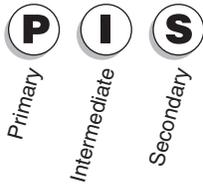


IV. Educational Activities



An old Chinese proverb says, “I hear; I forget. I see and hear; I remember. I see, hear, and do; I understand.” The following activities will strengthen your group’s experience while visiting Kohler-Andrae. Each activity has grade level descriptions. Primary students (P) include K-3rd grade. Intermediate students (I) are 4-6th grades and secondary students (S) include 7-12th grades. Each activity is accompanied by pre- and post-trip activities designed to strengthen the field trip learning experience.

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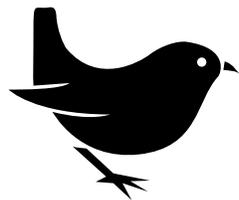


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A. Observation Skills: Tune up your tools

Your group's experience will be enhanced by their ability to hone their perceptual tools. These tools are their senses. In the following activities, students will learn to use their senses in the environment.



Activity: Observation Hike



Grade Levels: Primary and Intermediate

Objective: Students will learn to increase their ability to observe by using their senses to explore habitats along the trails at Kohler-Andrae.

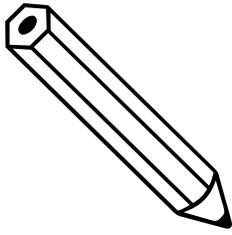
Materials:

- Student Worksheet: Observation Hike (one per group)
- Clipboard
- Pencil
- Optional: field identification guides to answer any “What is this?” questions. A whistle or signal to end activity

Procedure:

1. Divide the students into groups. Tell the students that they will be using their senses to locate things in the park. Ask them if they have brought their tools. The tools are not shovels or buckets, but their senses—seeing, hearing, smelling, and touching. If time allows, take your group to different habitats of the park, such as the beach and the woodlands. A good place to do this activity is on the Woodland Dunes Trail or the Black River Trail.
2. Lead the group down the trail. Begin the activity by pointing out various animal signs. Include scats, tracks, rub marks on trees, nests, etc. Encourage students to observe closely under logs, rocks, brush, and leaves.
3. Students should not collect any items nor pick any flowers or leaves from trees. This activity is a chance for them to explore and discover nature. Allow at least 20 minutes for each habitat.
4. When time is up, have each group share what they found in each habitat.



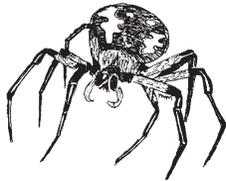


Student Worksheet: Observation Hike

Directions: We will visit different places in the park. As you pass through an area, take time to explore and hunt for the items listed below. Look closely under logs, brush piles, and rocks. As you observe something, check it off on this sheet. Remember: Leaves of three, let it be. It could be poison ivy.

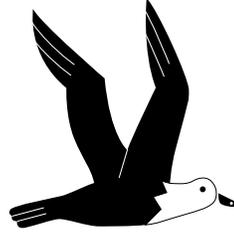
Things to see:

- a feather
- den tree
- bird nest
- red or yellow leaf
- tree bud
- inch worm
- bird flying
- small bird going down a tree head first
- insect cocoons
- spider web
- dragon fly



Look for these colors!

- Red
- Orange
- Yellow
- Blue
- Green
- Purple

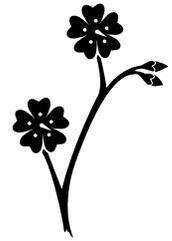


Things to hear:

- buzzing insect
- calling crow
- wind through the trees
- a woodpecker
- dry leaves under your feet
- a bird song
- a sea gull
- waves crashing on the beach

Things to feel:

- mud
- sand
- a spider web
- the wind
- rotten wood
- last year's leaves
- tree bark

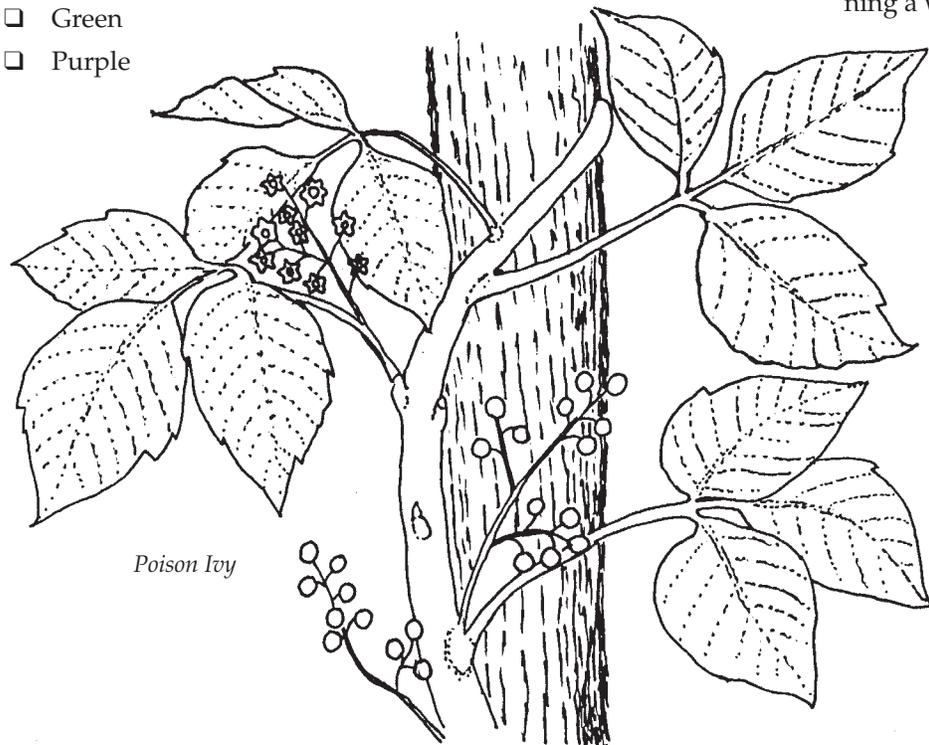


Things to smell:

- mud
- rotten wood
- flower
- animal burrow/hole
- old leaves
- green grass
- moss

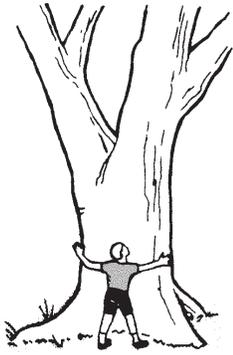
Things happening:

- an ant moving something
- a leaf falling
- a spider spinning a web



Poison Ivy





Activity: Adopt-A-Tree

Adapted from *I Can Teach ... in the Outdoors*.
Stephan P. Carlson. WI 4-H Program Ideas.



Grade Levels: Primary (only with direct supervision of an adult), Intermediate, and Secondary

Objective: Students will examine one tree and use their imagination and senses to investigate it.

Materials:

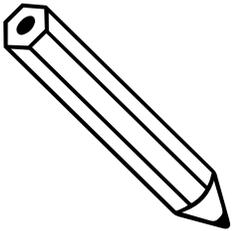
- Blindfolds
- Student Worksheet: Adopt-A-Tree (this can be done on note cards so you can reuse them)

Optional: paper and pencils, tree identification book

Procedure:

- Caution: Supervise this activity very closely while the students are blindfolded. Dividing your group into smaller groups is advisable.
1. Divide students into groups of twos. Each group gets a blindfold. Ask, "Has anyone ever become friends with a tree? How do you recognize your friends? Today you will get to know a tree without using your eyes." Warning: Make sure everyone can identify poison ivy!
 2. Each blindfolded person is led to a tree by a partner. The blindfolded person gets to know the tree by touching, smelling, and listening to it. He is then brought back to a starting base, the blindfolds removed, and he/she must find his/her tree. After everyone finds his/her own tree, the group discusses the unique features of each tree. Bark rubbing, story writing, and tree identification can be follow up activities.

Student Worksheet: Adopt-A-Tree



Directions: One person should be blindfolded; the other will lead. Lead your partner to a tree near the trail edge. As they get to know the tree, ask them these questions. Note: This worksheet does not have to be filled out; it helps the blindfolded person know their tree. When you are done, lead your partner back to the starting point. They will try to find their tree with your help. When you are finished, switch roles.

Tell your partner, "Put your arms around the tree."

Ask slowly:

1. Is it alive? _____
2. Is the tree old or young? _____
3. What does the bark feel like? _____
4. Can you smell the tree? _____
5. Can you hear any tree sounds? _____
6. Can you feel branches? _____



Activity: Extension of Adopt-a-Tree: Colors from Nature



Adapted from *Project Learning Tree*. 1987.
American Forest Council.

