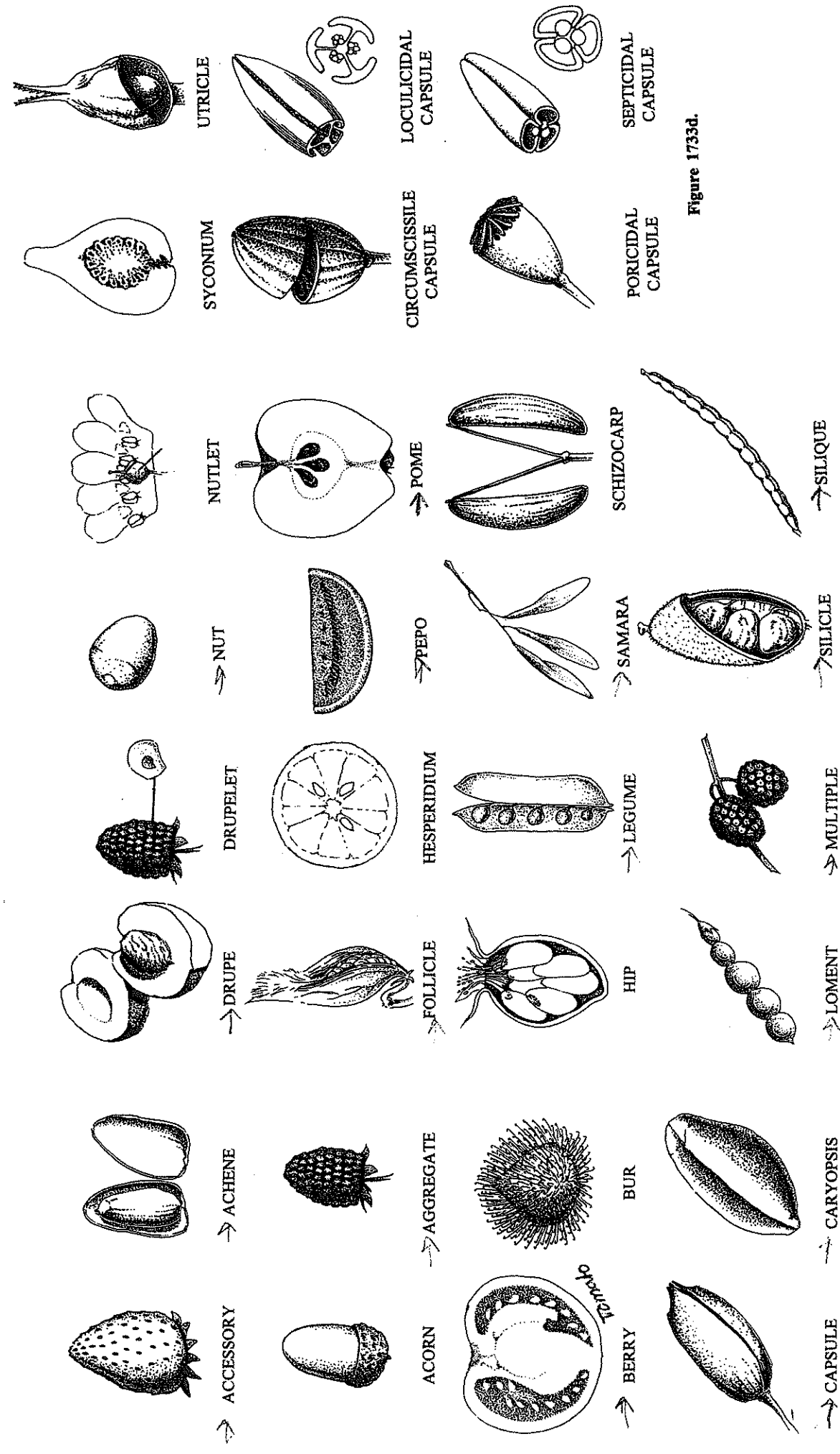
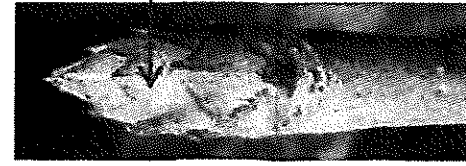


Figure 1733d.

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WINTER BUDS

This file, arranged by family, contains photos of winter buds, bark and fruit (acorns, nuts, etc.) of common woody shrubs and trees. It is sometimes the case that a shrub or tree can be identified quite easily in the winter using these features. All photos found here are also in the database of individual species. First, a few terms.



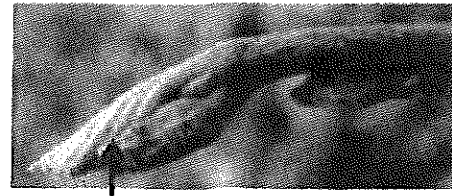
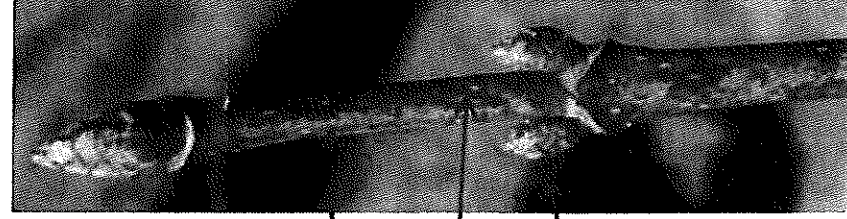
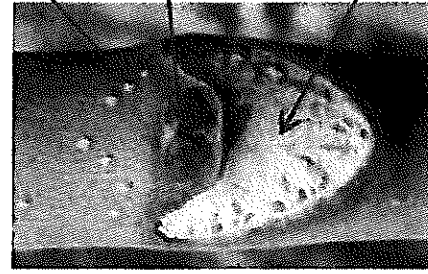
Terminal Bud – some species have a true terminal bud, others have a tip-scar and the nearest lateral bud takes the place of a terminal bud

Internode

Lenticels – round to lens-shaped, raised corky area on stem

Lateral Bud(s) – buds found at stem nodes (alternate, opposite or whorled)

Lear Scar – arrangement on twig same as lateral buds



Naked Terminal Bud – no bud scales, leaf structure observable

Terminal Bud-Scale Scars – of previous year(s)



Bud with Bud Scales – may be one to several covering scales, these may be hairy or not and in various arrangements

Bundle Scars – scar of vascular bundle that feed leaves – number and arrangement sometimes used to ID species

"All the Water on Earth" Student Challenge Strips

My wise water use tip is ...

My wise water use tip is ...

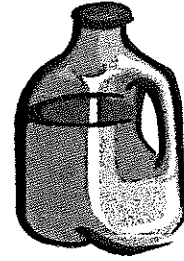
My wise water use tip is ...

My wise water use tip is ...

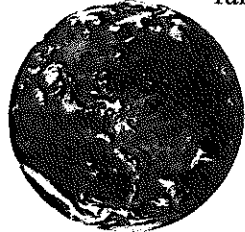
My wise water use tip is ...

All the Water on Earth Challenge...

1. Set the gallon of water for your grade level in front of your students.
2. Tell them that the whole grade level has been given an assignment meant to help keep fresh water available for all living things.
 - a. Optional: Introduce pictures of plants and animals that live in our area that also need to use water. Invite the students to tell you how these living organisms, the plants and animals, use water.
 - b. Optional: Have students bring in pictures of both wise water use and problematic water use.



3. "We need your help to come up with some wise water tips we can share with our families and neighbors. In fact, Woodland Elementary student tips will be collected and placed on the website during Earth Week 2016 so that people in our school district can use your tips to make sure water is used wisely and is available for all living things on earth."



4. Show the students the colored paper strips (master attached).
 - a. Each strip says, "Wise Water Tip..."
 - b. When you have an idea, you can write it on this paper strip, then slip it through the handle, like this and staple the ends together. Yes, you can have more than one tip!
5. Early in April, each grade level will review together all of the tips and choose 10 of their favorites.
 - a. Give these 10 grade level tips to your Environmental Club leader/Mrs. Bradley to put together as a poster or other type of display.
 - b. These tips will also be sent to the School District to upload on their website during Earth Week.
 - c. Woodland's display/poster, which will be found in the foyer of the school, will serve to remind everyone during Earth Week how important it is to use water wisely.
6. Finally, as a grade level, decide what you are going to do with your gallon of water. Let your wise water ways guide you.

All the Rivers Run by Alex Bevan

We all live on a planet so big and blue
All the rivers run
So much to learn, so much to do
All the rivers run
There are mountains high and valleys low
All the rivers run
And in between them waters flow
All the rivers run

Chorus

All the rivers run
Dancing in the sun
Cradled in their watersheds
All the rivers run

When the sun comes up and warms the land
All the rivers run
There's a world of wonder at every hand
All the rivers run
Dew drop, rain drop, river or sea
All the rivers run

The water cycles endlessly
All the rivers run

See millions of interlinking threads
All the rivers run
This is the web of life it's said
All the rivers run
The tapestry of life is knit
All the rivers run
And water flows through all of it
All the rivers run

When the rain comes down in your hometown
All the rivers run
It joins your creek and rolls on down
All the rivers run
Then your creek runs all the way
All the rivers run
Into your river and down to the bay
All the rivers run

Glossary

Temperature The temperature of stream water is influenced by both natural processes and human activities. Climatic zone, altitude, air temperature, and season of the year produce variation in water temperature. Other natural factors include shade provided by streamside vegetation, depth, flow rate, snow melt, and mixing with ground water.

Human activities can introduce thermal pollution into streams in several ways. Industries and power plants may use water to cool machinery and then discharge the warmed water into a stream. In the summer, storm water warmed by urban surfaces, such as roads, roofs, and parking lots, can flow into nearby streams. Water temperature rises when trees and tall vegetation providing shade are cut down. Soil erosion caused by construction, removal of streamside vegetation, poor farming practices, overgrazing, and recreation increases the amount of suspended solids in the water. The suspended particles absorb the sun's rays and also increase water temperature.

Chemical processes involved in the metabolism, growth, reproduction and behavior of aquatic organisms are sensitive to water temperature. Thermal stress and even shock can occur when the temperature changes more than 1° or 2°C in less than 24 hours. In addition, the sensitivity of an aquatic organism to toxic wastes, parasites, and disease often increases with rising temperatures.

Water temperature affects the amount of dissolved oxygen and other gases that water can hold at specific atmospheric pressure. A rise in temperature decreases the ability of water to hold oxygen molecules.

Dissolved Oxygen There are two main sources of dissolved oxygen in stream water: the atmosphere and photosynthesis. Waves and tumbling water mix air into the water where oxygen readily dissolves until saturation occurs. Oxygen is also introduced by aquatic plants and algae as a byproduct of photosynthesis.

The amount of dissolved oxygen is limited by physical conditions, such as water temperature and atmospheric pressure.

Lower temperature ---> higher potential dissolved oxygen level

Higher temperature ---> lower potential dissolved oxygen level

Activity of living organisms increases in warmer water, requiring more oxygen to support their metabolism and magnifying the temperature effect on dissolved oxygen.

Oxygen is essential for fish, invertebrate, plant, and aerobic bacteria respiration. Dissolved oxygen levels below 3 parts per million (ppm) are stressful to most aquatic organisms. Levels below 2 or 1 ppm will not support fish. Fish growth and activity usually require 5-6 ppm of dissolved oxygen.

Low dissolved oxygen indicates a demand on the oxygen of the system. Build up of organic material from human activities is one source of oxygen depletion. Microorganisms in the stream consume oxygen as they decompose inadequately treated sewage, urban and agricultural runoff, and discharge from food-processing plants, meat-packaging plants, and dairies that has entered the stream.

Natural organic materials, such as leaves, also accumulate in the stream and create an oxygen demand as they decompose.

Some pollutants, such as acid mine drainage, produce direct chemical demands on oxygen in the water. Dissolved oxygen is consumed in the oxidation-reduction reactions of introduced chemical compounds, such as nitrate (NO_3^-) and ammonia (NH_4^+), sulfate (SO_4^{2-}) and sulfite (SO_3^{2-}), and ferrous (Fe^{2+}) and ferric (Fe^{3+}) ions.

One measure of dissolved oxygen in water is parts per million (ppm), which is the number of oxygen molecules (O_2) per million total molecules in a sample. Calculating the percent saturation is another way to analyze dissolved oxygen levels. Percent saturation is the measured dissolved oxygen level divided by the greatest amount of oxygen that the water can hold under various temperature and atmospheric pressure conditions multiplied by 100.

pH The pH of a liquid is the negative logarithm of the concentration of

hydrogen ions in the solution.

$$\text{pH} = -\log [\text{H}^+]$$

Because the pH scale is logarithmic, every single unit change in pH actually represents a ten fold change in acidity. For instance, at pH 7 there are 1×10^{-7} hydrogen ions, and at pH 6 there are 1×10^{-6} hydrogen ions present.

The pH of natural water depends on several factors: the carbonate system, types of rock, types of soil, and nature of discharged pollutants. The concentration of carbonates (CO_3^{2-} , HCO_3^-) and carbon dioxide ($\text{CO}_2(\text{aq})$) is the main influence on the pH of clean water. High concentrations produce alkaline waters (high pH), while low concentrations usually produce acidic waters (low pH).

Acidic and alkaline compounds can be weathered into the stream from the different types of rock present. When limestone (CaCO_3) is present, carbonates can be released, affecting the alkalinity of the water. The types of soil in the drainage area also affect the pH. Drainage water from forests and marshes is often slightly acidic due to the presence of acids produced by decaying vegetation.

Nitrogen oxides (NO , NO_2) and sulfur dioxide (SO_2) from automobile and power plant emissions are converted into nitric acid (HNO_3) and sulfuric acid (H_2SO_4) in the atmosphere. The acids can affect the pH of streams by combining with moisture in the air and falling to the earth as acid rain or snow.

Surface waters can sometimes act as weak buffer solutions depending on the concentration of carbonates and hydrogen carbonates. Buffer solutions are usually a mixture of a weak acid and a strong base. The pH of a buffer solution changes only slightly when small amounts of acid or base are added.

The pH values of natural surface waters usually range from 5.5 to 8.5. Extremely high (9.6) and low (4.5) values are unsuitable for most aquatic organisms. Young fish and immature stages of aquatic insects are extremely sensitive to pH levels below 5.

Changes in pH can also affect aquatic life indirectly by altering other aspects of water chemistry. Low pH levels accelerate the release of heavy metals from sediments on the stream bottom. The heavy metals can accumulate on the gills of fish, reducing their chance of survival.

Turbidity This is the measure of the relative cloudiness of water. Turbidity is caused by suspended solid matter scattering light as it passes through water. Suspended solids include clay, silt, plankton, industrial waste, and sewage. Soil erosion introduces soil and mineral particles to surface water. Stream bed sediments can be stirred up by organisms feeding off the bottom. Particles remain suspended by water currents for some time. Urban runoff introduces a wide variety of particles to stream water. Algal growth from added nutrients and sunlight can also increase turbidity.

As the amount of suspended solids increases, photosynthesis decreases, fish gills become clogged, and eggs are smothered. Material settling into spaces between rocks makes these microhabitats unsuitable for the macroinvertebrates living there. Surface water temperature also rises as suspended particles near the surface absorb heat from the sunlight, which in turn affects dissolved oxygen levels.

Another concern of suspended sediments is that attached nutrients, metals, and pesticides can be carried throughout the water system.

Hardness Water hardness is a historical term expressing the total concentration of cations, specifically calcium (Ca^{2+}), magnesium (Mg^{2+}), iron (Fe^{2+}) and manganese (Mn^{2+}) in water. Hardness, however, refers primarily to the amount of calcium and magnesium ions present. Calcium and magnesium enter the stream mainly through the weathering of rocks.

A stream's hardness reflects the geology of the catchment area and provides a measure of the influence of human activity in a watershed. For instance, acid mine drainage often results in the addition of iron (Fe^{2+}) into a stream.

Calcium is an important component of plant cell walls and the shells and bones of many aquatic organisms, while magnesium is an essential nutrient for plants and a component of the chlorophyll cycle. Waters with calcium levels of 10 ppm or less are usually oligotrophic, supporting only sparse plant and animal life. Eutrophic waters typically have calcium levels above 25 ppm.

When the total hardness of water exceeds the total alkalinity, the excess is called "noncarbonate hardness" and indicates the presence of chloride and sulfate ions.

Alkalinity The buffering capacity of water is measured as the "alkalinity." Alkalinity does not refer to pH, but instead refers to the ability of the water to resist change in pH. The presence of buffering materials, principally the bases HCO_3^- , CO_3^{2-} , and OH^- , help neutralize acids as they are added to or created within the water column. A total alkalinity level of 100-200 ppm will stabilize the pH level in a stream. Levels of 20-200 ppm are typical of fresh water. Levels below 10 ppm indicate that the system is poorly buffered. Poorly buffered waters are susceptible to changes in pH from natural and anthropogenic (human-caused) sources.