P I S

Grade levels: Primary, Intermediate, and Secondary

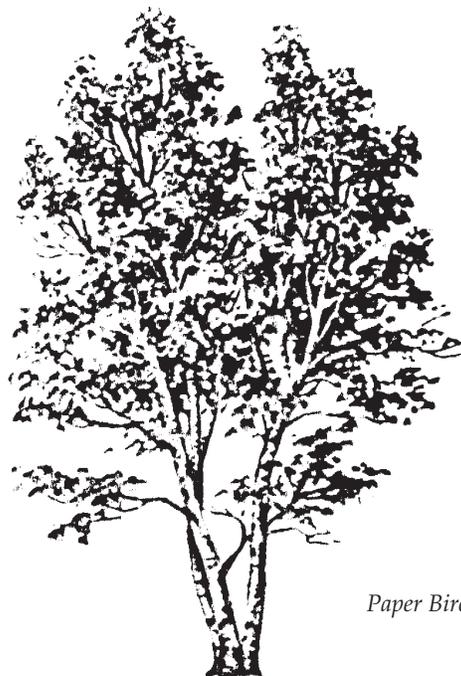
Objective: Students will learn that nature has its own colors by using natural materials to draw their adopted tree.

Materials:

- Soft, smooth paper
- Clipboard
- Adopted tree
- Natural materials such as leaves, moss, flower petals, soil

Procedure:

1. Ask your students to draw their adopted tree using colors from the natural materials surrounding the tree. Take care to do no damage to the environment when gathering and using these natural materials. Example: Use burnt wood from a campfire ring to sketch the tree outline. Grass or plant leaves rubbed on paper yields grays and browns.
2. Ask students to list the natural materials they used in their drawing.



Paper Birch

Activity: The Closer You Look

Adapted from *Project Learning Tree*. 1987.
American Forest Council.

I S

Grade levels: Intermediate and Secondary

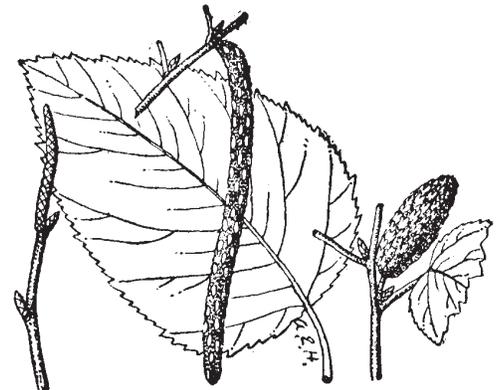
Objective: Students will learn to take a closer look at natural objects around them. Students will observe similarities and differences of various species of trees.

Materials:

- Drawing paper
- Clipboard
- Pencil
- Tape for tree gallery

Procedure:

1. Before you leave the classroom or on the bus to the park, ask your students to draw a tree.
2. Once you arrive at Kohler-Andrae, hike the Woodland Dunes Trail. Ask your students to examine several trees. Suggest to the students:
Look to see what colors you can find. What are the different shapes? Do the trees smell differently? Are there any fruit, flowers, or buds? Do you see any animals or plants living on the tree? How is the bark different? Do the branches point up, down, or straight out?
3. Give the students some time to observe these differences and similarities. Hike back to the picnic area and ask your students to draw a tree again.
4. On a picnic table, make a tree gallery and point out similarities, differences, and patterns in your students tree drawings. Ask what things students observed.

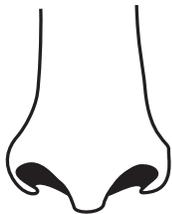


Pre-Trip Activities on Observation Skills



P I

Primary and Intermediate Students: Ask your students to bring in various natural objects. Examples include rocks, leaves, driftwood, skulls, twigs, moss, etc. Have the group sit in a circle blindfolded and give each person an object. They try to figure out what the object is before passing it to the left. Allow about 15 seconds before asking them to pass on the object. At the end show the group the objects.



P I S

Primary, Intermediate, and Secondary Students: *Project WILD* has many observation related activities to choose from. See "Learning to Look, Looking to See," p. 278, "Noisy Neighbors," p. 317, and "Tracks!" p. 30. *Project Learning Tree Activity Guide Pre K-8* offers additional observation skills enhancement activities. See "Did You Notice?" p. 366; and "Sounds Around" p. 9.



P I S



Primary, Intermediate, and Secondary Students: To enhance observation skills, ask a student to stand at the front of the room while the class observes the student's clothes, hair, etc. The student leaves the room and changes one small thing about his/her appearance. Ask the class to identify the change. This exercise may be done with objects on a table, ask the students to observe the objects for a period of time, close their eyes, and remove objects. Ask them to list missing items.

Post-Trip Activities on Observation Skills

P I

Primary and Intermediate: After your trip to Kohler-Andrae, ask the students to chart what they saw and what senses they used. Example:

Touch: Rock, Bark, Mud, Sand

Smell: Flower, Soil, Leaf

Hear: Bird song, Wind, Waves

See: Birds, Deer, Grass, Lake

I S

Intermediate and Secondary Students: Take your students on a blind walk. This will increase awareness of sounds and textures. Use a long rope attached to different objects in your school yard. Blindfold the group and line them up along the rope. Walk slowly and lead the group through the school yard. Discuss what was heard or felt after the walk. This may be done at Kohler-Andrae in different habitats. If a rope is not available, have the group walk in pairs with one person leading the other.



Sand Reedgrass





B. Natural Resources of Kohler-Andrae: Use Your Tools!

Habitat

All plants and animals have a home and a job to do! A habitat is the place where a plant or animal lives, its home address. A niche is a plant's or an animal's profession, occupation, or job.

The job of an organism helps decide where the organism is able to live. An earthworm's job includes feeding on decaying plant and animal parts in the soil. However, there are many things that have to be right for the earthworm to work: climate, soil conditions, natural enemies, and food. But the niche is about more than food. It is everything the organism must do to survive and to raise its young.

The following activities will introduce your students to the concept of habitat and niche. Kohler-Andrae has many different habitats in which plants and animals live in. Students can appreciate that as we need homes, so do plants and animals. When habitat, such as wetlands, forests, and prairies, is depleted, someone's home is lost.



Activity: Habitat Hunting

*Adapted from: I Can Teach ... in the Outdoors.
Stephan P. Carlson. Wisconsin 4-H Program Ideas.*



Grade Level: Primary and Intermediate

Objective: Students will appreciate how each animal they list has a special home.

Materials:

- Paper and pencil
- Clipboard
- A variety of habitats: Black River Trail is excellent for this activity. It has open fields, woodlands, and river marsh communities to observe.

Procedure:

1. Ask students to list a number of animals: snake, mouse, frog, bug, deer, rabbit. Look for their ideal habitat or home. How many did they find of each animal? What job does that animal have in that habitat?
2. Discuss how you can improve the habitat for certain animals. Examples: Planting bushes that grow berries, leaving brush piles for cover and protection, leaving dead logs for food and cover.



Activity: Scenery Seen

Adapted from: *I Can Teach ... in the Outdoors.*
Stephan P. Carlson. Wisconsin 4-H Program Ideas.



Grade Level: Intermediate and Secondary

Objectives: Students will be able to describe the characteristics of particular habitats and compare differences between habitats.

Procedure:

1. As you hike through different habitats in the park, stop and have students describe the habitat they are in. Take only a few moments and then gather students together to share what they have observed. During the sharing and your discussion of the habitat, describe and point out microhabitats.

Microhabitats can be found on a small section of ground. Look for different plants and animals that live there. Point out that several species of dune plants are rare and threatened including: thickspike wheatgrass, clustered broomrape, dune thistle, and dune goldenrod. The dunes are considered critical habitat for these plants.

2. Ask questions such as:

What do we mean by habitat? What are the characteristics of this habitat? Have you ever seen this kind of habitat outside Kohler-Andrae? How is it similar to the habitat we just walked through? Different from the habitat? What dangers do organisms face in this habitat? How does this habitat meet the needs of organisms? (Needs include: food, shelter, water, and space) What is a descriptive name for this kind of habitat? Could this habitat ever change? How? What are your ideas about what would happen?



Thickspike Wheatgrass



Dune Thistle

Pre-Trip Activities on Habitat



Primary Students: Divide the class into groups of four to six children. Assign each group an organism common in the area. Examples: Ring-billed gulls, red fox, grey squirrels, white-tailed deer. Explain the concept of niche and habitat. Tell the class that each group is going to perform a play illustrating the niche of the organism. The class tries to guess the identity of the organism and its niche. Give students time to research their animal and work on their play. Remind groups that secrecy about their play is important.