As increasing amounts of acid are produced, the buffering capacity is consumed. Natural buffering materials in water slow the decline of pH to around 6. A rapid pH drop follows this gradual decline as the bicarbonate buffering capacity is used up. At pH 5.5, only very weak buffering ability remains and the pH drops further with additional acid.

Conductivity The ability of an aqueous solution to carry an electric current is called conductivity. The current is conducted in the solution by the movement of ions. Conductivity increases with increasing amounts and mobility of ions. In natural water, the dissociation of inorganic compounds is the main source of ions in the solution. Therefore, measuring conductivity reveals the concentration of dissolved salts in water. Conductivity is also affected by heavy metal ions released into water by acid mine drainage.

Total Solids This is the sum of dissolved and suspended solids.

The quantity of dissolved material is mainly determined by the solubility of rocks and soils that the water contacts. Water that flows through limestone and gypsum dissolves calcium, carbonates, and sulfates, resulting in high total dissolved solid levels. The amount of material dissolved in a water sample affects its ability to conduct electricity. Total dissolved solids can be estimated by measuring conductivity, because as total solids increase, conductivity also increases.

Runoff from urban areas can carry salt from streets, fertilizers from lawns, along with other types of materials to contribute dissolved solids. Wastewater treatment plants can add phosphorus, nitrogen, and organic matter. Leaves and other plant materials dumped into streams are another source of dissolved solids. Soil particles are introduced by soil erosion and runoff. Decayed plant and animal matter is naturally converted to particulate matter within the water.

High concentrations of total solids can lower water quality and cause water balance problems for individual organisms. Low concentrations may limit the growth of different aquatic life. High concentrations of dissolved solids can lead to laxative effects and unpleasant mineral taste in drinking water.

Fecal Coliform These are bacteria that are naturally abundant in the lower intestines of humans and other warm-blooded animals. They are not pathogenic, but their presence serves as a reliable indication of sewage or fecal contamination in water. Fecal coliform can enter water through various sources, including mammal and bird discharge, agricultural and storm runoff, and human sewage discharge.

Biological oxygen demand (BOD) is the measure of the amount of oxygen consumed by microorganisms in aerobic oxidation of organic material. Unpolluted natural waters will have a BOD of 5 mg/L or less.

The organic matter available for decomposition has both natural and human origins. Nutrients are the main culprit for high BOD in river water. Calm stretches of water ways also collect organic wastes that settle out from upstream. Swamps, bogs, and vegetation along the water provide organic matter for decomposition.

Human activities can result in point source and nonpoint source contribution. Discharge from wastewater treatment plants, pulp and paper mills, meat-packing plants, and food-processing plants are examples of point sources of organic matter. Urban runoff is a nonpoint source provider. Rain and melting snow carry sewage from improper sewer connections into storm drains. Pet wastes wash off sidewalks. Nutrients from lawn fertilizers, leaves, grass clippings, and paper from residential areas also find their way to the water. Nitrates, phosphates, and other nutrients are carried from fields by agricultural runoff. Chemical oxidation of sulfides, ferrous ions, and ammonia also consume oxygen in water.

Nitrates Nitrogen is an element needed by all plants and animals to build protein. It most commonly exists in its molecular form (N^2) where it is unusable for most aquatic plant growth. Blue-green algae converts N^2 to ammonia (NH_4^{+1}) and nitrate (NO_3^{-1}) that can be taken in and utilized by aquatic plants. Ammonia is also released as bacteria break down aquatic plant and animal remains. Specialized bacteria can then oxidize the ammonia to form nitrites

(NO) and nitrates (NO_3^{-1}).

Excretions of aquatic organisms are very rich in ammonia. In large groups, duck and geese can contribute heavy loads.

Nitrogen in the forms of ammonia and nitrates functions as a plant nutrient and initiates eutrophication.

Sewage is the main source of human-influenced nitrate addition to streams. Nitrates are introduced by inadequately treated wastewater from sewage treatment plants, effluent from illegal sanitary sewer connections, and poorly functioning septic systems. Fertilizers from fields and runoff from cattle feedlots, dairies, and barnyards are other nitrate sources.

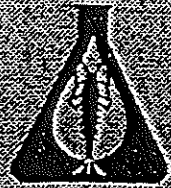
Total Phosphate Phosphorus present in natural waters is usually found in the form of phosphates (PO_4^{-3}). Phosphates accumulate from living plants and animals, their byproducts, and their remains. Phosphate ions bonded to soil particles and in laundry detergents also end up in streams. Other sources of phosphorus include sewage, animal waste, soil erosion, fertilizers, and drained swamps and marshlands.

Phosphate acts as a "growth-limiting" factor of aquatic plants and algae. Excess phosphate creates blooms of extensive algal growth. Forest fires and fallout from volcanic eruptions are responsible for natural eutrophication in streams, while humans are the instigators of cultural eutrophication.

Phosphorus initially stimulates aquatic plant growth, which unlocks even more phosphorus from bottom sediments. The first key symptom of eutrophication is the pea-soup green color of the water caused by an algal bloom. Algal blooms then become more frequent and further deplete the water of dissolved oxygen as the algae decays.



[Back](#)



Water Quality
Volunteer

Use this chart as a guide as you interpret your water quality field data. Remember, each aquatic system is different; this chart is only a guide, not a hard fast rule!

WATER TEST	WHAT IT MEASURES	NATURAL READINGS	CAUTIONARY READINGS	SOURCE	REMEDIES
Dissolved Oxygen	amount of oxygen in the water	5-14 ppm (parts per million)	<ul style="list-style-type: none"> • Below 5 -Water Quality Violation • 1.5-5 = stress resulting in abnormal feeding and reproduction • <1.5 = mortality • 0 = anoxic 	<ul style="list-style-type: none"> • atmosphere -wind -running water • photosynthesis 	<ul style="list-style-type: none"> • control nutrient content, algae growth • reduce water temperature
pH	acid/base of the water	generally 6.5-8.5 (bogs are naturally acidic, pH can be as low as 4.2)	<ul style="list-style-type: none"> • below 6.5 • above 8.5 	<ul style="list-style-type: none"> • acid rain • industrial pollution • chemical spills 	<ul style="list-style-type: none"> • pollution controls • moderated by limestone and dolomite
Nitrates	organic matter or fertilizer in water	0.0-1.0 ppm	consistent readings above 3 ppm	<ul style="list-style-type: none"> • sewage, industry • detergents • fertilizer, animal wastes 	<ul style="list-style-type: none"> • removal by water treatment (rare) • limited usage
Temperature	average amount of heat in the water	varies	generally above 27° C (81° F) >24° C for trout streams	<ul style="list-style-type: none"> • waste heat-industrial discharges • solar heat-loss of riparian shade urban runoff 	<ul style="list-style-type: none"> • cooling towers, etc. (Decreased T also increases DO) • increase riparian shade • decrease impervious surface
Turbidity	clarity of the water	80-120 cm (0-8 JTU, Jackson Turbidity Units)	increasing trends in turbidity measurements	<ul style="list-style-type: none"> • sediment • excessive algae growth • boat traffic, storms, etc. 	<ul style="list-style-type: none"> • sediment controls • reduced nutrients to reduce algae • boat speed limits

Is It Biotic or Abiotic?

1. Place students in pairs or threes.

Make no more than ten groups of students.

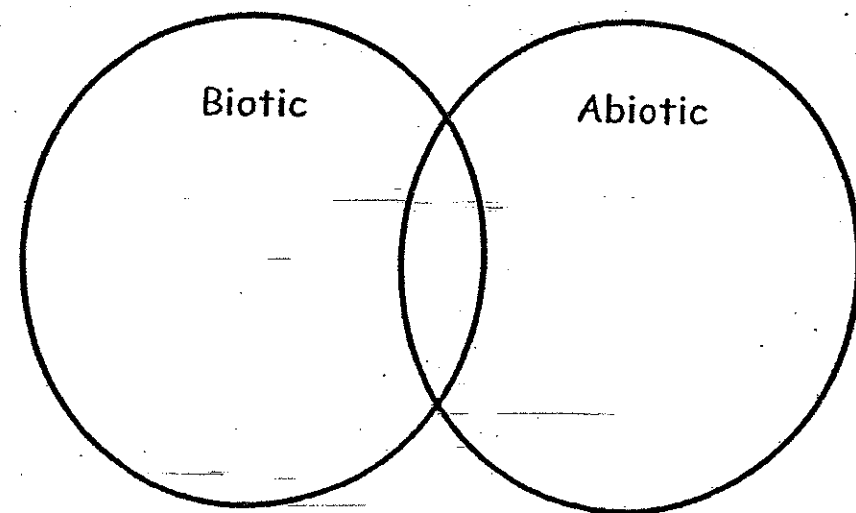
2. Begin a treasure hunt.

Collect all sorts of objects found in and around the school and school yard. Make sure students know not to take anything that belongs to someone. Objects may include lost pencils, bits of trash, grass, small rocks, and leaves. The goal is to collect as many different things in their bags as they can. (Make sure both biotic and abiotic things are collected.)

3. Gather the groups and sort the objects.

Consider having students sort their objects by common characteristics they identify. Eventually, draw a Venn diagram on the blacktop in chalk. Have students sort their objects into two groups: biotic and abiotic things based on the "Is It Biotic?" table of questions and/or the "Biotic Things, Abiotic Things" comparison list.

4. Ask students to discuss the similarities and differences in the groups. What makes something biotic or abiotic? Make sure to differentiate between things that were living and are now dead and things they were never alive.



Biotic vs. Abiotic Things

Why are we teaching biotic and abiotic?

(Wouldn't living and non-living be easier?)

Although *biotic* and *abiotic*¹ may seem like difficult words for primary students, there are reasons for their use. When we use the terms *living* and *non-living* we quickly run into problems. For example, a green leaf on a plant is living, but what is a green leaf that has just been picked? What about a brown leaf on the ground? Both are no longer living but are they really "non-living?" Are they non-living like a rock or air?

Biotic things include all things in the biosphere. They are alive or were alive. Abiotic things are all things that make up the atmosphere, hydrosphere, and geosphere. (See the figure on the previous page.) Abiotic things are (and were) never alive.

So, is a dead leaf biotic or abiotic? It is *biotic*, but it is no longer *living*. It is a dead leaf. It used to be alive. It is considered biotic until it decomposes into its abiotic parts—gases (O₂ and CO₂), water, and soil (minerals). (Biotic things are always made of abiotic things. When a biotic thing dies it rots back into its abiotic parts. This is a cycle. Abiotic things, on the other hand, do not decompose. They can crumble or get smashed, but things that were never alive cannot rot.)

In addition, using *biotic* and *abiotic* makes other concepts more straightforward. In first grade, students are asked to associate products with the raw materials. For example, wood (lumber) comes from trees (plants). Hamburger comes from cows (animals). Later, students are asked to differentiate between renewable (biotic) and non-renewable (abiotic) resources, as well as differentiate among the Earth's biosphere, atmosphere, geosphere, and hydrosphere. Being familiar with the concepts of biotic and abiotic makes these next steps more intuitive.

If you run into an object that seems difficult to classify, list its biotic and abiotic characteristics and then decide.

¹No, biotic and abiotic are not on the MAP test.

IS IT BIOTIC?	YES	NO
Does it grow?		
Can it reproduce?		
Does it need resources (air, energy, nutrients, water, and a habitat) to live?		
Can it die?		
Can it decompose (rot)?		

BIOTIC THINGS

1. **Grow.** Start off little and get bigger.
2. **Reproduce.** Have babies or make seeds.
3. **Use resources to live.**
Need a home (habitat).
Breathe (get air). Move (use energy). Eat (get energy and nutrients). Drink (get water).
4. **Live and then die.**
5. **Decompose.**

ABIOTIC THINGS

1. Do not grow. They can pile up, but they do not get bigger by growing.
2. Cannot make more of themselves. They can crumble or fall apart, but they cannot reproduce.
3. Do not need resources to live.
4. Don't live or die.
5. Abiotic things do not decompose.

What do biotic things need to live?

Air	Water
Energy	Nutrients
A Habitat	

Teacher's Notes

What Do Biotic Things Need to Live?

Place a live plant and a live animal (or pictures of each) in front of the class.

Part 1:
Ask students what an animal needs to live.

Encourage students to think about what their body is doing right now and about all the things they have to do each day to stay healthy.

Use a graphic organizer to record responses *and/or* use visual aids such as baggie with air, baggie with water, etc. Place all items such as "a place to sleep" in a category that will be called *habitat*.

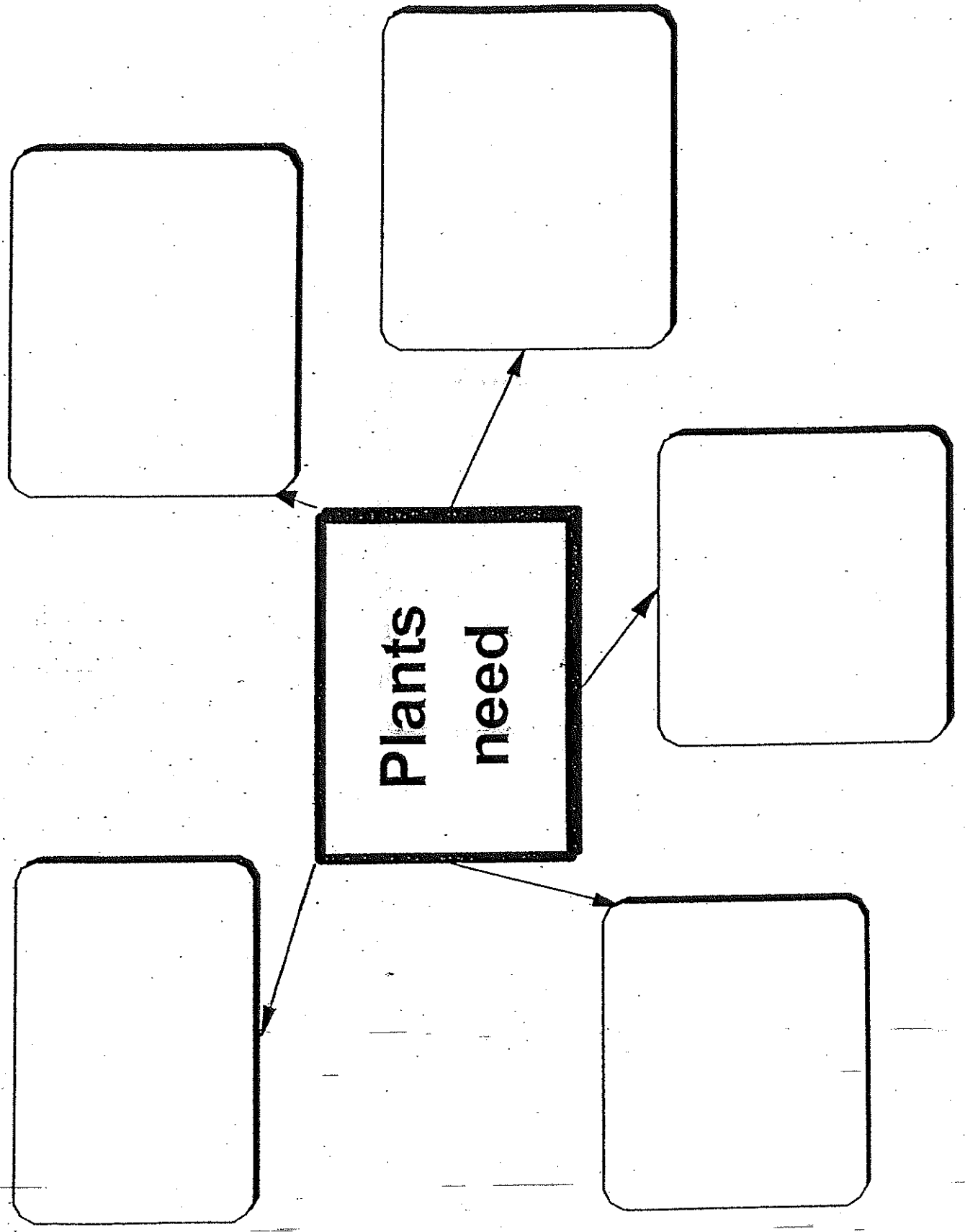
Place responses such as air, water, energy, and nutrients (or their equivalents) in their own categories.

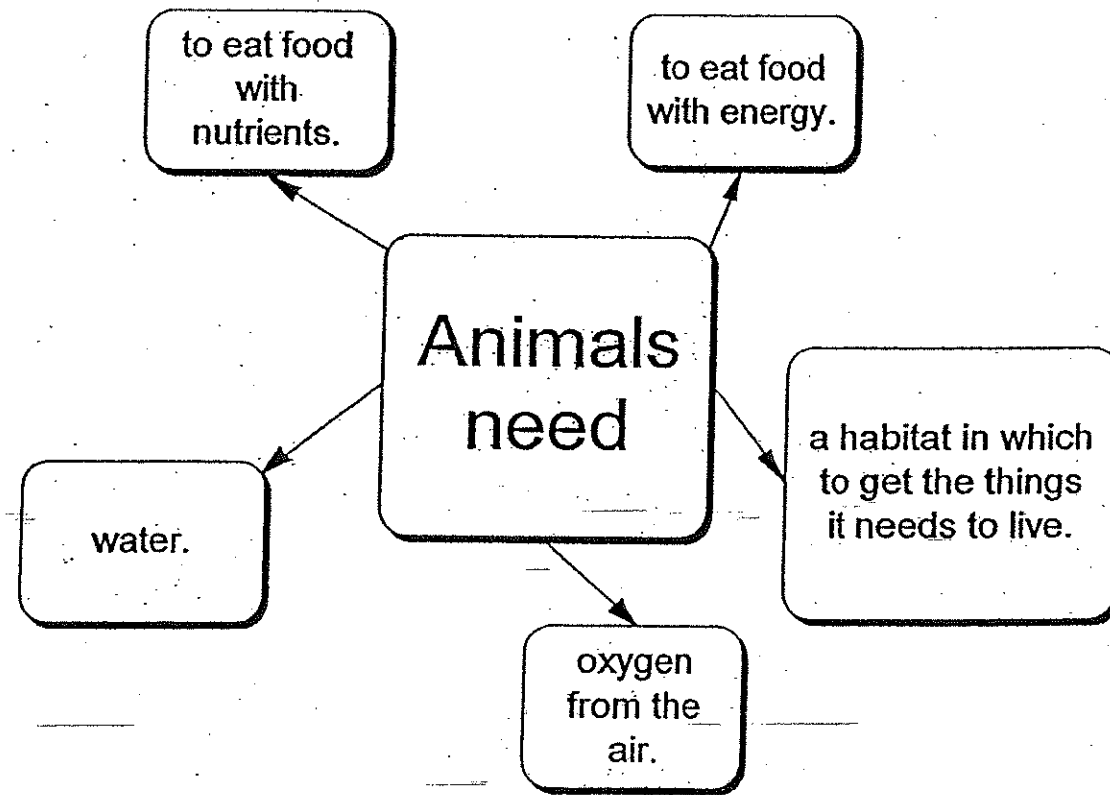
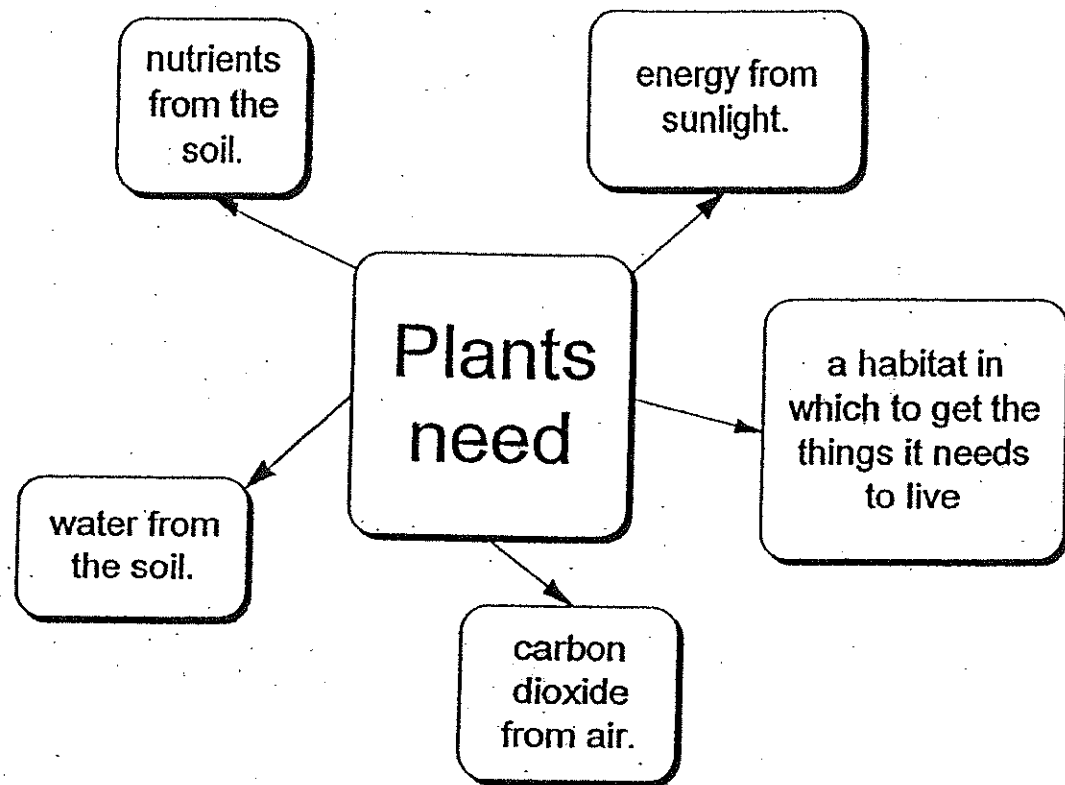
Part 2:
Ask students what a plant needs to live.

This may stump students as plants are not as familiar to them. Include all categories students created for animals. Use bags of air, soil, water, and picture of sun as props.

Use a white board marker or a crayon to draw on the laminated picture of a plant to show what happens where.

Make a new graphic organizer comparing plants and animals. Help students point out their similarities and differences.





Outdoor Education Scripture References

The King of Creation

The whole World – God our Father, King of Creation

Gen: 1:1, Psalm 24:1, Gen. 1:4, 10, 12, 18, 21, 25, 31, Psalm 33:5

The Seasons – Shows us God of Order

Acts 14:17, Gen. 1:14, Daniel 2:21, Psalm 8:3, Gen. 1:11

A God of Concern

Matt. 6:26

Stars, Trees, Mountains, Lightening – God of Majesty, Greatness, & Power

Psalm 27:4

Rainbow, Flowers, Waves Bird in Flight – God of Beauty

Matt. 6:29, Psalm 27:4

The Whole World – God's Gift to You – A God of Love

Gen. 1:28

Separated by Sin

A Stone – Symbol of the sinful heart

Rom. 2:5, Matt. 24:12, Isaiah 24:20, Ex. 15:16, Acts 7:56

The Wolf – The Birch – Symbol of Hypocrisy

Matt. 7:15, Matt. 15:7 & 8

Weeds & Thorns – Symbol of Futility of Compromise

Matt. 13:22

The lion, the Leech – Symbol of Greed

1 Peter 5:8, Prov. 30:15, Prov. 16:18

A Polluted Pond – Symbol of the Sin of Idleness

Phil. 3:14

A Hen & Her Chicks – Symbol of Sin is Separation from God

Luke 13:34

The Living Christ

An Angeworm – Symbol of incarnation of Christ

Phil. 2:6

A Stone – Symbol the Miracle of God's Redemptive Activity

1 Peter 2:4-6

A Lily – Symbol of Regeneration

Matt. 6:28, Rom. 6:4-11

Butterfly – Symbol of the Newness of Christian Life

2 Cor. 5:17

A Pile of Wood – Symbol of Restoration

Luke 15:24

Vine & Branches – Symbol Continuing Relationship With God

John 15:1-6

A Symbol of Power

The Wind – Symbol of the Attributes of the Holy Spirit

Acts 2:2

The Fire – Symbolizes Activity of the Holy Spirit

Acts 2:3, Mark 14:54, Luke 3:16, Malachi 3:2-3

The Water – Results of the Holy Spirit

Acts 2:17, John 4:14, Ezekiel 36:25-28

The Dove – Gentleness

Gen. 8:8, Matt 3:16

The Columbine – Symbol of Gifts of the Spirit

Rev. 5:12

The New Life In Christ

The Dew – Beauty, Purity, God’s Creation, Growth, Humility, Insignificance

Psalm 110:3, Deut. 32:2, Hosea 14:5

The Ant – Cooperation, Perseverance, Cleanliness, Foresight & Thrift

Prov. 30:25

Rock & Sand – Foundation of Christian Faith

Matt. 7:24-27, Eph. 4:13-16, Prov. 10:25

The Sparrow – Faith in God’s Eternal Vigilance

Matt. 10:29-31

Flowering Grass – Pointing Towards Eternal Life

Psalm 103:15

The Tent – Pointing Towards Eternal Life

Jer. 33:7-10, 2 Cor. 5:1

You mean I'm a Creature?

Chris Heaton

The Text: Genesis 1; Romans 8

Often when we hear the word “creature”, the image that is conjured up is not a positive one. The word sometimes makes people think of a monster like the one from the 1954 horror classic *the Creature from the Black Lagoon*. Other times people might think of a bug or something slimy that slithers in the sludge.

But at a most basic level, a *creature* is simply *something that is created*. While we might think of monsters or bugs, the truth is that everything is a creature. That is, everything was either created, or made by someone a Creator created. Given this understanding, *all things are creatures*—except for One—God.

“In the beginning, God created the heavens and earth.” Is the first verse in the Bible and maybe the most profound. As seen in this verse, the categories of all existence are defined. On one side there is the Creator, the One who brought something out of nothing (*ex nihilo*). On the other side is everything else, **everything else**, frogs, the moon, lettuce, human creatures, everything.

Seen in this light, the word *creature* takes on a different color. A creature is not something scary, but something *that stands in a special relationship to the Creator*. The creature obeys the Creator. The creature is under the control of the Creator. The creature is dependent upon the Creator. So this means a creature is not bad, not a monster...but “very good.” (Gen. 1:31)

However, sin entered into God's good and perfect creation. Sin corrupted and tarnished the relationship between the Creator and His creatures. Sin tarnished the creation itself. It is no longer perfect. We see this all around us in nature: storms, death, predators that stalk their prey rather than all creatures live in harmony. While God's work of beauty and perfection is detectable in nature (look at a sunset!), often nature itself can be dangerous and deadly to humans.

But God had a plan to redeem, not just the crown of His creation--man, but creation itself. In our baptism, we are made to be a *new creation* (2 Cor. 5:7—Paul actually uses the word “creature” in the Greek!). But God also will restore His creation to a better-than-new state. Paul says in Romans 8:21 that creation itself will be set free from bondage. While the creation “groans” in waiting for the full restoration at Jesus' return, we can fully live as creatures now. **That is, live in accordance with God's will—the Creators will—for His creatures.** Creatures are not monsters, or bugs, but those who stand under their Maker.

The Prayer

Father in Heaven, helps us to always see ourselves as your creatures and live lives in accordance with Your will. In Jesus name, Amen.

How the Sun Worships God and What We can Learn from It

Chris Heaton

The Text: Psalm 148

Psalm 148 is part of the five Hallelujah psalms that form a capstone, or a joyful conclusion to the entire Book of the Psalms. “Hallelujah” is from the Hebrew and can be translated “Praise the Lord”. This psalm starts from the top, that is, praise for God comes from the highest heavens, the angels, and the sun and moon. Verse five then says:

Let *them* praise the name of the Lord! For He commanded and *they were created*.

And He established them forever and ever. He gave a decree, and it shall not pass away.

Now this verse is talking about, among other luminaries, the sun. As I look at the sun (or try to!) or even the moon or the stars, the question is raised: How does the sun praise God? How does it worship its Creator?

Some may say this is poetry; the sun doesn't really “worship” God. “It can't,” they say, “The Sun is an inanimate object.” This thinking might go on to say that in poetry liberties are taken with language in order to give honor to God.

I disagree. While it is poetry, it is also reflective of the reality that even the mountains, the planets, the seas, *and even the sun are creatures*. They are created by God. And as such, they owe Him their honor and worship. So how does the sun praise?

By being the sun. By doing “sun stuff”. By warming the earth, and providing light and food for plants (see photosynthesis!). The sun is a valuable source of vitamin D which is necessary for life. The sun does these things, that is, *it does what it is created to do*. That is its praise. The sun worships its Creator by acting in accordance with its Creator's will.

Worship isn't just something we do on Sunday morning (as important as that is!), it is also seen in this way—as creatures living in accordance with the Creator. This understanding helps us to rethink our own lives on this earth. Instead of worshipping based on what we do for God, we worship God by living the way he wants us to live. We do “creature stuff”. We live to serve other creatures and His creation, the way He created us to live. We live to be fully human.

Of course, this is a problem for us. Our worship is beset with sin. We sin and fall short of any expectations our Creator has. Even though we might intend to, we live more often as creatures who are *enemies of God's creation*. But Jesus Christ died and rose from the dead, conquering sin and death and giving us eternal life. He restores our relationship with our Creator and His world. We are free from sin to serve the world and to worship Him. We can worship and praise God like the sun, by living in accordance with God's design for our lives.

The Prayer: Heavenly Father, grant us the strength to do Your will for us your creatures. Help us to worship you in Spirit and in truth. We ask this in the name of Jesus. Amen.

What the Walking Stick Tells Us about Jesus

Vicar Chris Heaton

The Text: Various ones (mainly John!)

Have you ever seen a “walking stick”? No, I’m not talking about the thing that older people sometimes use to get around, but the *order of insects* that look like a slender sticks from trees. In the Latin, they are known as the *phasmatodea* (or Phasmids), which is derived from the Greek *phasm*, meaning “apparition”. The *phasmatodeas* are so-named because their stick or leaf-like appearance enables them to be **camouflaged** from potential predators. At first glance, most walking sticks are mistaken for ordinary foliage and are overlooked. Many of these walking sticks also have a second line of defense of poisonous secretions. While they may look innocent, some may in fact be quite deadly to predators!

When I came upon one the other day, it got me thinking. This fascinating creature reminded me of Jesus. The eternal Son of God, who was in the beginning with God (John 1:1), took on human creaturely flesh, the ordinary **camouflage** of people. Like the walking stick, Jesus’ “disguise” is part of who He is—true man! And when came to save, Jesus, also true God, did so dwelling among creatures (John 1:14), mostly remaining undetected. Like the walking stick in the forest, Jesus walked on earth in a *hidden way*. This was in part so he could do the will of the Father who sent Him (John 6:38). If his true form had been visible, His work would have been impeded or interrupted. It was an *act of mercy* that Jesus was **camouflaged** from the world, for no one can see God and live (Exodus 33:20).

In other ways, like the walking stick, Jesus had secondary defenses. He is, after all, the all-powerful God of the universe! But He laid aside this power, sometimes escaping from danger through hiding and subterfuge (John 8:59). However, at other times the mere power of His name caused His attackers (=predators) to be knocked to the ground (John 18:6). However, most often when Jesus used his power, it was for healing and not for attack. During his arrest He heals Malchus’ ear after Peter had cut it off. Jesus possessed “deadly” power that could have destroyed His enemies, but His mission was for salvation and not destruction.

When I came upon the walking stick, it was not in the woods or among plants, but was attached to the front door of my house. It struck me that its **camouflage** was rendered useless stuck to the door. *The walking stick revealed itself in plain sight*. This is what reminded me most about Jesus. Even though he was clothed as true man, Jesus revealed His full glory in plain sight—on the cross. It is on Calvary that Jesus’ **camouflage** is transformed to glory: the Son of God revealed for all to see.

The Prayer: Dear Jesus, thank You for **camouflaging** your glory so that will of the Father was accomplished and our sin was paid for. Help us to always look to the cross to know about You. Amen.

CHANGE!!

Christine Dehnke

Scripture Text:

The grass withers, the flower fades, but the word of our God will stand forever. Isaiah 40:8

Change...There is constant change in nature. If you study just one plant at a nearby park or in your own yard, you will see it change with the seasons. You will witness it grow in the spring, blossom in the summer, wither in the fall, and rest during the colder days of winter.

Change...trees are such great examples of change! When a tree takes in the water through its roots and the carbon dioxide through its leaves a process called photosynthesis allows the tree to create oxygen for our air and sugar for its food. But as the days shorten and there is less sunlight, the tree begins to shut down production and the chlorophyll that causes the green in the leaves starts to fade. Then the leaf reveals the hidden beauty of color - the reds, oranges, and yellows that were not visible before.

Change...in some areas of the country there are lawns that go dormant during the winter. The grass isn't dead, but it is resting. Those types of lawns often take a bit longer to green up in the spring. When they do, the grass grows and someone – maybe you! – has to mow it to keep the lawn looking presentable.

Change...we look forward to the changes in nature! Following a hot and humid summer, we long for those cooler fall days. We might eagerly wait for the first snowfall. And after a long winter, those first crocuses that pop up through the snow bring joy and hope of spring!

We are certainly not the first to recognize the changes in nature. So many years ago, Isaiah wrote about the grass withering and the flower fading. But Isaiah wasn't just excited about the changes of nature. He made an important point when he compared the changes of nature to the Word of the Lord.