Students should answer the following questions: What does it eat? What does it do? (profession) What effects does this organism have on other organisms in the community? What effects do other organisms in the community have on this organism?



Intermediate and Secondary Students: *Project WILD* has many excellent activities on habitats. See "Habitat Rummy" p. 14, "Microtrek Scavenger Hunt" p. 82, "Which Niche?" p. 66. *Aquatic Project WILD* contains an activity that can be extended to Kohler-Andrae habitats. See "The Edge of Home" on p. 75.



Post-Trip Activities on Habitat

P I S

Primary, Intermediate, and Secondary Students: See *Project Learning Tree Activity Guide Pre K-8*, "Trees as Habitat," p. 70 and "School Yard Safari," p. 131.

P I

Primary (modify) and Intermediate Students: The Incredible Shrinking Habitat (adapted from *Biological Diversity Makes a Difference*. Biological Diversity Curriculum. National Park Service. Copies may be purchased from: National Parks and Conservation Association, 1015 31st St. NW, 4th Floor; Washington, D.C. 20007.)

Discussion: Five hundred years after Columbus came to the New World, America's plants and animals are seriously depleted. More than 140 kinds of animals and approximately 60 kinds of plants have been declared extinct. Today, thousands of kinds of plants and animals are in danger of being lost forever. The leading cause of extinction has been habitat alteration by humans for purposes of converting land to more immediately recognized, productive uses. Habitat alteration by humans is also responsible for endangering plants and animals. This activity will enhance student's awareness on the danger of habitat alteration.

Objectives: Students will be able to describe the consequences of shrinking habitat, understand the role of parks in preserving biodiversity, and understand the role that all humans have to play in preserving biodiversity.

Materials: (for a class of 25)

- 5 Frisbees
- 20 Popsicle sticks
- 25 Name tags
- Rope/String

Procedure:

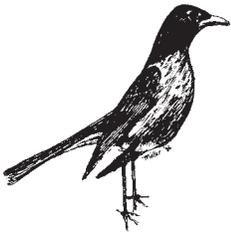
1. Round 1. Place rope in a large circle and have your students stand just outside of it. Tell them they can choose to be any plant or animal they would like to be. Have them make a name tag so that the others will know what plant or animal they are.

Place the frisbees inside the circle. Distribute 20 popsicle sticks among the five frisbees. Have students walk or trot slowly around the perimeter of the rope circle. When you yell out, "Home address," students rush to get a popsicle stick. *Rules:* No pushing or shoving. Those who do not get a stick stand outside the circle.

2. Round 2 and 3. Collect the popsicle sticks, reduce them by five, and redistribute them. Reduce frisbees by one in each round. Do you have any ideas what the various rounds and frisbees represented? Round 1, before Columbus and settlement of the U.S. by Europeans. Rounds $\frac{2}{3}$, changes in habitat by Europeans, e.g., for agriculture, wood, cities. Frisbees = habitat. Diminishing number of frisbees = decreasing amount of habitat available for plants and animals. Elimination of species by bumping = interference by humans that decreases the amount of habitat available.

Organisms eliminated may be either endangered or have become extinct. The remaining frisbees represents Kohler-Andrae and other parks. They provide habitat protection and for many species provide critical habitat. Reinforce this concept and ask: What are some ways humans "bump" into plants and animals and cause them to become endangered? What are your views on what should be done about this?





Birds

Kohler-Andrae has over 150 bird species which visit or live here. A species list of Kohler-Andrae birds is included in Appendix F. Your students can become amateur ornithologists at the park. A start here can lead someone on the path of a great career or rewarding hobby. In addition, research has shown that bird watching can be the beginning of an environmental awareness and appreciation.

The following activity can be done in any habitat at Kohler-Andrae. Spring is a good time to view birds before the tree foliage leaves out.

Activity: Observing Birds in the Wild



Grade Level: Primary, Intermediate, and Secondary

Objective: Students will enhance their observation skills and observe wild bird behaviors. Students will learn to appreciate the variety of behaviors.



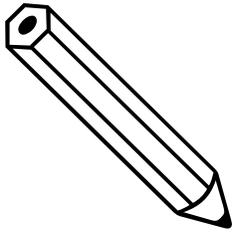
Materials:

- Student Worksheet: Observing Birds in the Wild
- Clipboard or something to write on
- Pencil or pen
- Sharp eyes
- Whistle (for the teacher or leader to call back the students)

Procedure:

1. Ask students to list behaviors they display during a day. Prompt them with brushing your teeth, combing your hair, singing or talking, or walking to school. The students can expand on the list.
2. Discuss with the students that birds and other animals display behaviors like we do. Hand out the Observing Birds in the Wild worksheet. Divide the students into small groups and ask them to spread out in the area. They should be looking for birds to watch. As they observe a bird doing something included on the list they should check it off. Remind them that a bird may do many different behaviors so they should watch the bird for a short time. If the bird flies away, look for another bird to observe.
3. The students should stay in sight of the teacher at all times. Ask them to make sure they can see you during the activity. Allot about 15 minutes for primary and intermediate and 30 minutes for secondary.
4. Call the students back with your whistle or other signal. Gather together and discuss the different behaviors they observed. This activity can be expanded to other wildlife, such as insect in a leaf-filled jar.



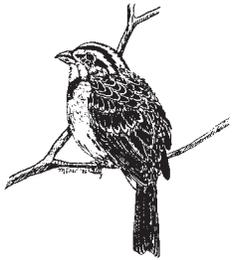


Student Worksheet: Observing Birds in the Wild

Introduction: Birds display behaviors and actions just like we do. Birds clean themselves, speak, and move about during their daily lives. In this activity you will observe birds to see how they act and behave.

Directions: Observe birds in an area chosen by your teacher or leader. As you locate and observe birds, watch for behaviors listed here. As you see these behaviors, check them off your list. If you see a bird doing something not included on your list, describe it as best you can. Watch the bird for a while because, just like us, the bird will show many behaviors in a short time. If your bird flies away, try to find another bird to watch. **Make sure your teacher is within sight at all times!**

Checklist:



- a bird singing or calling. (Most singing birds are males. Singing is how males announce their nesting territories during the spring and summer. By singing, a male bird is saying to other male birds, "This is my space." To females, it is an invitation to come in and see what a great place this is to raise a family.)
- a bird preening. (Sometimes a preening bird looks as if it is nibbling or tugging at its feathers. Other times it looks as if the bird is combing its feathers with its beak.)
- a bird bathing in water.
- a bird taking a dust bath to choke parasites.
- a bird soaring. (While soaring, a bird's wings are spread and held still, beating only occasionally. A soaring bird stays aloft by riding air currents.)
- a bird flying. (The wings are beating.)
- a bird perched on a limb or branch.
- a bird hovering in mid-air. (The wings are beating rapidly.)
- a bird swimming.
- a bird walking or hopping on the ground.
- a bird diving or tipping up its rump in the water.
- a bird standing on the ground.
- a bird wading in water.
- a bird feeding.
- a bird flying with a worm or insect in its mouth. (May be taking food to its young.)
- a bird feeding its young.
- a bird flying with or gathering nesting material (twigs, leaves, grasses).
- a bird perched on the edge of its nest.
- a bird climbing a trunk or branch.
- a bird hanging upside down from a branch to feed.
- a bird chiseling into the side of a tree or branch.
- a bird keeping watch over an open area by perching on a wire, fence post, tree snag, or other place.
- a bunch of small birds chasing a large bird (hawk, crow or owl), called "mobbing."
- a group of birds flocking together.
- other behaviors. List on another piece of paper:





Activity: Bird Watching—Identifying Birds



Grade Levels: Intermediate and Secondary

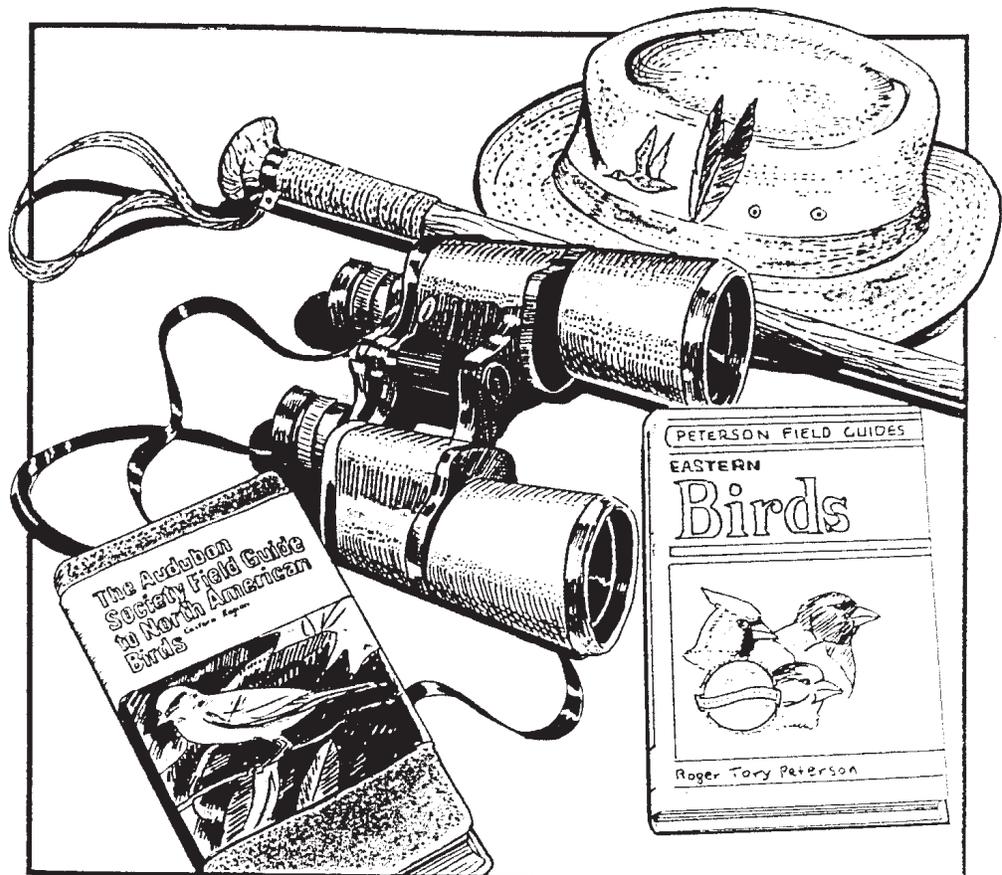
Objective: Students will learn bird identification basics, use of binoculars and field guides. Students will appreciate the diversity of bird species in our environment.

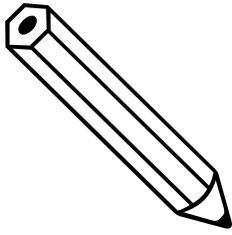
Materials:

- Field identification guides on birds—suggested guides:
- Bull, John and John Farrand, Jr. 1994. *The Audubon Society Field Guide to North American Birds*. Random House.
- Peterson, Roger Tory. 1998. *Peterson First Guide to Birds*. Houghton Mifflin Company.
- Binoculars—enough for 2–4 person groups
- Notebook and pencil
- Student Worksheet: Bird Watching—Identifying Birds

Procedure:

1. Visit a community in the park. The following trails are suggested for different types of birds: Woodland Dunes Trail—woodland birds and Black River Trail—open field and woodland birds. The Black River Marsh Boardwalk is a good place to view marsh birds. Instruct your students to watch very carefully for any birds. You and your class are sleuths! Approach the area quietly, don't scare any birds off.
2. If you have enough field guides and binoculars for your groups, have them spread out in the area. Each group should receive a worksheet.
3. Impress on your group the need for complete QUIET. In order to be successful during this activity, students must be silent or they may not have a chance at seeing nor hearing many birds.





Student Worksheet: Bird Watching—Identifying Birds

Directions: Try to observe the birds and look up any unfamiliar birds in your field guide. Look for distinguishing or unusual characteristics such as its shape/silhouette, color and plumage, and head. List as many birds as you can see and answer the following questions about each bird.

1. How big is the bird compared to a robin? _____

2. How does their shape differ? _____

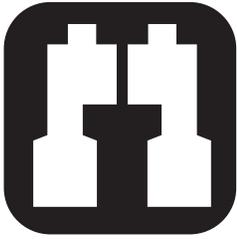
3. What is the bird saying? _____

4. What is special about each bird? _____

5. What is it doing? _____

6. List your birds here: _____

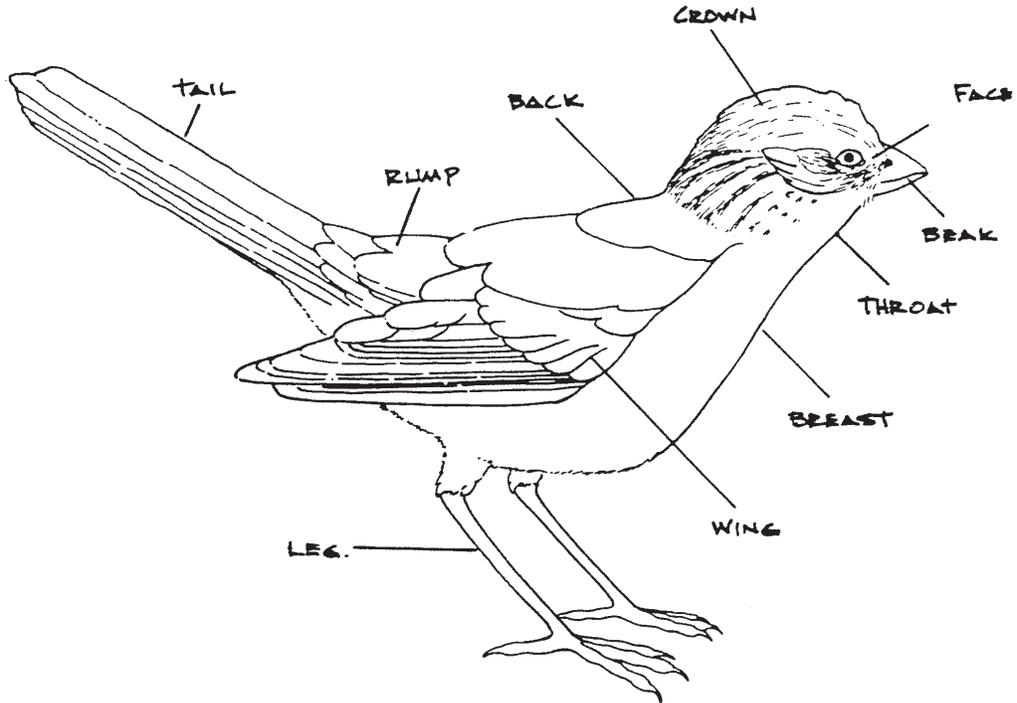




Note: At first it may be difficult to identify birds. Don't get frustrated, it takes practice and patience. Enjoy the birds and take notes about its distinguishing characteristics so you can look them up together later.

Pre-trip Activities on Birds

1. Intermediate and Secondary: Introduce the basics of bird parts. Hand out photocopies of the following drawings.



Learn the parts of a bird

This drawing will help you become familiar with the parts of birds. Take this sheet along with you on the field trip or when you watch birds. It will help you identify distinguishing features of birds.

Eyes and crown: Does the bird have a stripe over the eye, a ring around the eye? Is the crown striped or patched?

Beak or bill: Is the beak long or short, thick or thin?

Throat: Any special markings or color?

Breast: Is the breast plain and unmarked or spotted, streaked, or striped?

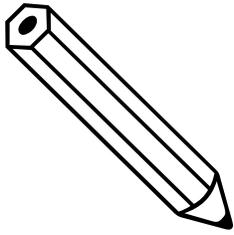
Wings: Do the wings have light wing bars or are they plain?

Legs: Long or short legged? Color?

Tail: Does the tail have a "flash pattern," a bright mark that appears in flashes when the bird flies? Does it have a band at the tail tip? Does it have white sides or spots? Is the tail forked, notched, square tipped, round tipped or pointed?

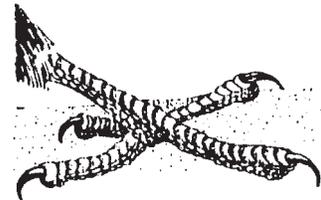
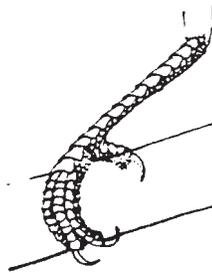
Rump: Does the bird have a light rump patch?