While everything on earth changes in some way, our Lord and His Word do not. That is a comfort and a confidence we have as God's people! When change is difficult – when there is family disruption or friendships fade – the Lord stays true to His word. His love never fails. His promise of salvation through Jesus does not decrease or diminish. His presence with us through all the changes does not wither or fade away, ever!

So, just as we study and delight in the changes God created in nature, as His people we study and delight in His Word that stands forever. It gives us hope. It instills us with courage. It reminds us of His love in Jesus. As He says Hebrews 4:12 – The Word of God is living and active. So not only is it unchanging – it is living! Like the plants in the garden, God's Word lives and grows within us through the power of the Holy Spirit. That's quite a point the prophet Isaiah made so long ago – one that stands true even today, and forever, unchanging.

Prayer: Dear Lord, although you do not change, you have created a world that is full of change! That was your plan. Changes in our lives are not always easy to accept, though. Help us to trust Your changeless promises and as we walk with You through the garden of life. Help us to find and embrace

the beauty of each change. Give us the confidence in your unchanging Word to trust in Jesus through whom we pray, Amen.

[Ralph Waldo Emerson – Never lose an opportunity to see anything that is beautiful. It is God's handwriting...]

Outdoor Education Devotion

Pastor Daniel Ramsey

Text: Psalm 8; Matthew 2:2

Have you ever had the chance to be out in the country on a warm night where you can lay out and look at the night sky? If you live near a city, you are missing something special. That's because there are too many lights shining around you and you cannot see nearly as many stars as you can when you are far away from any town or city lights. Even so, maybe you've seen photographs of the night sky that show just how many can be seen. In fact, one of the best things about getting out to see all those stars from the countryside are to be able to see the Milky Way. The Milky Way looks like a cloud in the sky that's been lighted-up from the inside. What it actually is are stars that are so far away that we can't see the stars themselves but there are so many of them that their light still reaches to us here on earth as a glow. That's a lot of stars!!!

If you ever get the chance to spend some time looking at the night sky, think about what King David wrote in Psalm 8. "O Lord, our Lord, how majestic is Your name in all the earth! You have set Your glory above the heavens."

As a shepherd-boy, David must have sat out many nights marveling at God's creation in the heavens as he tended his father's sheep. He may have even watched for shooting stars. Today we know that shooting stars are bits of meteorites that burn up in our atmosphere but they still look pretty awesome. And because of telescopes and the international space station we can see so much more than David did. Nevertheless David still could see that we have an awesome God.

It must have been humbling to realize that God, who made the heavens and the earth, even as small and insignificant as we may seem in all of creation, still cares about you and me. That is why David asks the question that he does in this psalm, "O Lord, our Lord, how majestic is Your name in all the earth!" He then goes on to point out that God made us as the top of His creation. He is so mindful of us (that means He's thinking of us a lot!) that on an especially starry night, one star shone brighter than all the rest to celebrate the birth of His Son into our world. He sent Jesus to save us from our sin so that we could live with Him forever in heaven. That's how much He cares for us. In fact, Jesus tells us in the Gospels that God even knows the number of hairs we have on our head (see Matthew 10:29-33). What an awesome God that we have!

Prayer: O God, we thank You for the wonders of creation and today especially for the lights that You placed in the heavens on the fourth day of creation. Your glory is even greater and higher than anything we can see and yet we know that You love us. Thank You for sending Your Son to save us and help us to take care of all that you have put us in charge of to the best of our ability. In Jesus' name, Amen.

Insignificant? Not in God's Eyes!

Pastor Glen Thomas

Text: Psalm 8: 3 When I look at your heavens, the work of your fingers, the moon and the stars, which you have set in place, 4 what is man that you are mindful of him, and the son of man that you care for him?

If you have ever had the experience of getting away from the city lights and looking up at the sky on a clear night, you have no doubt marveled at the vast expanse of stars. The moon, so bright and appearing to be so close, is actually almost 239,000 miles away. The solar system that we call home ends at about 122 astronomical units (AU) away from the sun, where one AU is 93 million miles. And the Sun is one of about 200 billion stars (maybe more) just in our Milky Way galaxy alone.

When faced with the vast expanse of the heavens, we cannot help but marvel at the God who created all of this and set it all in motion. Even without God's revelation of Himself in the Bible, we would have to conclude that there must be no limit to His power, knowledge, and intelligence. To think that He brought all of this into existence from nothing, merely by speaking the word (Gen. 1) is beyond our ability to comprehend.

The vastness of the heavens can also lead us to feel quite insignificant by comparison. Earth is but a speck compared to the vast universe. In turn, each of us is but a speck compared to the enormous size of the earth. It is easy to see why David asks an obvious question of God: What is man that you are mindful of him, and the son of man that you care for him?

Yet, amazing though it may seem to us, this all-knowing, all-powerful God is more than merely "mindful" of us. He loves each one of us with an everlasting love. That love moves Him to provide for our physical needs each and every day. Though we often fail to acknowledge it, Luther reminds us in his explanation of the First Article of the Apostle's Creed, that God "richly and daily provides me with all that I need to support this body and life." Jesus invites us to observe how God feeds the birds of the air, adorns the lilies of the field and clothes the grass of the field and assures us that we do not have to worry. This same loving God has provided and will continue to provide for us (Matt. 6:25-30). Yes, He is much more than merely "mindful" of us.

This love for us moved Him to give us special honor and glory over the creation. David says that God has made man "a little lower than the heavenly beings and crowned him with glory and honor" (v. 5). David speaks to God concerning how God has honored us by appointing us caretakers and stewards of His creation: "You have given him [man] dominion over the works of your hands; you have put all things under his feet, all sheep and oxen, and also the beasts of the field, the birds of the heavens, and the fish of the sea, whatever passes along the paths of the seas" (vv. 5-8).

Of course, the honor and glory God gave us over the creation was not enough for Adam and Eve. They succumbed to the temptation of Satan in the garden, disobeying God and bringing sin and death into God's creation. David's question would have been just as appropriate if it were on the lips of Adam and Eve following their sin: What is man that you are mindful of him, and the son of man that you care for him?

Once again, more than just mindful of His creation, God would promise One Who would crush the head of Satan. God would personally intervene in His creation and begin a new creation, made new by the blood of His Son shed on the cross. Once again, it is love that moves this all-knowing, all-powerful God to act on our behalf. As Paul wrote, “For while we were still weak, at the right time Christ died for the ungodly. For one will scarcely die for a righteous person— though perhaps for a good person one would dare even to die— but God shows his love for us in that while we were still sinners, Christ died for us” (Romans 5:6-8).

Insignificant? Not in God’s eyes. We are significant in His eyes. David’s response when considering the wonder of God’s love for us, even as seemingly insignificant as we are, is very appropriate. He opens and closes Psalm 8 with the same words: “O LORD, our LORD, how majestic is your name in all the earth! (vv. 1, 9).

Prayer: O LORD, our LORD, how majestic is your name in all the earth! We praise you for the wonder of your creation. Its vastness and beauty are beyond our ability to comprehend. Above all, we thank you for your new creation, made new in the blood of your Son, Jesus Christ. Help us, we pray, as your forgiven and redeemed people, to acknowledge your daily provision to us with thanksgiving and to be wise stewards of your creation. Amen.

“He Determines the Number of the Stars and Calls Them Each by Name” *Psalm 147:4*

Pastor John Genzsler

When sharing this devotional thought, it helps to have the following visual aids:

An adult (6 feet tall)

A large marble (or even a ping pong ball)

a tennis ball

a familiar landmark approximately 645 feet away

The sun is 864,000 miles across (in diameter). The earth is 8000 miles across (in diameter). The earth is 93 million miles from the sun. Those are really big numbers, so let's put that in terms we can see. If a 6 foot tall adult stands here to represent the sun, then the earth would be the size of a large marble (or ping pong ball) and would have to be 645 feet away [as far away as...].

The planet Neptune would be the size of a tennis ball and would be 3.65 miles away [as far away as...].

The Bible tells us in Genesis 1 that all of this God made by just saying “let it be”. He spoke the sun and the planets into being. That is one very powerful God. He created everything we know – out of nothing - simply by speaking.

On the earth, there are 7.2 billion people (as of 2015). That means for every mile between the sun and the earth, there are 78 people. How does that make you feel? Very small or unimportant?

When you feel you don't matter or no one cares, remember this – all throughout Jesus' ministry, he cared for individual people – blind people, a little girl, a friend whose brother had died, and many more. John reminds us “How great is the love the Father has lavished on us, that we should be called children of God.” *1 John 3:1*

The almighty God of the universe who spoke everything into existence cares about you and provides everything for you – food, shelter, abilities, other Christians, and most importantly a Savior. The one who made everything beyond our ability to understand cares about you and calls you by name.

Prayer:

Dear Father, thank you for all that you have done. You are so much more powerful and wonderful than we can imagine. Please forgive us when we forget that you provide for us and care about us. Thank you for making us your children and calling us by name and loving us so much that you have promised to bring us to be with you for all eternity.

In Jesus name,

Amen

“Storms of Life”

John Koren

My scout troop had a full and fun day at our scout camp. We swam, hiked, and studied the plants and animals of Eastern Iowa. We even got to see a bald eagle soaring along the river. We were tired. (At least I was.) That night, around midnight, a couple of the scouts woke me up. Thunder, lightning, and heavy rain had them scared. My first thought was to tell them to go back to their tent so I could go back to sleep. But I got up and sat with them while the storm raged.

[22] One day Jesus said to his disciples, "Let's go over to the other side of the lake." So they got into a boat and set out. [23] As they sailed, he fell asleep. A squall came down on the lake, so that the boat was being swamped, and they were in great danger.

[24] The disciples went and woke him, saying, "Master, Master, we're going to drown!"

He got up and rebuked the wind and the raging waters; the storm subsided, and all was calm.

[25] "Where is your faith?" he asked his disciples.

In fear and amazement they asked one another, "Who is this? He commands even the winds and the water, and they obey him." Luke 8:22-25

First of all, I'm not saying I'm Christ-like (I wish I were more like Him, I was just tired). The storm was raging, the boat was being tossed to and fro, and the disciples (some of whom were experienced fishermen) were panicking. And Jesus slept. They roused Him from His sleep, He woke up, told the storm to quit, and asked them "Where is your faith?"

Throughout the Bible believers have put their trust that God was with them. Moses in front of Pharaoh, David battles Goliath, Daniel in the lion's den. God was with them. He protected them and guided their ways. Their faith was in the Lord.

Where is your faith? The Lord never promised you or me there would be smooth sailing all the time. Everyone experiences storms along the way. Just as Jesus was with the disciples, He is with us. As we weather the storms of life the question always before us is "Where is your faith?"

Where is your faith? Is it in the wealth you have? Is it in your friends and family? "Trust in the Lord always and again I say trust." Even though the disciples had seen Jesus perform many miracles they still didn't trust completely. Even in the worst of times we need to never doubt whether Jesus is with us, He is.

Dear Heavenly Father, we trust that your Son is always by our side. Please help us not fear the storms of life but trust that our faith will always see us through. In His name we pray, Amen

“Trust”

Pastor Kyle Castens

Text: “Trust in the LORD with all your heart, and do not lean on your own understanding.”
Proverbs 3:5

Let’s begin by doing some math. What do you get when you add a group of 6th grade outdoor education students, a tractor tire, and some able and willing adult chaperones?

Answer: A not-so well-thought-through team building/trust exercise. It had the makings of a perfect obstacle. The set-up included a tractor tire suspended from a tree, and the goal to get every team member through without touching the tire. Easy, right? However, who goes through first? One of the students? Not quite. One 6th grader would have difficulty supporting the weight of the next ones to come through. The team conferred. An adult should go through. I volunteered? Yet, how would one adult get through a tire without touching it? We leaned upon our own understanding. What a mistake!

The team decided that the other two adults would throw me through the tire. I would soar through the tire, land safely on the other side, and get ready to start receiving the conveyer line of people. Brilliant plan, until I forgot to duck. I made contact with the tire, with my head. The quick lesson I learned when flying through a tractor tire was twofold. First, duck. Second, tractor tires hurt when they hit you in the head. Ouch!

With a smudge of black on my forehead I quickly recovered, the exercise quickly recovered, and we completed it to move on to whatever obstacle came next. It is funny today looking back at how brilliant we thought that plan was, but leaning upon our own understanding certainly had its flaws.

It is for this reason, and for so many more, that we should find absolute comfort in the 5th verse of Proverbs 3. “Trust in the LORD with all your heart, and lean not upon your own understanding.” Oh, how we so often desire to lean upon our own understanding! How we like to try to rely upon ourselves, and even try to find answers where none are to be found. We know God is good, but we try to handle things until we realize we can’t handle things. Do we simply look to God as a last resort?

The truth is our own understanding is limited. It is flawed, faulty, and full of sin. How often have you tried to depend on an understanding that has led you astray, or an understanding that was really no understanding at all?

Whereas our understanding can leave us in a heap of a mess, or simply lost, there is something so much more. The verse says, “Trust in the LORD.” How is He better than our own understanding? Witness what He has promised. “She will bear a son, and you shall call his name Jesus, for he will save his people from their sins (Matthew 1:21)”. Hear what He has said. “I am the resurrection and the life. Whoever believes in me, though he die, yet shall he live, and everyone who lives and believes in me shall never die (John 11:25-26). He always keeps His word, always fulfills His promises, and has saved us from our mess of sin; while we were yet sinners, and lost, He died for us.

Is that something you can trust in? Absolutely! He is the God who is always there. The God who died on the cross and said, "It is finished," means what He says, it is finished. All of your sin is forgiven, your debt is paid, your mess is clean, your failure to lean on him absolved.

I probably will find myself back at Outdoor Ed someday soon. I probably will be confronted with another team building/trust exercise. I probably will be a participant in leaning upon my own understanding and come up with a half-baked idea. Thank the Lord for His word in Proverbs 3:5 that my own understanding is not my strength or stay or success, but

"my hope is built on nothing less than Jesus blood and righteousness, no merit of my own I claim but wholly lean on Jesus' name. On Christ, the solid rock I stand; all other ground is sinking sand." (LSB 575, Concordia Publishing House.)

Dear Lord, Heavenly Father, we are too quick to pull out our own understanding as our best tool. Forgive us for relying on you only as a last resort. Remind us of your great love for us that you have shown by sending your Son Jesus, our Crucified Lord and Savior. Give us trust by the power of your Holy Spirit to always hold onto this truth. In Jesus name, amen.

“Fishing”

Rev. Mark A. Jennings

Goal: The deceit and trickery of sin and the devil brings only pain, guilt and death but that the truth of God found in and through Jesus brings eternal life.

There is nothing better than a great day of fishing. The thought of putting on waders and climbing into the stream early in the morning and casting to the fish is one I dream about! Of course maybe stream fishing isn't for you. If not, there are many different ways to fish. You can go to a lake and sit on the shore and throw your line in or you could go out in a boat on a lake or the ocean.

There are many different ways to fish and many different techniques you can use and master. There is fly fishing, bait fishing, casting and trolling to name a few. You see the plan is to hook fish by tricking and fooling them or making them angry so they bite and there is one thing that these methods all have in common. They all use hooks attached to a line to hook (show different hooks and sizes or maybe pics) the fish and bring it in.

Whether you use a nice fat worm (maybe have an actual night crawler!) or some kind of other bait or whether you use flies (which are not really flies, just made to look like different bugs), lures or other artificial baits (show some different kinds of lures or pics of lures) underneath them all is a hook or hooks that is meant to hook the fish. The bait or lure looks irresistible to the fish as it deceives and tricks it to bite! The hook is meant to catch the fish and hold on to it. That is why hooks have barbs on them. The barb digs in and keeps the fish hooked. So the fish bites into what it thinks is an easy meal and WHAM, it's hooked! Sounds painful!

So the fish takes the bait, bites down and is hooked and then he ends up on the dinner plate! He was tricked and deceived into biting and because of that he will die. Sound like anybody else you know? Do you know anybody else who gets tricked and deceived and then has to die?

Let's read from the book of Genesis, Genesis 3: 12-13 *“The man said, “The woman whom You gave to be with me, she gave me from the tree, and I ate.” 13 Then the LORD God said to the woman, “What is this you have done?” And the woman said, “The serpent deceived me, and I ate.”*

Hey, they are like the fish! They were deceived and took the bait and were hooked and because of that they now had to die. The devil and sin tricked them and he tries to do the exact same thing to us today. He tempts us and deceives us and tries to trick us with all sorts of bait (ask kids what kinds of things tempt them) but underneath there is a hook waiting to stick us in pain. You see anything that takes us away from God is bad. Even things that we think are good. The devil and sin will do whatever they can because they know. They know that if we focus on them and not God we will die just like they will die.

But how do we do that? How can we avoid that bait with the hook in it? Well the truth is that you can't-on your own. God provides the way through the death and resurrection of His only Son, Jesus. Through faith in Jesus brought to us in our baptisms we can live confidently that Jesus doesn't try to trick us or deceive us but brings only truth. It is that truth found in Jesus that gives us eternal life.

God doesn't disguise or try to trick us or try to make us bite like a fish does. Instead like a gentle net God gathers us to Him through the pain and death that His only Son took for us! Matthew 13: 47-48, *"Once again, the kingdom of heaven is like a net that was let down into the lake and caught all kinds of fish. 48 When it was full, the fishermen pulled it up on the shore. Then they sat down and collected the good fish in baskets, but threw the bad away.* Because Jesus died on the cross for all, all who believe will never die but have eternal life living in His truth with God forever!

Jesus answered, "I am the way and the truth and the life. No one comes to the Father except through me. 7 If you really know me, you will know my Father as well. From now on, you do know him and have seen him." John 14: 6-7. If we fall to temptation and bite that hook we will be like a fish wiggling on a hook headed for the frying pan but if we trust and have faith in the truth of Jesus we are guaranteed to live with Him forever and be forgiven for our sins and we are released to share with others this good news! Alleluia, amen!

“God’s Power”

Matthew Springer

Psalm 93

1 The Lord reigns; He is robed in majesty;
The Lord is robed; He has put on strength as His belt.
Yes, the world is established; it shall never be moved.
2 Your throne is established from of old;
You are from everlasting.
3 The floods have lifted up, O Lord,
The floods have lifted up their voice;
The floods lift up their roaring.
4 Mightier than the thunders of many waters,
Mightier than the waves of the sea,
The Lord on high is mighty!
5 Your decrees are very trustworthy;
Holiness befits your house,
O Lord, forevermore.

In the name of the Father, and of the Son, and of the Holy Spirit...

This psalm can easily be broken into three sections. In the first, verses 1 and 2, the Lord is praised with words that describe Him. He reigns, He is majestic, He puts on strength as His belt. You are witnesses of these things. You know that God Himself has created all that we have seen today; from the power of the Sun providing all the world’s energy, to the soaring birds, to the chirping of the frogs seeking to make more frogs, to the beauty of the undulating hills...God has made it all.

God does not need us to say, “Wow, that’s really cool.” He is just as powerful, strong, and majestic without our acknowledgement. It’s just the way God is.

In the second section, verses 3 and 4, we are reminded of the devastation of floods. Certainly floods can wreak havoc on God’s creation. We hear of many stories about the destructive power of flood waters.

However, we mustn’t forget that the psalms are poetry, and the author is probably thinking more of floods as a metaphor for the devastation of sin on the world. We have all experienced it. We destroy the creation God has given us instead of taking care of it. We ruin the relationships God has blessed us with by mistreating others. At times we don’t even have an appreciation for ourselves and the fact that God has made us unique and marvelous creatures capable of amazing feats.

This is our fault. The floods are the sins that mar even our proper understanding of God as stated in the first two verses. But it is also not the end of the psalm. Verses 4 and 5 remind

us that God is the solution for the sinful flood. God is mighty. God is trustworthy. God is holy forever.

In His might, He has defeated sin and death through Jesus Christ. We celebrate that fact on Easter Sunday. In His trustworthiness, we can have faith that when He says sins are forgiven, they really are. In His holiness, He does not wish for us to languish in our sins, but rather seeks to make us holy. Thanks be to God for His power and salvation in our Savior, Jesus.

“Creation”

Matthew Springer

Text: Genesis 1:1-10; John 1: (included in devotion text)

On December 21, 1968, three American men were launched into space as Apollo 11. The mission of Apollo 11 was to go to the moon, orbit it, and return safely to Earth. These men were to pave the way for the first moon landing by testing the systems that would get astronauts there and return them.

Because of the outline of the mission, the Apollo 11 astronauts, Frank Borman, James Lovell, and William Anders became the first humans to: leave Earth orbit, travel to the Moon, see the entire sphere of the Earth, see the far side of the Moon, and watch the Earth rise over the Moon’s horizon as they orbited.

Now, imagine yourself in their position, traveling at almost 36,000 feet/second in a metal container slightly larger than a school’s storage closet. You are crossing more than 200,000 miles of empty space with just that metal shell protecting you from the deadly emptiness. You might be nervous or afraid. You might even become filled with pride that YOU were the one brave enough to be chosen for the job.

Because of the launch date of December 21, these men were in orbit around the moon on Christmas Eve. The three were to make a brief television transmission back to the people on Earth. It became the most watched television broadcast up to that time. Here is what they had to say:

Bill Anders:

"We are now approaching lunar sunrise, and for all the people back on Earth, the crew of Apollo 8 has a message that we would like to send to you."

"In the beginning God created the heaven and the earth.

‘And the earth was without form, and void; and darkness was upon the face of the deep.

‘And the Spirit of God moved upon the face of the waters. And God said, Let there be light: and there was light.

‘And God saw the light, that it was good: and God divided the light from the darkness.'"

Jim Lovell:

"And God called the light Day, and the darkness He called Night. And the evening and the morning were the first day.

‘And God said, let there be a firmament in the midst of the waters, and let it divide the waters from the waters.

‘And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament: and it was so.

'And God called the firmament Heaven. And the evening and the morning were the second day.'"

Frank Borman:

"And God said, Let the waters under the heaven be gathered together unto one place, and let the dry land appear: and it was so.

'And God called the dry land Earth; and the gathering together of the waters called He Seas: and God saw that it was good.'"

"And from the crew of Apollo 8, we close with goodnight, good luck, a Merry Christmas – and God bless all of you, all of you on the good Earth."

These men of faith witnessed of the creative power of God and the amazing order with which He empowered it. Unfortunately, as we know, things were not to remain as good as they were on those days of creation; sin would eventually enter and destroy the perfection God intended it to have.

Today we are beginning an exploration of creation. Like the astronauts, we will be looking at creation from a new perspective. We will see the amazing organization of food chains, the intricate design of living organisms, and the beauty God has given our Earth. We will also see how sin introduced death and imperfection to the previously perfect creation.

But there's one more thing. In John 1:1-2 we are reminded of this: "In the beginning was the Word, and the Word was with God, and the Word was God. He was with God in the beginning. Through him all things were made; without him nothing was made that has been made. In him was life, and that life was the light of all mankind."

God created all things with a Word. That Word, the power behind creation, is Jesus Christ Himself. The power behind creation is the same power that has forgiven you in baptism; That Word is the same one that loves and continues to forgive you every day. You can be as sure of forgiveness as you are of the Earth and creation that surrounds you. So, look around, enjoy the blessings of creation and your new life in Christ!

Prayer: O God, we thank you for making and preserving us, the Earth, and all creation. Help us to see your goodness in our surroundings as we study what you have made. We especially thank you for sending Jesus, the Word, to pay for sin in our place. Fill us with thankfulness, so that we may serve you during our time on Earth. In Jesus' name, Amen.

Population Bean Density

CHANGING POPULATIONS

I. Materials

- a. 4 bags of common beans; the beans from three bags spray painted red, green, or yellow; the fourth bag unpainted
- b. styrofoam cups; one for each student
- c. plastic eating utensils (forks, spoons, and knives); for a class of 30, you need about 15 of each

II. Pre-activity Preparation

- a. Spray paint the beans. This can be done by spreading the beans on a newspaper, and using quick drying enamel spray paint, apply one coat. After the first coat dries, shake the paper such that the most of the bean turn over, and apply a second coat. Doing this 3 - 5 times will give fairly good results.
- b. In a grassy area 3 to 5 meters square, randomly distribute 500 beans of each color; red, green, yellow, and white (natural).

III. Procedure

- a. Introduce the activity. The students in the class will be predators, and will try to capture as many prey (beans) as possible.
- b. Discuss the characteristics of the prey (bean) population. The population is composed of individuals which have natural variation in their color.
- c. Assign feeding mechanisms to each student. Approximately 1/4 of the students will be assigned a spoon, 1/4 a fork, 1/4 a knife, and 1/4 can use their fingers. Explain that the predator population has variation in the type of feeding mechanism each uses, i.e., fork, spoon, knife, or fingers. All predators have the same kind of mouth, the styrofoam cups.
- d. Describe the rules:
 - 1) The prey must be picked-up with the feeding mechanism only, and deposited in the mouth (cup).
 - 2) The prey can not be pushed or scraped into the cup, but must be picked-up.
 - 3) You may dash in and grab the prey being captured by another predator. Competition is a characteristic of natural populations.
 - 4) A strict time limit will be maintained, no eating after time is up.

All survivors Double in population.

- e. Perform first feeding. Show predators approximate location of the range of the prey. Have them line up away from the range so that each predator has an equal opportunity. Allow about 3 to 5 minutes for the first feeding episode, depending upon the age of the students.
- f. Return to the class and have each student count the number of prey (beans of each color) collected. Add up the class total number of each color prey for each predator feeding mechanism and fill-in table 1.
- g. Calculate the number of survivors remaining in the habitat by subtracting the number of prey captured from the initial population size (500).
- h. Reproduce the prey population by "reseeding" the habitat with a number equal to the size of the surviving population. This becomes the second generation. Fill in Table 2.
- i. Determine surviving predators. The predators that caught the fewest prey (bottom 25%) did not survive. Their feeding strategies are eliminated from the population, and the students are reassigned other strategies of the more successful predators. Fill in table 3.
- j. Second, third, and fourth feeding; repeat steps e-i as time permits.
- k. Graph the predator and prey population sizes for each generation.
- l. Discuss results.

IV. Concepts

- a. camouflage
- b. adaptation
- c. natural selection
- d. predator/prey relationships

Note: This activity can be done with any age group. With younger children, it would not be necessary to have more than one feeding episode. Then the class can discuss why it was harder to find the green beans, and the concept of camouflage can be introduced. The activity can also be used to introduce the concept of adaptation, and as well as natural selection and predator-prey relationships.

TABLE 1

FIRST GENERATION

Number Killed

	Red	Green	BROWN	White
Spoons				
Forks				
Knives				
Initial Population Size				
Total Kills				
Survivors				

SECOND GENERATION

Number Killed

	Red	Green	BROWN	White
Spoons				
Forks				
Knives				
Initial Population Size				
Total Kills				
Survivors				

THIRD GENERATION

TABLE 1 (cont.)

Number Killed

	Red	Green	BROWN	White
Spoons				
Forks				
Knives				
Initial Population Size				
Total Kills				
Survivors				

FOURTH GENERATION

Number Killed

	Red	Green	BROWN	White
Spoons				
Forks				
Knives				
Initial Population Size				
Total Kills				
Survivors				

Table 2

Prey Population Generations	Red	Green	BROWN	White
1				
2				
3				
4				

Table 3

Predator Generations	Forks	Spoons	Knives
1			
2			
3			
4			

1. What did you learn about population growth, density, diversity...etc. ?
2. What did you learn about predators and prey?
3. Why will only the strong survive in a population?
4. How are adaptations helpful to prey?
5. How do adaptations help predators?
6. Did you enjoy this activity on population?

Bug - 0 -lympics

<u>Habitat</u>	<u>Adaptations</u>	<u>Scientific Name</u>	<u>Diurnal or Nocturnal</u>
<i>Soil</i> <i>Trees</i> <i>Animals</i> <i>Stream</i>	<i>Mimicry</i> <i>Camouflage</i> <i>Bioluminescence</i> <i>Movement</i>	<i>Latin-Two Names</i> <i>Genus & Species</i> <i>Usually reflects something about its anatomy, behavior, food habits, etc....</i>	<i>Active in the day or at night</i>
<u>Leg Type</u>	<u>Mouth Type</u>	<u>What does it eat?</u>	<u>Prey/Predator</u>
<i>Walking-Walkingstick</i> <i>Swimming-Water</i> <i>Boatman, Giant Water Bug, Backswimmers</i> <i>Jumping-</i> <i>Grasshoppers, crickets, fleas, katydids</i> <i>Digging- Mole crickets, cicada nymphs</i> <i>Running-Cockroaches, tiger beetles, ground beetles</i> <i>Grasping- Preying Mantis</i>	<i>Chewing</i> <i>Sponging</i> <i>Piercing-sucking</i> <i>Siphoning</i>	<i>Leaf matter</i> <i>Blood</i> <i>Nectar</i> <i>Plant Sap</i> <i>Wood</i> <i>Clothes</i> <i>Animal matter</i>	
<u>Color</u>	<u>Communication</u>		
<i>Camouflaged – to blend in and hide from predators</i> <i>Colorful – to show their presence</i>	<i>Pheromones</i> <i>Light</i> <i>Sound</i> <i>Color</i>		

Communication of Insects

Method	Structure Used	Function	Insect
Light	Light producing organ at end of abdomen	Attract mates	Fireflies
Sound	File on one wing rubbed against scraper on the other wing	Attract mates. Protect territory	Crickets
	Abdomen tapped against wood	Attract mates	Stoneflies
	Head banged against the wall nest	Warn of danger	Soldier termites
Color	Red, Black, orange or yellow	Warn of danger	Bees, wasps, and hornets

Body Parts of Insects

Insects have a head, thorax, and abdomen. The head has eyes, a mouth, and antennae. The thorax (chest) has legs and wings. The abdomen (belly) has an ovipositor if it is a female.

Abdomen-*The abdomen of insects is often the largest region. The abdomen usually has 9 or 10 segments or rings.*

Antenna-*Insects have two antennae either in front of or between the eyes. The shape of the insects' antenna varies. This difference helps us identify different insects.*

Compound Eye-*Most insects have two compound eyes. They are called compound because each eye is made up of many individual lenses.*

Head-*The head of insects is like an upside down bowl. The compound -eyes and antenna sit on top or on the sides of the bowl. The mouth parts are found on the underside of the bowl.*

Leg-*An insect's leg has several parts. The parts have unusual names. The coxa attaches the leg to the body. The tiny trochanter joins the coxa to the femur. Following the femur is the tibia, which is often long and slender. The tarsus, on the end of the tibia, has small segments and ends in the pretarsus. The pretarsus has claws and a pad between the claws.*

Spiracle-*Insects breath through small holes on the side of the thorax and abdomen. These holes are spiracles. There are two pairs on the thorax and eight pairs on the abdomen in most insects.*

Thorax-*The thorax is the middle body region between the head and the abdomen. The thorax is divided into three segments. Each segment has a pair of legs. If there are two pairs of wings, they are on the last two segments of the thorax. If there is only one pair of wings, it is located on the middle segment of the thorax.*

Tympanum-*The tympanum helps insects hear. You'll find it on each side of the first segment of the abdomen in grasshoppers. In crickets, the tympanum is on the inside of the front legs. Not all insects have a tympanum.*

Who Needs An Entomologist?

Police - Working with forensic entomologists, use insects to offer clues in criminal investigations.

Doctors - need insect information to help people with insect-carried diseases.

Homeowners - need entomologists to help prevent damage to homes and plants.

Teachers - use insects in the classroom to teach about living things.

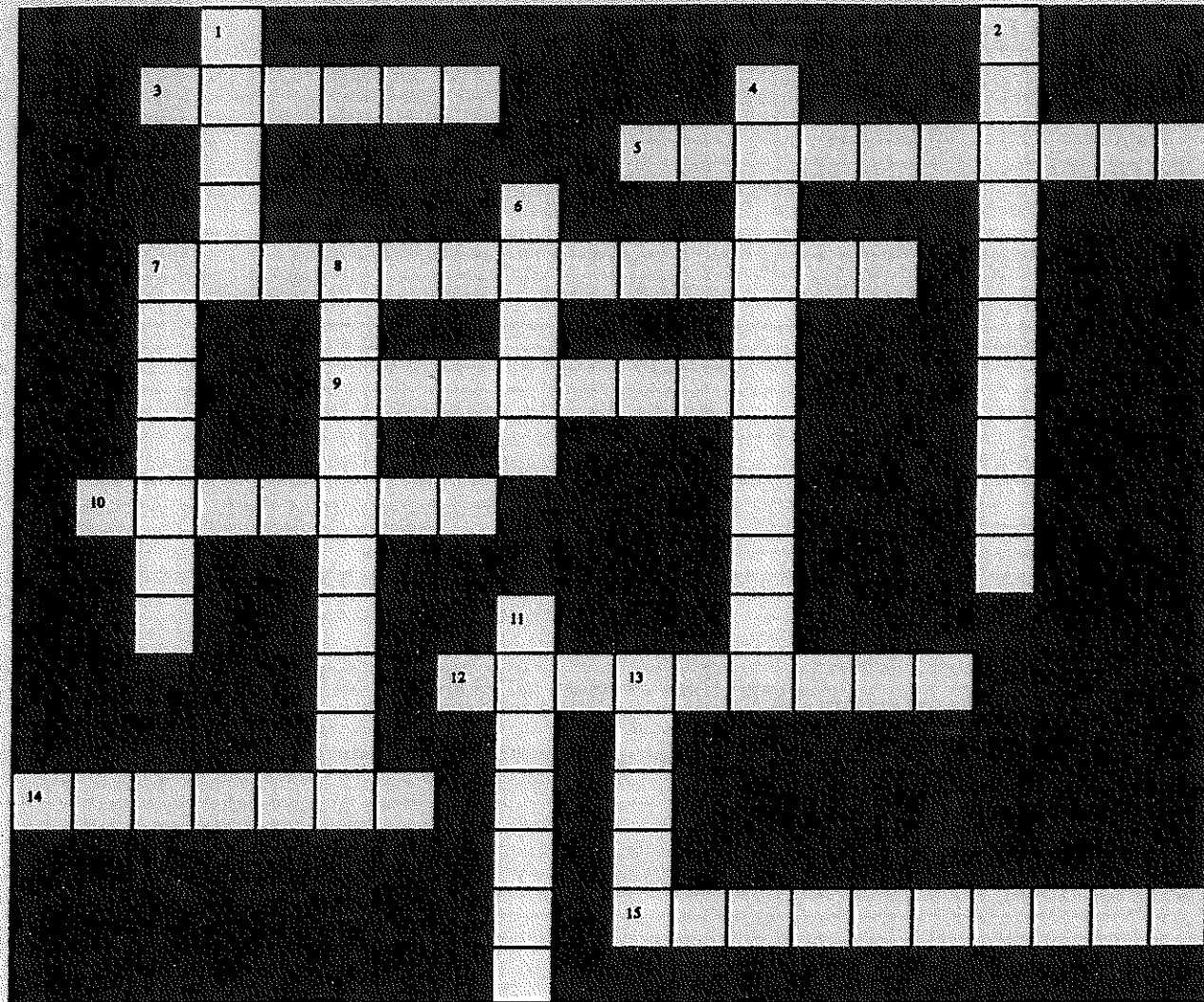
Farmers - must understand insect biology to prevent insects from damaging crops.