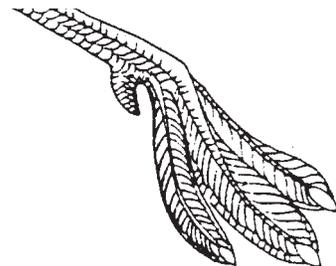
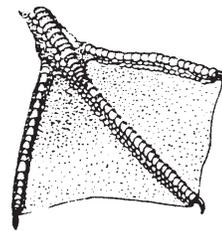
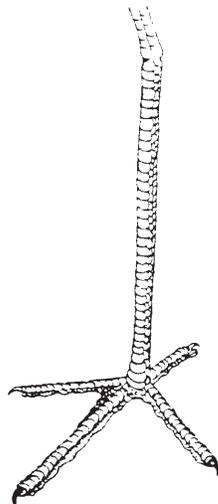




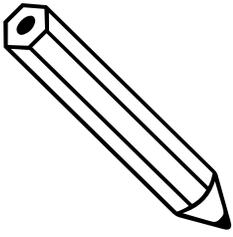
Foot Adaptations

Look carefully at the six different types of feet. These are the foot adaptations certain birds have developed to maneuver in their habitats while they are gathering food. Label the adaptations according to what function they would be especially useful for. Your choices are **Wading**, **Preying** (seizing and carrying live prey), **Swimming**, **Perching**, and **Climbing**. Two of the adaptations are useful for the same manner of traveling.



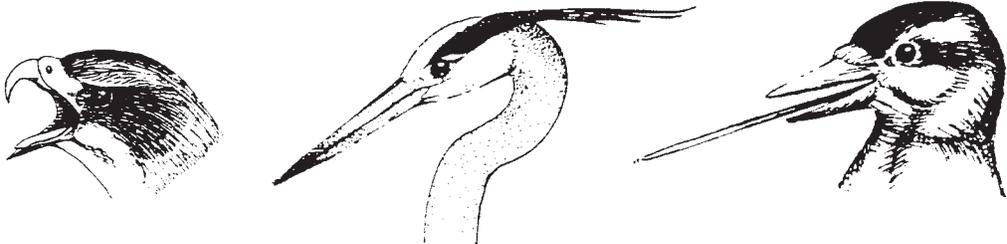
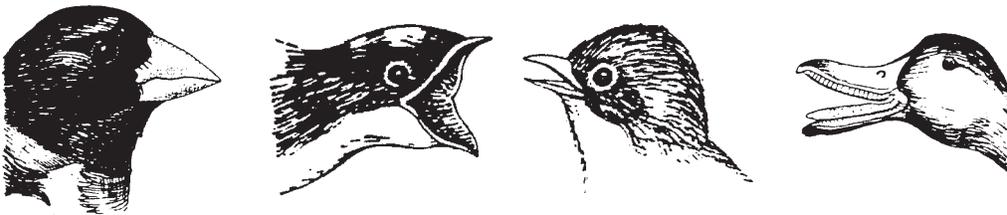






Beak Adaptations

The beak adaptations shown above are described below. Each beak adaptation is especially useful for gathering certain types of food. Read each description, find the beak drawing that matches the description, and then label the drawing with the name of the beak type on the blank line beneath it.



Beak descriptions:

Fish-Eating Beak: long, slim, strong, and pointed to reach into the water and to grasp slippery creatures.

Water- and Mud-Sifting Beak: wide and shallow; comb-like strainers on edges filter out bits of food in water.

Insect-Catching Beak: small beak that can open wide to grab insects in flight.

Chisel Beak: sturdy and sharply pointed to chisel into wood; accompanied by an extremely long, barb-tipped tongue to pull insects and insect eggs out of tunnels in bark or wood.

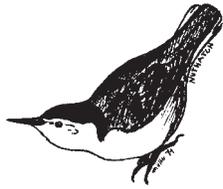
Seed-Eating Beak: arched into the shape of a cone; stout and sharp to crack seeds.

Insect- and Fruit-Eating Beak: narrow and pointed to grab insects or reach fruits, and slightly arched to crack seeds; larger than an insect-eating beak but shorter than a fish-eating beak; sleeker and longer than a seed-eating beak.

Preying Beak: stout, sharp, and sharply hooked to tear the flesh of animals.

Probing Beak: thin and long to reach insects and other small animals buried in mud or sand.





Pre-trip Activities on Birds

Tell the students to concentrate on just a few very noticeable features of bird parts when they begin to observe birds. Identifying birds is difficult, so they should look for the eyes, crown, plumage and coloration at first. Most field guides use silhouettes to assist you in identifying birds. Read through the introduction of the field guides you will use so looking up birds in the field will be easier. Students should practice, too.

P I S

Primary, Intermediate, and Secondary: Take students out into the school yard. Ask them to look for birds without using binoculars. Students should observe their behaviors and special markings. Practice observation of birds using binoculars.

Post-trip Activities on Birds

P I S

Primary, Intermediate, and Secondary Students: Students can keep a bird species list of those birds they observe outside of class.

P I S

Primary, Intermediate, and Secondary Students: Ask students to write a story, poem, or draw a picture of their favorite bird.

P I S

Primary, Intermediate, and Secondary Students: Make a pine-cone feeder to attract small song birds. Use one large pine cone. Tie a string long enough to hang from a tree branch. In the spaces between each pine cone bract, stuff a mixture of cornmeal and peanut butter. Hang from a branch in your schoolyard. If you are unable to hang it at school, assign students to make them and hang them at home. Students can keep a log of the birds they see and their behaviors. Feeders can be made from clean plastic bottles, milk cartons, or shoe boxes. Cut doors and windows. Fill with seed and hang with a metal coat hanger. Birds can forage for their own food in the summer, but need assistance in the winter. Experiment with: suet (beef fat), crumbs, nuts, seeds, crumbled dog biscuits, oatmeal, crackers, coconut, lettuce and celery, grapes, cherries, apple bits.

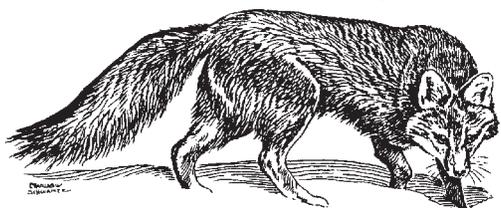


Predator-Prey Relationships

What does every living thing on earth have in common? We all must get enough food to nourish our bodies or face death. Herbivores, animals depending on plants for food, are hunted (prey). Carnivores, depend on herbivores to supply their food; they are hunters (predators). Omnivores eat both plants and animals. Herbivore's food source is stationary and abundant; the challenge is how to get enough food while avoiding an attack from the hunter. Carnivores must work harder to find and catch their food.

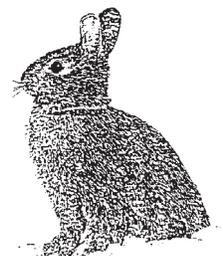
Escape is an important means of defense for prey animals. Their hearing is finely tuned to catch the slightest sound waves made by a predator. The eyes of prey are placed towards the sides of their heads, enabling them to have a broader view of their surroundings. Even their sense of smell is well developed. These senses help prey detect predators, and if they are quick enough, avoid being caught.

Predators are quite different than prey. Predators are curious and investigate any option that may yield food. Predators are usually quick, restless, energetic, and alert. Their sense of smell is finely tuned to follow scent trails prey leave behind. Carnivores have eyes towards the front of their heads, providing the essential vision needed to capture prey.



The following activities increase your students awareness of the remarkable adaptations of the hunter and the hunted. Students will understand the important relationship between them; and how they are both part of nature's balance.

Activity: Observing Prey Protecting Themselves



Grade Levels: Primary, Intermediate, and Secondary

Objective: Students will learn to appreciate how prey use their hearing to protect themselves from predators.

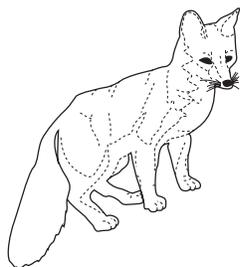
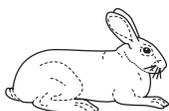
Materials:

- Large open space in which to play game. The picnic area or the open field on Black River Trail would be appropriate.
- Groups of five people
- Blindfold for each group

Procedure:

1. Have five students join hands and form a circle. Ask them to drop hands, and take 10 steps backward. Have one person go to the center of the circle, put on a blindfold and pretend to be the prey.
2. Allow all group members forming the circle to take turns pretending to be the predator. The predators try to get close to the prey without being heard. If the prey hears the predator, the prey points toward the predator and calls, "Stop." If the prey is pointing directly at the predator, the predator must leave the game. But if the predator tags the prey, then the prey must leave the game, and the predator takes its place. The game ends when only one person is left.
3. Ask: How must the predators move so that they might catch the prey?
How can the prey move their bodies to help them more easily hear the predators?





Activity: Predator-Prey Game

Adapted from *Project WILD*. 1987. *Western Regional Environmental Council*.