Writers - create fascinating stories about insects to educate and entertain us.

Military - study exotic insects and the diseases they carry.

Everyone - You need to know about insects because they are everywhere in your world!

INSECT CROSSWORD PUZZLE



ACROSS

3. The body part that is between the head and the abdomen.
5. A person that studies how insects are named and grouped.
7. Changes in the shape and habits of an insect as it grows into an adult.
9. An insect's "feelers".
10. The place where an insects lives.
12. Some insects fertilize or _____ plants.
14. When an insect is in an inactive state it is considered to be _____.
15. This group of animals has jointed legs and hardened bodies and includes insects.

DOWN

1. An insect has _____ pairs of legs.
2. When an insect has a certain color or pattern that lets it blends into the background.
4. External skeleton.
6. A group of related insects which may include many families.
7. To travel from one place to another, usually for the winter.
8. A special shape or body part that helps the insect survive.
11. An insect's legs are _____.
13. The young form of an insect is known as a nymph or _____.

Unscramble These Insects

1. Everywhere a _____ goes, it leaves germs. l y f
2. _____ make wax and honey and live in hives. e b s e
3. _____ feed off the blood of many animals, including cats, dogs and even humans. e s l f a
4. _____ eat wood. s t m e i r e t
5. You might see a _____ after dark, because it glows. y f r e i l f
6. _____ are red or yellow in color, have 2-24 black spots and eat aphids. g s d y a u l b
7. _____ begin their lives as caterpillars. t f u i e b e t l r s
8. _____ usually live near freshwater streams and ponds and eat mosquitoes. o n g f s i r a d l e
9. _____ are well camouflaged as twigs or sticks. i w s k l a t g k n c s i
10. _____ resemble a leaf and their song slows down as the temperature gets colder. i a t k s d y d
11. _____ live in colonies, build hills and always enjoy a good picnic lunch. s a t n
12. _____ live everywhere people do, and if you don't wear insect repellent their bite will cause an itchy red bump. u s m o q s t i e o
13. _____ are usually black or brown in color, resemble a grasshopper and chirp. k t c e s r c i
14. _____ are known to sting, have wings and pollinate flowers. p s w a s
15. _____ may be found on human's heads and cause itching. c e l i

Where I'm From: Inviting Students' Lives Into the Classroom

WHERE I'M FROM

I am from clothespins,
from Clorox and carbon-tetrachloride.
I am from the dirt under the back porch.
(Black, glistening
it tasted like beets.)
I am from the forsythia bush,
the Dutch elm
whose long gone limbs I remember
as if they were my own.

I am from fudge and eyeglasses,
from Imogene and Alafair.
I'm from the know-it-alls
and the pass-it-ons,
from perk up and pipe down.
I'm from He restoreth my soul
with a cottonball lamb
and ten verses I can say myself.

I'm from Artemus and Billie's Branch,
fried corn and strong coffee.
From the finger my grandfather lost
to the auger
the eye my father shut to keep his sight.
Under my bed was a dress box
spilling old pictures,
a sift of lost faces
to drift beneath my dreams.
I am from those moments —
snapped before I budded —
leaf-fall from the family tree.

— George Ella Lyon

I remember holding my father's hand as he read my story hanging on the display wall outside Mrs. Martin's third-grade classroom on the night of Open House. I remember the sound of change jingling in Dad's pocket, his laughter as he called my mom over and read out loud the part where I'd named the cow "Lena" after my mother and the chicken "Walt" after my father. It was a moment of sweet joy for me when my two worlds of home and school bumped together in a harmony of reading, writing, and laughter.

In my junior year of high school, I skipped most of my classes, but each afternoon I crawled back through the courtyard window of my English class. There were no mass assignments in Ms. Carr's class: She selected novels and volumes of poetry for each student to read. Instead of responding by correcting my errors, she wrote notes in the margins of my papers asking me questions about my home, my mother, my sister who'd run away, my father who'd died three years before.

These two events from my schooling capture part of what the editors of *Rethinking Our Classrooms: Teaching for Equity and Justice* (1994) meant when we encouraged teachers to make students feel "significant" in our classrooms:

The ways we organize classroom life should seek to make children feel significant and cared about — by the teacher and by each other. Unless students feel emotionally and physically safe, they won't share real thoughts and feelings. Discussions will be tinny and dishonest. We need to design activities where students learn to trust and care for each other. Classroom life should, to the greatest extent possible, pre-figure the kind of democratic and just society we envision, and thus contribute to building that society. Together students and teachers can create a "community of conscience," as educators Asa Hilliard and George Pine call it.



Image Productions

Mrs. Martin and Ms. Carr made me feel significant and cared about because they invited my home into the classroom. When I wrote and included details about my family, they listened. They made space for me and my people in the curriculum.

In my classrooms at Jefferson High School, I've attempted to find ways to make students feel significant and cared about as well, to find space for their lives to become part of the curriculum. I do this by inviting them to write about their lives, about the worlds from which they come. Our sharing is one of the many ways we begin to build community together. It "prefigures" a world where students can hear the home language from Diovana's Pacific Islander heritage, Lurdes' Mexican family, Oretha's African-American home, and my Norwegian roots, and celebrate without mockery the similarities as well as the differences.

Sometimes grounding lessons in students' lives can take a more critical role, by asking them to examine how they have been shaped or manipulated by the

media, for example. But as critical teachers, we shouldn't overlook the necessity of connecting students around moments of joy as well.

I found a poem by George Ella Lyon in *The United States of Poetry*¹ that I use to invite my students' families, homes, and neighborhoods into the classroom (see page 18).

Lyon's poem follows a repeating pattern, "I am from . . ." that recalls details, evokes memories — and can prompt some excellent poetry. Her poem allows me to teach about the use of specifics in poetry, and writing in general. But the lesson also brought the class together through the sharing of details from our lives and lots of laughter and talk about the "old ones" whose languages and traditions continue to

**As critical teachers,
we shouldn't
overlook the
necessity of
connecting
students around
moments of joy.**

¹ *The United States of Poetry* (see reference) is a book and a video. *The United States of Poetry* introduces students to political poetry as well as to some old and new poets from diverse racial and social backgrounds. The video uses a music video format and demonstrates performance poetry. I use both the book and video with my high school students. Most of the pieces are more appropriate for older students, but some pieces, like "Where I'm From," could be used with elementary students as well.

permeate the ways we do things today.

Teaching Strategy:

1. After students read the poem out loud together, I note that Lyon begins many of her lines with the phrase, "I am from." I remind the class of William Stafford's advice to find a hook to "link the poem forward" through some kind of device like a repeating line, so the poem can develop a momentum. I suggest they might want to use the line "I am from" or create another phrase that will move the poem.
2. We go line by line through the poem. I ask students to notice the details Lyon remembers about her past. After we read, I ask students to write lists that match the ones in Lyon's poem and to share them out loud. This verbal sharing

I AM FROM SOUL FOOD AND HARRIET TUBMAN

By Lealonni Blake

I am from get-togethers
and Bar-B-Ques
K-Mart special with matching shoes,
baseball bats and BB guns,
a violent family is where I'm from.

I am from "get it girl!"
and "shake it to the ground."
From a strict dad named Lumb
sayin' "sit yo' fass self down."

I am from the smell of soul food
cooking in Lelinna's kitchen.
From my Pampa's war stories
to my granny's cotton pickin'.

I am from Kunta Kinte's strength,
Harriet Tubman's escapes,
Phyllis Wheatley's poems,
and Sojourner Truth's faith.

If you did family research,
and dug deep into my genes,
you'll find Sylvester and Ora, Geneva and Doc,
My African Kings and Queens.
That's where I'm from.

sparks memories and also gives us memories to share as we make our way through the lesson:

- Items found around their home: bobby pins or stacks of newspapers, grandma's teeth, discount coupons for a Mercedes. (They don't have to tell the truth.)
 - Items found in their yard: broken rakes, dog bones, hoses coiled like green snakes. (I encourage them to think of metaphors as they create their lists.)
 - Items found in their neighborhood: the corner grocery, Mr. Tate's beat up Ford Fairlane, the "home base" plum tree.
 - Names of relatives, especially ones that link them to the past: Uncle Einar and Aunt Eva, Claude, the Christensen branch.
 - Sayings: "If I've told you once. . . ." (The students have a great time with this one. They usually have a ready supply that either brings me back to childhood or makes me want to steal their families' lines.)
 - Names of foods and dishes that recall family gatherings: lutefisk, tamales, black-eyed peas.
 - Names of places they keep their childhood memories: Diaries, boxes, underwear drawers, inside the family Bible.
3. We share their lists out loud as we brainstorm. I encourage them to make their piece "sound like home," using the names and language of their home, their family, their neighborhood. The students who write vague nouns like "shoes" or "magazines" get more specific when they hear their classmates shout out, "Jet," "Latina," "pink tights crusted with rosin." Out of the chaos, the sounds, smells, and languages of my students' homes emerge in poetry.
 4. Once they have their lists of specific words, phrases, and names, I ask them to write. I encourage them to find some kind of link or phrase like "I am from" to weave the poem together, and to end the poem with a line or two that ties their present to their past, their family history. For example, in Lyon's poem, she ends with "Under my bed was a dress box / spilling old pictures. . . . I am from those moments"
 5. After students have written a draft, we "read around." (See page 14 for a detailed description of this activity.) This is an opportunity for students to feel "significant and cared about," in

²William Stafford, Oregon's poet laureate for many years, published many outstanding books of poetry as well as two wonderful books on writing: *Writing the Australian Crawl* and *You Must Revise Your Life*. See references.

I AM FROM PINK TIGHTS AND SPEAK YOUR MIND

By Djamila Moore

I am from sweaty pink tights encrusted in rosin
bobby pins
Winnie-the-Pooh
and crystals.

I am from awapuhi ginger
sweet fields of sugar cane
green bananas.

I am from warm rain cascading over
taro leaf umbrellas.
Crouching beneath the shield of kalo.

I am from poke, brie cheese, mango,
and raspberries,
from Marguritte
and Aunty Nani.

I am from speak your mind
it's o.k. to cry
and would you like it if someone did that to you?

I am from swimming with
the full moon,
Saturday at the laundromat,
and Easter crepes.

I am from Moore and Cackley
from sardines and haupia.
From Mirana's lip Djavan split,
to the shrunken belly
my grandmother could not cure.

Seven diaries stashed among
Anne of Green Gables.
Dreams of promises
ending in tears.
Solidifying to salted pages.

I am from those moments of
magic
when life remains a
fairy tale.

the words of *Rethinking Our Classrooms*, as they share their poems.

6. Seated in our circle, students read their poems. After each student reads, classmates raise their hands to comment on what they like about the piece. The writer calls on his/her classmates and receives feedback about what is good in the poem. I do stop from time to time to point out that the use of a list is a technique they might "borrow" from their peer's poem and include in their next poem or in a revision. I might note that the use of Spanish or home language adds authenticity to a piece and ask them to see if they could add some to their poem. After a few read-around sessions I can spot writing techniques that students have "borrowed" from each other and included in their revisions or in their next piece: dialogue, church sayings, lists, exaggeration.

"Where I'm From" is an opening lesson in a year of critical teaching. As we create schools and classrooms that are "laboratories for a more just society than the one we now live in," we need to remember to make

our students feel significant and cared about. These kinds of lessons keep me going, too. When the gray days of budget cuts, standardized tests, school restructuring plans gone awry, and kid-bashing talk in the teacher room pile up one after another like layers of old newspapers on your back porch, pull out George Ella Lyon's poem and invite the stories and voices of your students into the classroom. ■

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- Stafford, William. *Writing the Australian Crawl*. Ann Arbor, MI: University of Michigan Press, 1978.
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Where I'm From

--George Ella Lyon

I am from clothespins,
from Clorox and carbon-tetrachloride.
I am from the dirt under the back porch.
 (Black, glistening,
 it tasted like beets.)
I am from the forsythia bush
 the Dutch elm
whose long-gone limbs I remember
as if they were my own.

I'm from fudge and eyeglasses,
from Imogene and Alafair.
I'm from the know-it-alls
 and the pass-it-ons,
from Perk up! and Pipe down!
I'm from He restoreth my soul
 with a cottonball lamb
and ten verses I can say myself.

I'm from Artemus and Billie's Branch,
fried corn and strong coffee.
From the finger my grandfather lost
 to the auger,
the eye my father shut to keep his sight.

Under my bed was a dress box
 spilling old pictures,
 a sift of lost faces
to drift beneath my dreams.
I am from those moments--
snapped before I budded --
leaf-fall from the family tree.

Where I'm From

I am from _____ (*specific ordinary item*)

From _____ (*product name*) and _____ (*product name*).

I am from the _____ (*home description – 2 story house, ranch house...*)

_____ (*adj.*), _____ (*adj.*), _____ (*sensory detail – smells like, tastes like, sounds like...etc.*)

I am from the _____ (*plant, flower, or natural item*),

The _____ (*plant, flower, or natural item*),
_____ (*description of natural item – soft, green, fragrant...*)

I'm from the _____ (*family description – 5 brothers and sisters, close-knit.*)

And _____ (*family trait – tallness, blonde hair....*),

From _____ (*name of family member*) and _____ (*another name*).

I'm from the _____ (*description of family member – loving, caring..*)

And _____ (*another description of family member – loving, caring..*)

From _____ (*something you were told as a child*) and
_____ (*something you were told as a child*).

I'm from _____ (*description of God*) and
_____ (*description of God*).

I'm from _____ (*place of birth/family ancestry*), _____
and _____ (*two food items representing your family*).

From the _____

(Specific one line story about a specific family member)

And _____ (*another detail of a family member*).

I am from those moments!

VOYAGE OF LEARNING PROJECT DESIGN

Expectations: It is expected that this project will be designed in a collaborative manner with all members of the group participating and consenting to the final product.

Project Design Outline

Each project design will include the following five areas:

I. What Do You Want Students to Learn and How Will You Know They Have Done So?

General objective:

Content objective:

Behavioral Objective:

Related Extension Activity or Service Project:

II. Site Description

Description of Terrestrial Features:

Description of Aquatic Features:

Major Biotic Communities Present:

Significant History of Site:

Knowledgeable Experts or Information Sources:

III. Why This Site Is Important or Special

Why the site was chosen:

How the site relates to the lessons learned in the first part of the course:

Any evocative or reflective potential of the site for promoting stewardship of the Park:

IV. Example of Approach to be Taken With Your Class

Theme within academic discipline, or

Theme integrating two or more subject areas, or

Interdisciplinary theme integrated in classroom curriculum, pre and post park activities, correlated to standards.

V. Specific Activities to be Used

Descriptive titles for two specific activities to be carried out at the site:

Two lesson plan outlines for the above activities with procedure steps for doing the activities:

Activity 1:

Activity 2:

Sources of related material, information and reference citations:

Nature Meditations:

Our land is more valuable than your money. As long as the sun shines and the waters flow, this land will be here to give life to men and animals; therefore, we cannot sell this land. It was put here for us by the Great Spirit and we cannot sell it because it does not belong to us.

Anonymous, *Blackfoot chief (c. 1880)*

Nature is just enough; but men and women must comprehend and accept her suggestions.

Antoinette Brown Blackwell (1825 - 1921)

In all things of nature there is something of the marvelous.

Aristotle (384 BC - 322 BC), *Parts of Animals*

Nature does nothing uselessly.

Aristotle (384 BC - 322 BC), *Politics*

Real freedom lies in wildness, not in civilization.

Charles Lindbergh (1902 - 1974)

Art is born of the observation and investigation of nature.

Cicero (106 BC - 43 BC)

Nature herself makes the wise man rich.

Cicero (106 BC - 43 BC)

The materials of wealth are in the earth, in the seas, and in their natural and unaided productions.

Daniel Webster (1782 - 1852), *Remarks in the Senate, march 12, 1838*

My mission is to create a world where we can live in harmony with nature.

Jane Goodall (1934 -)

People say to me so often, 'Jane how can you be so peaceful when everywhere around you people want books signed, people are asking these questions and yet you seem peaceful,' and I always answer that it is the peace of the forest that I carry inside.

Jane Goodall (1934 -)

Climb the mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop away from you like the leaves of Autumn.

John Muir (1838 - 1914), *Our National Parks, 1901*

Come to the woods, for here is rest. There is no repose like that of the green deep woods. Here grow the wallflower and the violet. The squirrel will come and sit upon your knee, the logcock will wake you in the morning. Sleep in forgetfulness of all ill. Of all the upness accessible to mortals, there is no upness comparable to the mountains.

John Muir (1838 - 1914), *Atlantic Monthly, January 1869*

Everybody needs beauty as well as bread, places to play in and pray in, where nature may heal and give strength to body and soul alike.

John Muir (1838 - 1914), *The Yosemite, 1912*

“A bird doesn't sing because it has an answer, it sings because it has a song.”

— **-Lou Holtz**

As long as I live, I'll hear waterfalls and birds and winds sing. I'll interpret the rocks, learn the language of flood, storm, and the avalanche. I'll acquaint myself with the glaciers and wild gardens, and get as near the heart of the world as I can.”

— John Muir

I speak for the trees, for the trees have no tongues.

Dr. Seuss (1904 - 1991), *The Lorax*

I would feel more optimistic about a bright future for man if he spent less time proving that he can outwit Nature and more time tasting her sweetness and respecting her seniority.

E. B. White (1899 - 1985)

Mountains inspire awe in any human person who has a soul. They remind us of our frailty, our unimportance, of the briefness of our span upon this earth. They touch the heavens, and sail serenely at an altitude beyond even the imaginings of a mere mortal.

Elizabeth Aston, *The Exploits & Adventures of Miss Alethea Darcy, 2005*

I believe in God, only I spell it Nature.

Frank Lloyd Wright (1869 - 1959)

Adapt or perish, now as ever, is nature's inexorable imperative.

H. G. Wells (1866 - 1946)

In wildness is the preservation of the world.

Henry David Thoreau (1817 - 1862)

It is pleasant to have been to a place the way a river went.

Henry David Thoreau (1817 - 1862)

“Earth and sky, woods and fields, lakes and rivers, the mountain and the sea, are excellent schoolmasters, and teach some of us more than we can ever learn from books.”

— John Lubbock

“Everything you can imagine, nature has already created.”

— *Albert Einstein*

“The tree which moves some to tears of joy is in the eyes of others only a green thing that stands in the way. Some see nature all ridicule and deformity ... and some scarce see nature at all. But to the eyes of the man of imagination, nature is imagination itself.”

— William Blake

IN THE MUSEUM:

We will use some of the same observation techniques from outside in the Museum as we look closely at pieces of art.

Look for the influence of the natural world on the pieces that you observe. Continue to add to your grid of patterns and designs.

CLASSROOM PROJECT:

Clay creations with space for nature

Using a self-drying clay but the same techniques can be applied to clay that needs to be fired with slight modifications.

Roll out the clay.

Create textures/ designs using natural objects, inspired by your nature patterns.

Use the templates to cut out the clay.

Make any cut outs in the clay. (a subtractive process)

Assemble the clay by pushing the sides of the darts together. Form and shape and smooth. (an additive process)

Let dry.

Challenge yourself to use all of your clay, making smaller and smaller objects until all is used. This is a good exercise in resource management.

Keep unused clay in the ziplock bag as you work as it dries out fairly quickly.

VOCABULARY:

Additive: a process in which pieces of material are glued or joined together. Also known as constructing and assemblage.

Subtractive: a process such as carving, in which the sculptor removes or subtracts from the piece.

Modeling: a building up and shaping of soft material to create a sculpture.

Texture: the visual and especially textile quality of a surface

Relief: a type of sculpture that has forms that extend into space from a single plane; the only sculpture that is not viewed from all sides.

“in the round”: sculpture that is viewed by all sides.

Hand-built: process of making pottery by hand without the use of a wheel.

Coiling: a hand method of forming pottery by building up the walls with coils of rope-like rolls of clay.

Standards:

Language Arts

R.1.H.b.: Identify and explain the relationship between the main idea and supporting details

R.2.C.a.: Demonstrate comprehension skills previously introduced

Science

7.1.C.a.: Use quantitative and qualitative data as support for reasonable explanations

7.1.D.a.: Communicate simple procedures and results of investigations and explanations through: oral presentations, drawings and maps, drawings and maps, data tables, graphs (bar, single line, pictograph), writings

7.1.C.d.: Analyze whether evidence supports proposed explanations

Missouri Core Academic Standards

SL.5.1(b): Follow agreed-upon rules for discussions and carry out assigned roles.

abiotic - nonliving. The parts of nature composed of physical and chemical components of the environment, including water, sunlight, temperature and soil chemistry.

adaptation - any specialized structure or behavior that helps an organism survive in a particular environment.

biodiversity - the number of plant and animal species found in a given environment; sometimes also habitat diversity (the variety of places where organisms live) and genetic diversity (the variety of traits expressed within a species).

carnivore - any meat-eating animal.

carrying capacity - an ecosystem's resource limit; the maximum number of individuals in a population that the ecosystem can support.

channelize - to straighten (a stream) by means of a channel, or to direct flowing water into a narrow passage.

clear-cutting - removal of all the trees in a stand of timber; even-age management.

community - interacting populations of various kinds of individuals (as species) in a common location.

competition - active demand by two or more organisms or kinds of organisms for some environmental resource in short supply.

conservation - the wise use of natural resources such that their use is sustainable long term; includes protection, preservation, management, restoration and harvest of natural resources; prevents exploitation, pollution, destruction, neglect and waste of natural resources.

consumer - an organism requiring complex organic compounds for food, which it obtains by preying on other organisms or by eating particles of organic matter - compare *producer*.

cultural carrying capacity - the maximum population (as of deer) that a co-habiting population of humans will tolerate.

cultural limiting factor - any of those factors that determine cultural carrying capacity, e.g., rate of deer-vehicle collisions.

decomposer - an organism such as a bacterium or fungus that feeds on and breaks down dead plant or animal matter, making essential components available to plants and other organisms in the ecosystem.

ecological succession - the sequence in which biological communities are replaced by other biological communities over time.

ecology - a branch of science concerned with the interrelationship of organisms and their environments.

ecosystem - a community along with the abiotic parts of its environment.

ecological restoration - the effort to renew degraded, damaged, or destroyed ecosystems and habitats in the environment by active human intervention and action.

exotic species - an organism that has recently - within the past 200 years - moved into an area in which it previously did not exist; a non-native species.

floodplain - the flat land on both sides of a stream, into which the stream's extra water spreads during a flood.

food chain - a series of plants and animals linked by their feeding relationships and showing the transfer of food energy from one organism to another.

food web - many interconnected food chains within a community.

habitat - the natural environment in which an organism normally lives, including the surroundings and other physical conditions needed to sustain it.

herbivore - an organism that gets energy by eating plants.

invasive species - a species that has been introduced by human action to a location where it did not previously occur naturally, has become capable of establishing a breeding population in the new location without further intervention by humans and has spread widely throughout the new location.

keystone species - a species that plays an integral role in a community or that has a disproportionately large effect on its environment relative to its abundance, often because of its position in a food web.

limiting factors - those factors that slow a population's growth or prevent it from existing in certain areas; may be population density-dependent or -independent.

natural resource management - the effort to control the interaction and impact of humans on the environment, with the aim of ensuring that ecosystem services are protected and maintained, and to maintain ecosystem integrity.

niche - the function, position or role of a species within an ecosystem.

omnivore - an animal that eats both plants and animals.

organism - an individual living thing, such as a plant, animal or fungus, that is able to grow and reproduce.

pioneer species - the first species to show up in an area after a disturbance.

population - a group of individuals of the same species occupying a specific area.

predator - an organism that gets energy by catching, killing and eating prey.

prey - noun: an animal that is hunted by another animal for food. verb: when an animal hunts and eats another animal for food.

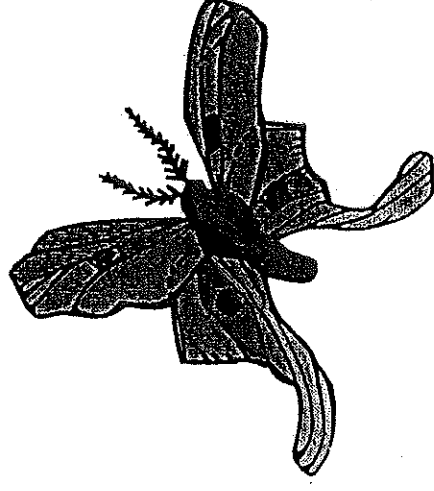
prescribed burn - controlled introduction of fire; used to restore ecosystems in which fire is a natural process.

preservation - the protection of a natural resource without allowing for use of the resource.

producer - an organism that is able to produce its own food from non-living materials (especially sunlight, water, air and minerals), and which serves as a food source for other organisms in a food chain; green plants.

upland - land at higher topographic elevations, especially areas uphill from major bodies of water.

Recipe for a Moth



MARVELOUS MOTH MASH

What you need:

Sugar	Over-ripe fruit, like bananas
Molasses	Stale beer or other such alcohol
Fruit juice/cider	Wide paint brush

Mix, mash or blend these ingredients together. Let it sit...the longer the better, you want the mixture to ferment a little, yet not mold.

Pick a cloudy evening to bait for moths. A few hours before dark, take your mash out and paint the mixture on the bottom of a few deciduous trees. Try painting trees that are on the edge of a wooded area. You can also soak sponges in the liquid of your mash and place the sponges at the base of the trees.

Later, approach the trees quietly and keep your flashlight off until you get really close. Then shine your flashlight near the baited area, but not directly on it. You may even want to try to get a moth to sit on your hand! Dip your fingers in the mash and then place them near the moths mouth...be brave...they'll tickle you!!!



BAT CONSERVATION
www.batcon.org

BATFAQ

White-Nose Syndrome: A Crisis for America's Bats

For up-to-date information about WNS, visit www.batcon.org/wns

Updated Oct 10, 2010

What is White-nose Syndrome? White-nose Syndrome (WNS) is a new disease that is causing the most precipitous decline of North American wildlife in the past century. It has killed more than one million bats in less than four years and threatens to devastate bat populations across the continent. Nearly 100 percent of bats have died at some sites.

Why is it called White-nose Syndrome? This affliction was given its name because of a telltale white fungus that grows on the noses (and sometimes wings, ears and tails) of most infected bats. This fungus is new to science and has been named *Geomyces destructans*.

Which bats are dying? Six bat species have been affected by WNS so far: little brown myotis (*Myotis lucifugus*), big brown bats (*Eptesicus fuscus*), tri-colored bats (*Perimyotis subflavus*), northern myotis (*Myotis septentrionalis*), eastern small-footed myotis (*Myotis leibii*), and the endangered Indiana myotis (*Myotis sodalis*). Another three species have been detected with WNS-associated fungus: gray bats (*Myotis grisescens*), southeastern bats (*Myotis austroriparius*) and cave myotis (*Myotis velifer*). These species have not yet been diagnosed with the disease. If current infection and mortality patterns continue, 25 species of hibernating bats in the United States could decline, and WNS could threaten some previously common species with extinction.

How is it transmitted? Although bat-to-bat transmission is believed to be the primary route, circumstantial evidence suggests humans may also inadvertently carry WNS from infected sites to clean sites.

How fast is it spreading? WNS, first detected in New York in February 2006, has spread rapidly throughout the eastern United States. Last year, it spread 450 miles in a single winter. WNS or its associated fungus is now documented in 14 U.S. states and 2 Canadian provinces. Biologists fear it will reach the largest colonies of endangered Indiana, gray and Virginia and Ozark big-eared bats this winter. A current map of WNS spread can be found at www.batcon.org/wns.

Why do bat die-offs from WNS matter? The number of insects consumed annually by one million bats, the estimated number of WNS fatalities to date, is staggering: just under 700 tons. These bats have extraordinary value in maintaining the health of nearly all terrestrial and aquatic ecosystems. And since many of the insects eaten by bats are crop pests, losing large numbers of bats will likely have expensive impacts on agriculture.

How soon will bat populations recover? Bats are long-lived but slow-reproducing mammals. Bats of most species have an average lifespan of more than 20 years and give birth to only one pup each year. Where WNS has killed large numbers, it is unlikely bat populations will recover to pre-WNS levels in our lifetime – if ever.

How does WNS kill bats? Although the root causes of mortality associated with WNS are still under investigation, most available evidence suggests the newly described fungus is capable of causing this disease.

Hibernating bats affected by WNS are characterized by some or all of these symptoms:

- 1) a white fungus that grows on the nose, ears and wing membranes;
- 2) depleted fat reserves due to increased winter arousals long before bats normally arouse from hibernation in the spring;
- 3) a compromised immune response during hibernation;
- 4) damage or scarring of the wings;
- and 5) abnormal bat behavior (for example, bats emerge too soon from hibernation and are often seen flying around in midwinter, which usually means they will freeze or starve to death).

What is being done to slow the spread of WNS? The only tool currently available to slow the spread of WNS is restricting access to caves.

- 3) Regional and local cave closures have been implemented in an attempt to slow the spread of WNS by reducing the likelihood of human transmission (<http://www.caves.org/WNS/>).
- 4) Researchers are exploring the feasibility of several potential treatments against WNS. Until we understand the relationship between the fungus and WNS, however, we dare not risk damaging these sensitive and complex cave ecosystems by introducing fungicides or other treatments.











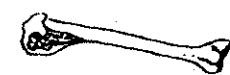

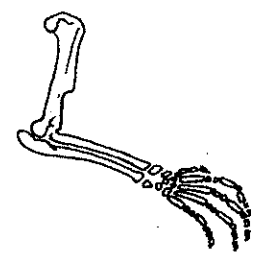
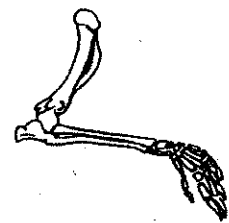
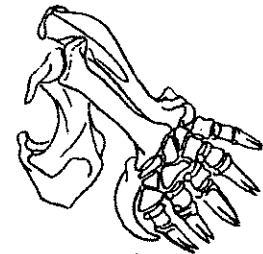
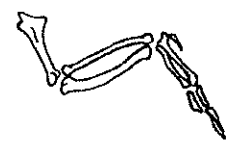
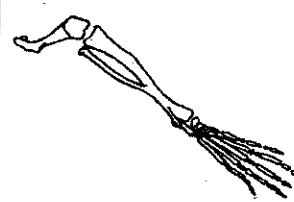
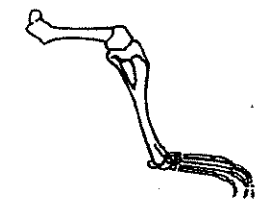
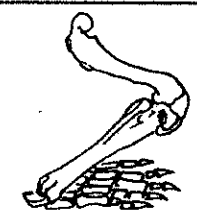
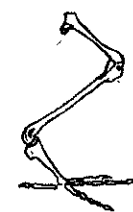




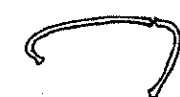

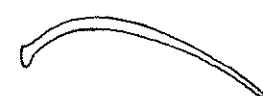
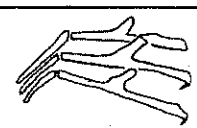
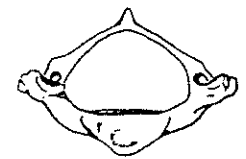

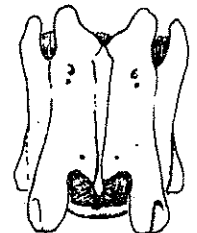
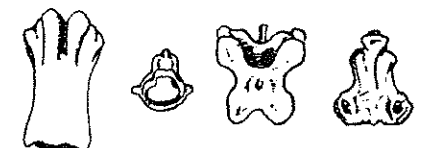
What about Mexico's bats? The ecological and geographical limits of White-nose Syndrome are not yet understood. Any hibernating bats are likely at risk for WNS, although preliminary evidence suggests bats that do not hibernate for long periods may experience lower mortality

rates. At this point, we do not know what effect WNS may have on bats in Mexico. Although there is no projected timeline for when WNS might reach Mexico, it is prudent to follow disinfection guidelines for caving and bat-capture gear to reduce the chance of human transmission.