Objective: Students will learn various interrelationships of predators and prey. Students will be able to describe how wildlife populations increase, decrease, or stabilize depending on their interaction with each other and their environment.

Grade Level: Intermediate and Secondary

Materials:

- Poster with the game rules
- Strips of cloth for the rabbit tails
- Whistle, bell or some other device for signaling the end of each round
- newsprint paper
- 3 different color markers
- Large field near picnic area or open field near Black River Trail
- 4 colored wooden stakes to mark out your playing area

Rules:

The game is a series of rounds. Each round lasts from 1 to 5 minutes. The object of the game is eat or be eaten!

Rabbits:

Each rabbits gets a "tail." The "tail" is a flag which must be visible and tucked into a back pocket or waistband of the rabbit's pants. It cannot be tied onto the rabbit in anyway. All rabbits start in a safe area, call the Rabbit Hutch. Each rabbit must run up to the dandelion patch, grab a dandelion by the hand, and run back to the hutch with the dandelion.

If a fox grabs the rabbits's tail while the rabbit is outside the hutch, then the rabbit is eaten by the fox. The rabbit must then sit out the rest of the round. Any dandelion which the rabbit may have taken, must go back to the patch.

At the end of the round, every rabbit which has not taken at least one dandelion dies and is decomposed, coming back as a dandelion in the next round. Rabbits that manage to get one dandelion were successful. They are chief rabbits in the next round.

Foxes:

When a round begins, the foxes try to grab a rabbit's tail. Each fox must get at least one rabbit, or starve. All rabbits are safe in the rabbit hutch. At the end of the round, those foxes who caught a rabbit become the chief foxes in the next round.

Dandelions:

Sit down in the dandelion patch and gobble up the sunlight. A dandelion should run hand in hand with any rabbit which tags the dandelion. Once back at the rabbit hutch, the dandelion should stay there until the next round begins. In the next round the dandelion becomes a rabbit.

If a dandelion is caught by a rabbit which in turn is caught by a fox, the dandelion must go back to the dandelion patch.

Procedure:

1. Have the playing area clearly marked. Place a "Rabbit Hutch" safety zone at least 100 feet from the "Dandelion Patch." Prepare a scoreboard as below:

Post the rules near the score board and prepare a "skeleton" for the predator-prey graph.

Predators or Prey	Dandelions						
	Foxes						
	Rabbits						
		1	2	3	4	5	6
		Round Number					

2. Seat your students in a semi-circle around you with the rules poster and scoreboard. Review the concepts of food chain, predator, prey, population. Now explain: "For the next 30 minutes, each of you will become a predator or prey. You may be a fox, a cottontail rabbit, or a dandelion, but no matter what you are, you're going to fight for you life. This is a game of survival."
3. Choose randomly the initial dandelions, rabbits, and foxes. You should begin with a ration of 3 dandelions to 2 rabbits to 1 fox. If you have extra players, make them dandelions.





4. Explain all the rules to your students as many times as necessary. Explain that as “Nature” you can change the rules occasionally, especially if things aren’t going the way you planned.
5. Write the initial numbers of dandelions, rabbits, and foxes on the scoreboard under Round #1. Rabbits go to their hutch; dandelions to their patch. Foxes are dispersed in between.
6. Blow the whistle to signal the start of the round. The real trick to the game is knowing when to end each round. You should end the game when several rabbits and foxes have captured their prey. Generally, after a few minutes, the action really slow down. This is when you should consider ending the round, or start running around to encourage the foxes and rabbits.

At the end of each round, gather everyone around the scoreboard and count the number of dandelion, rabbits, and foxes that you will have for the next round. Refer to the rule poster to clear up any misconceptions or problems. Write the numbers down on the scoreboard. Retrieve rabbit tails from successful foxes and then give the tails to new rabbits (former dandelions). Send dead rabbits to the dandelion patch. Send all rabbits back to the hutch. Begin another round.

Variations:

- Eventually you will run out of foxes or rabbits or dandelions. Go one more round with only one member of the population in short supply. Let the predators experience starvation. Then, do something. Change the rules so that one population may begin to build up its numbers. Be imaginative; make these changes represent natural disaster or changes.
- Too few rabbits? Rabbits can be safe if they crouch and remain motionless.
- Too many foxes? Mange strikes and fox-es go lame. They must hop on one leg.
- Too many rabbits? Make them hop like real rabbits. Or have foxes catch two rabbits.
- Too many dandelions? Declare that a rainstorm has loosened the soil around



the roots. A big wind is blowing them away from the rabbit hutch. Dandelions must roll. Explain that a big wind blew dandelion seed everywhere. Let each dandelion pick a place where he or she thinks the wind dropped the seed. Or have rabbits get two dandelions. These variations help make life as a dandelion more interesting.

- When you run out of one population explain that new members are migrating in from another area. Make new rabbits or foxes from dandelions. Make new dandelions from foxes or rabbits.

Graphing Predator-Prey Relationships:

1. Allow 10-15 minutes to graph the results of the game. The graph will be a picture of how each population changes over time. Seat the player around the graph and begin.
2. Graph each population separately with a different color maker. If time permits, let the students do the graphing.
3. Discuss the Results
 - Do the graphs of each population look similar to or different from each other? Why: In most cases, the predator graph will mirror the prey graph, except that it will be one round out of phase. This is true because it will take the predator population one round to react to, or be affected by, an increase or decrease in the prey population.
 - Do any of the graphs have any repeating patterns? Many natural populations go through cycles—lows and highs. What causes this?
 - Are there any limits on how big a population can grow? What are they?
 - What would happen to the fox population if the dandelion patch failed? How many round would it take before the foxes were really affected?
 - If all the foxes died, what would happen to the rabbits? The dandelions?





Pre-Trip Activities for Predator-Prey Relationships

P I S

Primary, Intermediate, and Secondary Students: Discuss the food web with your students. A food web shows how plants and animals depend on each other. Make a food web. Give each person a card with an animal, plant, decomposer, or sun printed on it.

Explain that the sun's energy is captured in the leaves of green plants. Through photosynthesis the plants make food and give off oxygen. All animals depend on this process for life. The top predators are fed by a long energy chain from the sun.

The world is made up of producers, consumers, and decomposers. This forms food chains. Ask your students to draw a food chain. A food chain is a chain of organisms in which each link feeds on the one ahead and is eaten by the one behind. Examples:

Grass → Cow → Person

Algae → Protozoa → Insects →

Bluegill → Pike → Person

Circle the students and starting from the sun with a ball of string, unwind the string connecting all things together in the food web. Ask the students to decide what is connected to what and why.

P I S

Primary, Intermediate, and Secondary Students: Introduce predators and prey. Glue cut outs of common predators and prey on cardboard or laminate them with clear contact paper (example: cottontail rabbit, barn owl, coyote, meadow vole, garter snake, thirteen-lined ground squirrel, red-tailed hawk, red fox, raccoon, deer mouse, white-tailed deer, and great horned owl). Pictures may be found in old nature magazines. Pin pictures of animals on the back of each of your students without showing them the pictures. Students should ask questions to guess what animal is in the picture. The other students can only answer yes, no, or maybe.

Post-Trip Activities for Predator-Prey Relationships

P

Primary students: Ask your students to pretend to be a hunter or a hunted. Your students can write a story about how it feels to hunt or be hunted.

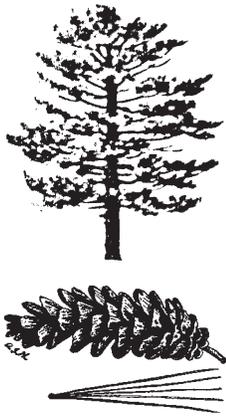
I S

Intermediate and Secondary Students: Make a list of many different predators and prey. Examples include: Predators: Red-tailed hawk, red fox, coyote, Eastern Screech Owl, Belted Kingfisher, Bald Eagle. Prey: Gray Squirrel, Cottontail Rabbit, White-tail Deer, Field Mouse. Ask your students to write a short research paper on the life of a predator or prey species, including what they eat and where they live. Expand by asking the students to draw a picture of their animal and what it eats and where it lives. Students can write poems or short stories about their animals.

S

Secondary Students: Read "The Land Pyramid" in the *Sand County Almanac* by Aldo Leopold. Place wildlife and plants observed at Kohler-Andrae into a pyramid students make with newsprint paper. Discuss interrelationships in nature.