What Can You Do to Help? Urgent and effective conservation action is critical if we are to avoid endangering additional species and perhaps even seeing some species become extinct! There are things you can do to help:

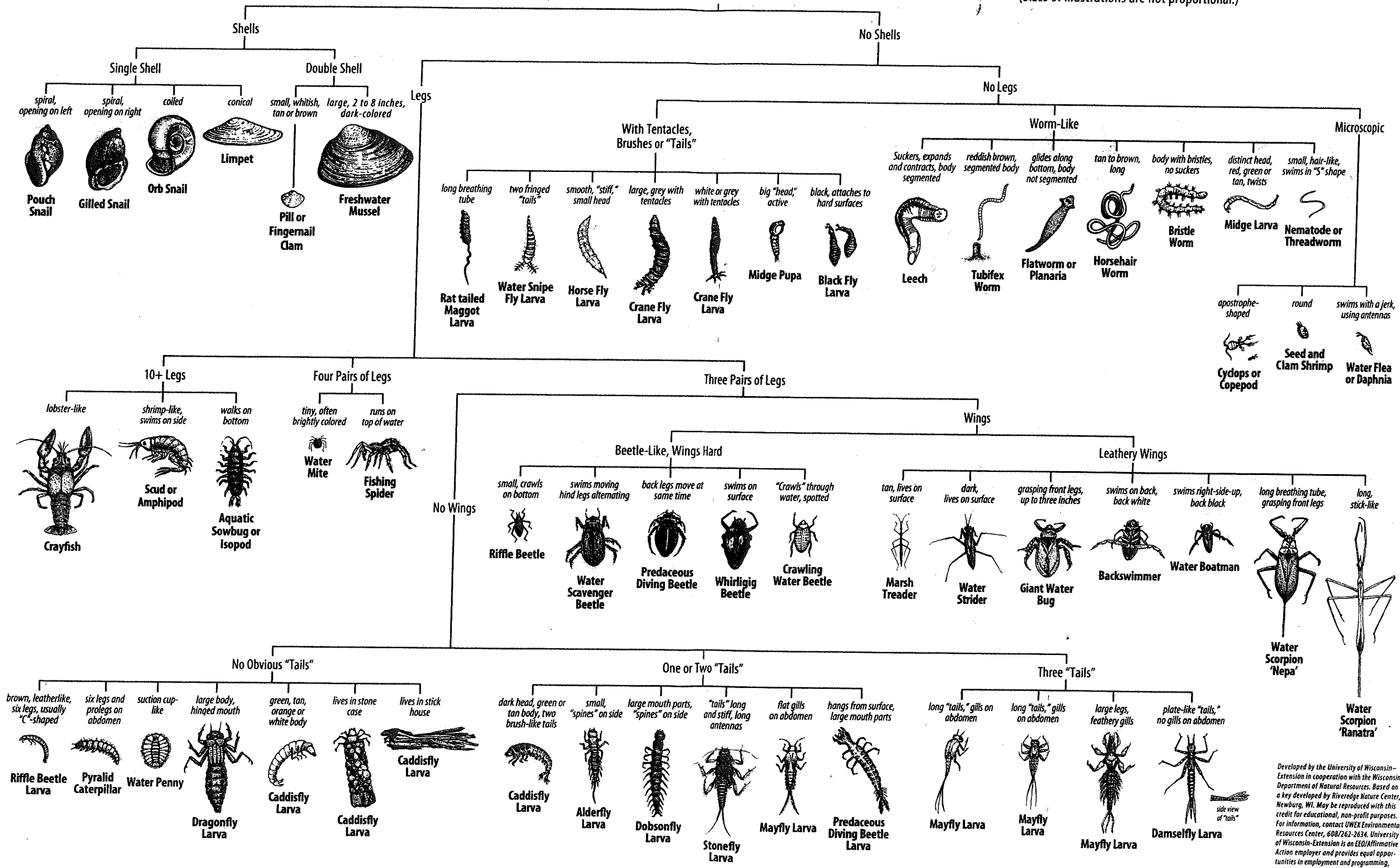
- 1) • Educate your friends and families about the benefits of bats and the threat of White-nose Syndrome.
- 2) • Encourage your state and federal legislators to allocate funding for efforts to understand and fight this devastating disease.
- 3) • Report unusual late-winter bat behavior (such as bats flying during the daytime) or unexplained bat deaths to your state wildlife agency.
- 4) • Adhere to state, federal and local cave advisories and closures to help prevent the transmission of WNS.
- 5) • When you enter caves, carefully follow decontamination protocols outlined by the U.S. Fish and Wildlife Service. You'll find updated protocols at <http://www.fws.gov/northeast/wnsresearchmonitoring.html>.
- 6) • Donate to BCI's WNS Rapid Response Fund at www.batcon.org/wnsdonate.

OWL PELLET BONE CHART

	RODENT	SHREW	MOLE	BIRD
SKULL				
JAW				
SCAPULA				
FORE LIMB				
HIND LIMB				
PELVIC BONE				
RIB				
VERTEBRAE				

Key to Macroinvertebrate Life in the River

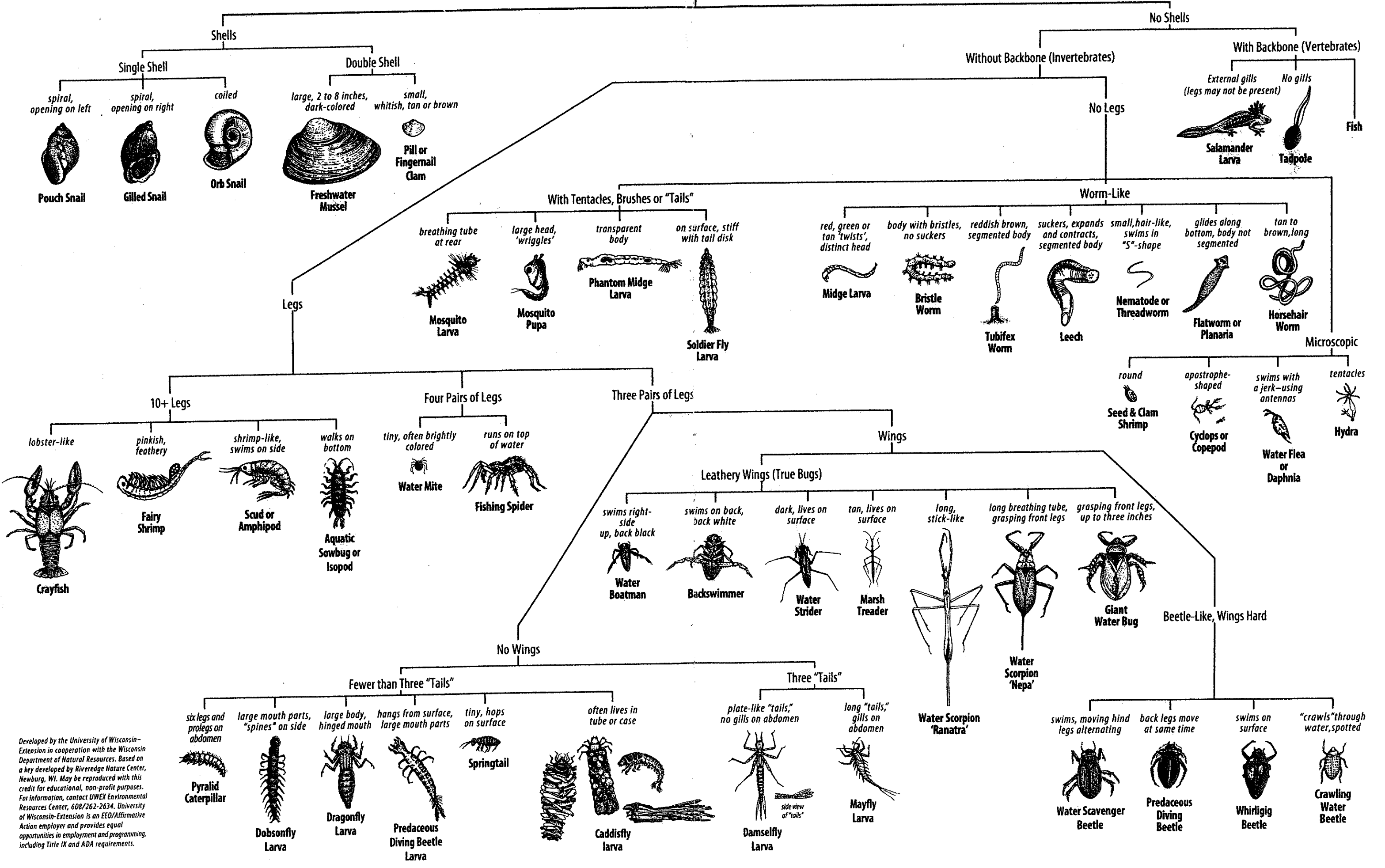
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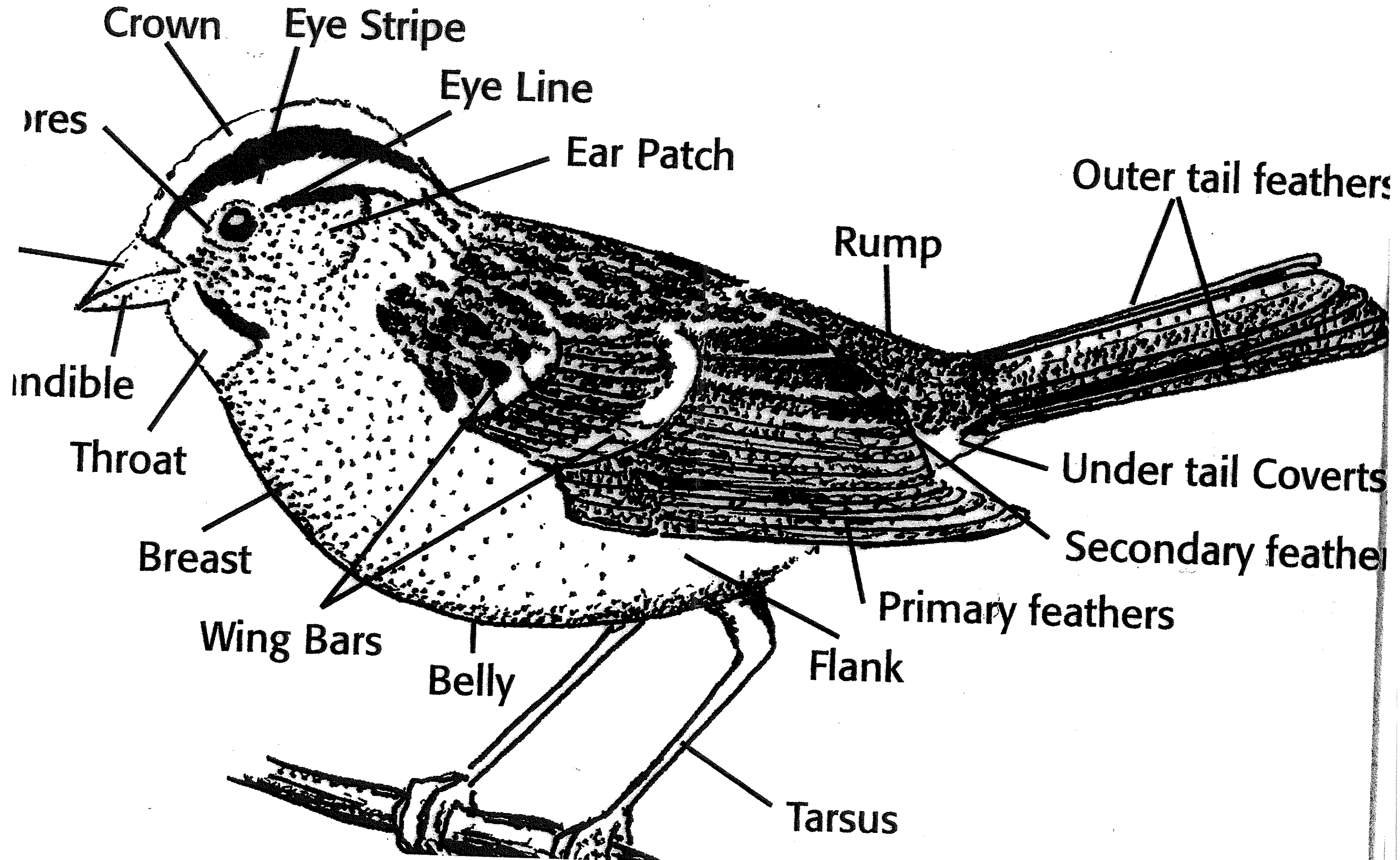
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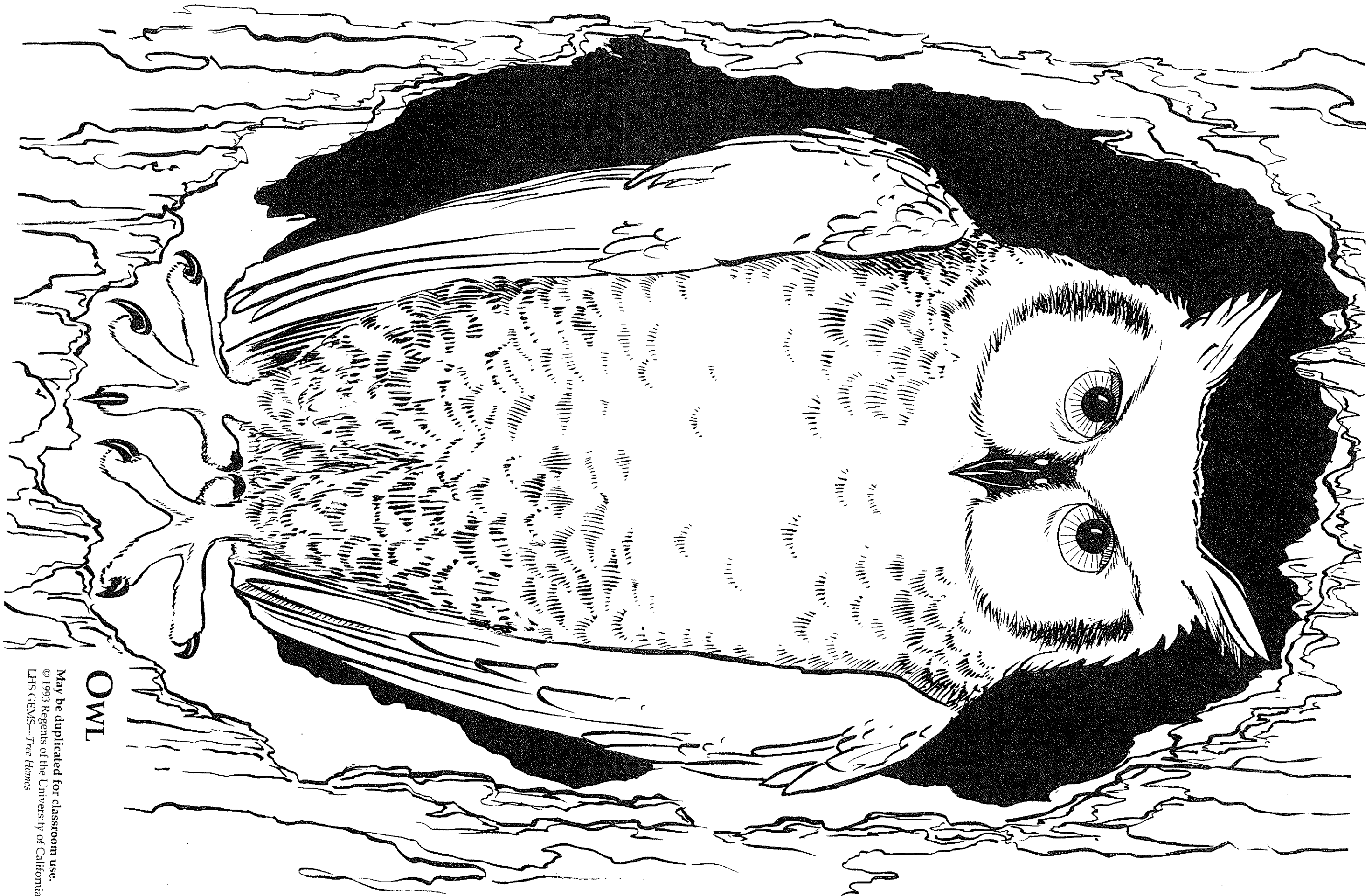
Key to Life in the Pond

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