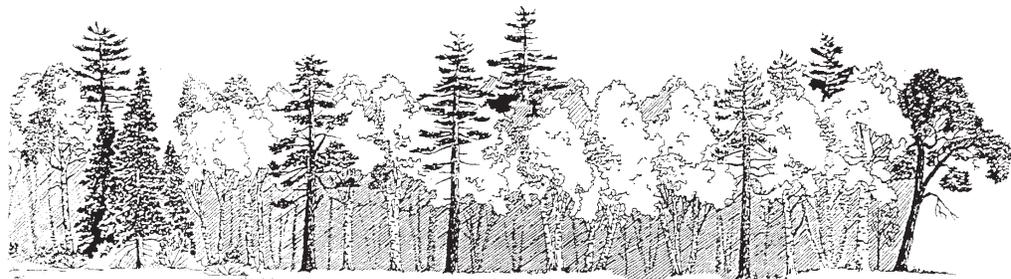
White Pine

Forests

Why do we need forests and trees? Forests are a mixture of many communities all gathered together. The forest consists of layers. The top layer or canopy, is made up of leaves and branches of the tallest trees. A second shorter layer of trees follows behind. Beneath this layer are shrubs and bushes and plants. Ferns, grasses, seedlings, wild flowers, and low lying plants form the herbal layer. Within these layers, insects, birds, and other wildlife live.

Trees produce oxygen and water for living things. Trees support many forms of life; insects, plants, fungi, and wildlife need trees. When trees die, they decompose and return important nutrients and minerals into the soil. Many life forms live on dead trees. Small animals such as mice and rabbits find homes in hollow logs. Insects lay their eggs in decomposing wood. Termites and ants find the wood to be both tasty and a good home. Woodpeckers peck holes in the wood, feeding on the insects living within it. Fungi feed on dead trees, too. Algae, mosses, and lichens break down organic matter sending the tree's nutrients and minerals back to the soil.

Kohler-Andrae's forests show this never ending cycle of life and death and the return of nutrients to the soil. Along the Woodland Dunes Trail and Black River Trail, you will venture upon fallen trees. Explore with your class these fallen trees and share its secrets. Note: These logs are someone's home. Please return the investigated log and its inhabitants to the place where it was found.



Activity: Life in a Rotting Log



Grade Level: Primary, Intermediate, and Secondary

Objective: Students will explore a rotting log to find various life forms. Students will learn that trees die, decompose, and return to the soil.

Materials:

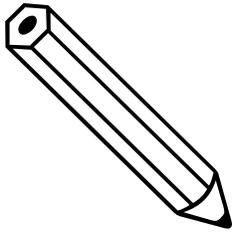
- A good sized tree or log in decay (find along the trail)
- Pointer or stick to probe the log
- Student Worksheet: Life in a Rotting Log

Procedure:

1. While on your hike on the Woodland Dunes Trail or the Black River Trail, discuss with the students why trees die. Trees die from insects, disease, old age, natural disasters, and from vandalism. Ask students what happens to a tree when it dies.

2. Find a rotting log close to the trail. Caution: Beware of poison ivy. First, ask the students to kneel around the log. Instruct them to close their eyes and listen. Tap the log; does it sound hollow or solid? Smell the log; what does it smell like? Feel the log; is it hard or soft? Rough or smooth? Wet or dry? Ask the students to predict in which parts of the log they will find the most creatures. Ask your students to play forest detectives and answer the questions on the worksheet. After the investigation, try to leave the log in the same condition you found it.





Student Worksheet: Life in a Rotting Log

Directions: We are going to be forest detectives. Use your tools (hint: your nose, hands, and eyes) to investigate this rotting log. Discover what is living under and within the log. Remember: This log is someone's home. After you have finished your investigation put any materials and inhabitants back where you found them.

Answer the following questions:

1. Are there any leaves on or near your log? _____
2. Is there bark on the log? _____
3. Is the wood soft or hard? _____
4. Is the wood moist or dry? _____
5. Do you see any insects or other wildlife that live in or feed on the log? If you do not know what the name is draw a picture of it on the back of this worksheet and make up your own name.

6. Can you see any signs of animals in or on your log? List: _____

7. Are there any plants growing out of your log? Are they ferns, mosses, fungi, flowers, or saplings? Draw each of the plants you find on the back of this worksheet.

8. If not for decay, what would have happened to the earth centuries ago?





Maple

Pre-trip Activity on Forests

P I S

Primary, Intermediate, and Secondary: Obtain *Nature's Recyclers Activity Guide* from the Department of Natural Resources, Box 7921, Madison, WI 53707. This guide offers many valuable activities that educators can use in the classroom and on field trips.

Post-trip Activity on Forests

P I S

Primary, Intermediate, and Secondary: Learn to compost. You need: aquarium, organic wastes: leaves, needles, grass clippings, sawdust, kitchen scraps; soil, not potting soil; thermometer, trowel or large spoon and 1-2 dozen red earthworms. Chop wastes into small pieces. Alternate your layers and sprinkle with water, repeat until finished. Cover with an inch of soil. Water the pile enough to make moist, not soggy. Add earthworms. Do not place in direct sunlight. Mix compost gently once a week and take temperature (keep a record). Discuss: How composting reduces the amount of waste that is thrown out, what happens to organic material that ends up in landfill? Tie in with the "Life in a Rotting Log" exercise done at Kohler-Andrae.





Lake Michigan

Share with your students the fascination of the second largest Great Lake, Lake Michigan. The following activity illustrates the importance of water earth-wide. Lake Michigan is part of the greatest freshwater resource in the world and it is in our own backyard. Introduce the importance of water in our daily lives, the interrelatedness of all water, and the water cycle concept with the following activity.

Is there a sense of just one body of water on earth? Waterways from each continent flow in an interconnected pattern. You can easily see and sometimes touch this universal body of water in some form—turning on a water faucet or looking to the sky filled with clouds. Lakes, ponds, and inland seas are webbed together by waters flowing across the land surface or from below, in the seeping flow of groundwater. Through evaporation, condensation, and precipitation, the atmosphere transports water from place to place.

Plants are an active part of the water cycle in many ways, including transpiration. This process allows plants to shed moisture through the surface of the leaves. This moisture evaporates into the atmosphere; where, at some point, it will condense and fall to the earth as precipitation.

Human beings are linked to the planet's watery world. Our bodies are approximately 75% water. Each molecule within us has been part of the watery world in past times. Our bodies' water may have flowed in streams, lofted in air, or been locked in glacial ice. Other animals and plants are also tied to the planet's waters. Since living things are partly made of water, all life depends upon water in some way.

The continuous dynamic movement of water is called the water cycle. The concept of the water cycle is a way to view water's movements in its many forms. This cycle is never-ending; it can be observed every day. Lake Michigan is an opportunity to give your students a first hand look at the water cycle and its importance to life.

Activity: Lake Michigan Water Wings

*Adapted from: Aquatic Project WILD. 1987.
Western Regional Environmental Education
Council.*

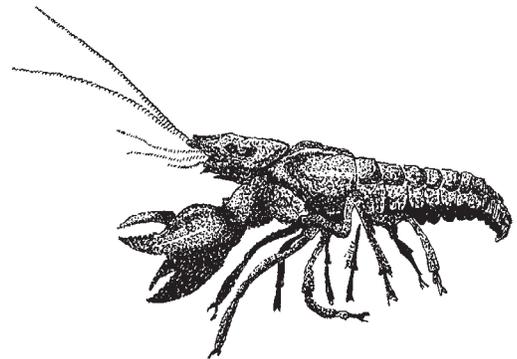


Grade Levels: Primary (modify), Intermediate, and Secondary

Objective: Students will be able to illustrate the water cycle, describe the interrelatedness of the world's waters, and state the importance of water to people, plants, and animals.

Materials:

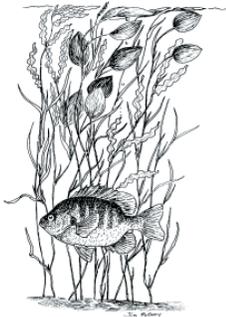
- Art materials: water-based paints such as acrylics, water colors, or poster paints; brushes, paper, containers for water
- Clipboards
- Paper
- Lake Michigan sounds



Procedure:

1. Walk on the beach at Kohler-Andrae. Find a secluded spot for your class to sit and listen to the water. If policy permits, allow the students a chance to touch the water with their hands and bare feet. This is a visualization exercise which may be too long for younger students. Make necessary adjustments in the exercise to allow those students a chance to move around.
2. Ask the students to sit or rest quietly in a comfortable position. Begin the guided imagery. Invite the students to relax and listen carefully to the water. Explain these sounds are simply background for the ideas you are going to ask them to visualize in the minds.





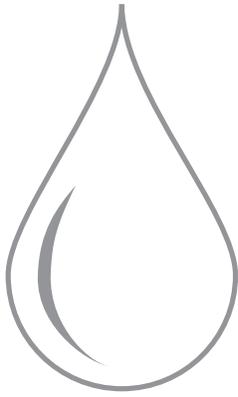
Bluegill

3. Read the following in a quiet, gentle voice. For younger students, you may want to shorten and modify the text.

You are to try to imagine the things you will hear me describing. Sit comfortably and close your eyes ... Relax and imagine what I am describing. You are standing here on the Kohler-Andrae beach of Lake Michigan. You walk down to the water and it touches your bare feet ... The water feels good and cool ... it dances over your feet ... The current pulls at your feet and takes away the sand beneath them ... Your feet are buried in the cool, wet sand ... Water rushes past your buried feet ... Think about where the water moves as it flows past your feet ... It is in Lake Huron, another Great Lake ... Lake Michigan's water is connected with Lake Huron's water ... The water carries us past many cities, factories, forests, and farmlands along the way ... The water flows into a river and we move to Lake Erie ... We have a rough ride on the Niagara River and we tumble through the Niagara Falls to enter Lake Ontario ... The water beneath our feet moves through the St. Lawrence Seaway and to the sea ... Through your feet and the continuous currents of water you can imagine that you feel the sea..Now stretch your mind and realize that you interconnect with all the world's oceans ... You are now touching one single body of water ... This body stretches around the world ... Your body contains water that is a part of this system ... Water flows under the Golden Gate bridge in San Francisco's bay, it leaps and plunges around oil drilling platforms in the North Atlantic ... It pours from the sky as a storm rages dark and gray ... It drenches the Alaskan native who shivers on the Arctic shores before her parka begins to warm her ... Water connects your feet with every stream flowing into the oceans around the world ... Your can reach up the rivers to the hearts of continents ... You can feel the tremor of the hippopotamus that just dove into an African river ... You can feel an alligator silently sliding toward a heron in the Florida Everglades ... You can see water, tons of it, in great drifting fleets of heavy white clouds ... Your reach embraces the whales, porpoises, dolphins, and sharks ... Your watery embrace wraps all around the earth ... And, of course, the water flowing over you feet connects you with everyone else who is now wading in the water, wondering where the water goes ... It is time to come back from the world's rivers and oceans ... back to the surfaces of your feet ... back to the water of Lake Michigan ... When you feel ready, you may open your eyes.

4. Ask the students to open their eyes. Tell them each had their own private journey even though they all heard the same words. Ask them to close their eyes and find their favorite place on the journey. Younger students may be asked to describe their place with the class. Older students may be able to visualize further. Ask them to re-create the mental picture. Ask them to pay attention to detail, the role which water plays in the lives of people, plants, and animals.
5. With these images, students can paint a picture of their favorite place in the journey. Gather some water for your paints, pointing out that water from your journey will help them draw their pictures.
6. Discuss each picture. Point out themes. Draw your own picture of the water cycle to show them the big picture. Once at school, make an image gallery on a bulletin board.





Pre-trip Activities on Lake Michigan

P I S

Primary, Intermediate, and Secondary Students: Ask your students to list at least ten ways that you use water every day. Introduce the water cycle concept.

Use yarn to connect water sources on a world map at school to illustrate the interconnectedness of the world's water.

P I S

Primary, Intermediate, and Secondary Students: Use activities from *Our Great Lakes Connection*. 1985. Lynn Entine. Available free from: Environmental Resources Center, 216 Agriculture Hall, Madison, WI 53706.

Post-trip Activities on Lake Michigan

P I S

Primary, Intermediate, and Secondary Students: Discuss the "One body of water" principle. Emphasize the concept that all the waters of the world are interrelated and connected. Help the students see that the air is part of that connection, too. It is air that carries water back to the rivers and lakes from the sea. Point out that watersheds are places where the air rains its water back down on the earth's surface and it accumulates. Talk about the importance of water to people, plants, and animals. Ask students to list as many examples as you can of why water is important to plants and animals.

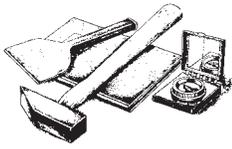
P I S

Primary, Intermediate, and Secondary Students: Using their favorite images from the field trip water journey, students can write stories and poems. Students can express their feelings about water and its importance.

I S

Intermediate and Secondary Students: Introduce pollution of the Great Lakes. Students can research ways to clean up the environment and what happens when a pollutant is introduced into Lake Michigan or other water source. Who is effected by pollution?





Rock Identification/Geology

It is rare that a person can hike along the beach without picking up some rocks deposited by the waves. Children are well known for this. As a result, teachers and group leaders who use the beach for a hike are commonly besieged by the question, "What's this rock?" The following activity introduces younger children to rock characteristics using various observational techniques. For older children, this activity may be expanded to discuss sedimentary, igneous, and metamorphic rock formation and identification.

Pebble, stone or "skipper," they are all rocks to the geologist; "an aggregate of minerals." Smaller rocks are broken down from large geologic formations by the action of weather and water. When the glaciers covered the Midwest 20,000 years ago, they picked up and carried rocks of all sizes. Giant boulders and tiny pebbles moved with the glaciers.

As the glaciers melted, streams of water carried loosened rocks away and piled them along the water's path. This explains why many rocks found around the Great Lakes region are from geological formations many miles north. The glacial meltwater carried along the rocks and sand that cover the lake bottoms and beaches.

Watch waves at the beach. Rocks are picked up and rolled over and over again. The rocks batter against one another in the water, sand and water scour them into round, smooth rocks; finally the scouring grinds rocks into pebbles and into sand grains. The beach contains many "special finds" for students to discuss and observe rocks. When you are done with the rocks, ask the children to return them so others may enjoy their beauty and learn their stories. For further study, a beach rock display is located in the nature center.

Activity: Rocking Around

Adapted from *Our Great Lakes Connection*.
1985. Lynn Entine.



Objective: To introduce younger students to characteristics of rocks using observational techniques.

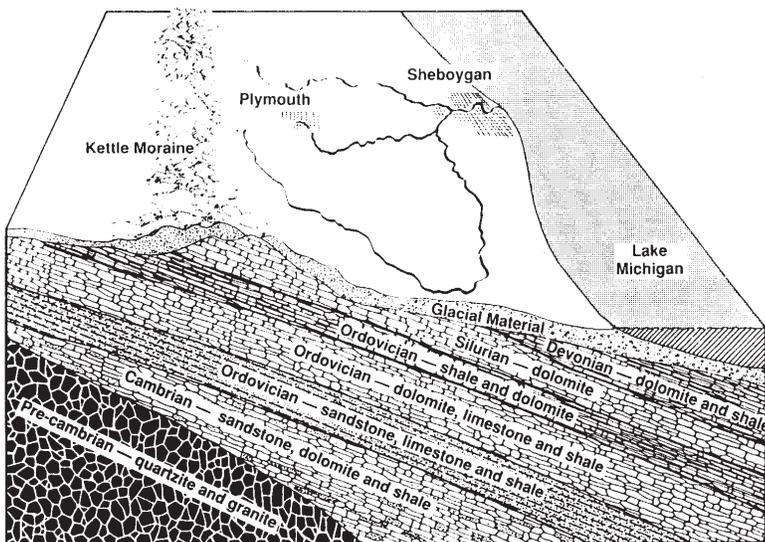
Grade Level: Primary, modify for Intermediate and Secondary

Materials:

- Magnifying glasses (one for every 2-4 students)
- Assorted rocks
- Sheet for recording observations
- Pencil and Clipboard
- Rock identification field guide

Procedure:

1. Take a hike along the beach. Instruct your students to collect one or two rocks for the activity. Make sure the rocks are not all the same type and size. Note: Due to the dynamic changes in the Lake Michigan shoreline daily, your group may have to search for uncovered rocks. Generally, there are more rocks on the north end of the beach.
2. At the end of the hike, each group selects several rocks. Ask them to sort rocks by size. Ask:
 - What words can you use to describe the rocks in this group of rocks?
 - Which is a heavy rock? (or some other one characteristic)
 - Show me a rock which is rough and dark-colored. (or two other characteristics)



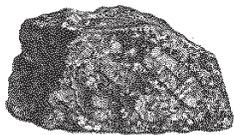


- Show me a rock with three colors in it. (or three other characteristics)
 - Ask your students to sort the rocks in ways other than by size.
3. Have each student select two rocks. Ask:
 - How are these two rocks different? List three ways.
 - How are they similar? List three ways.
 - What color is the first rock? The second rock?
 - Which rock is bigger? Heavier? Smoother? Rougher?
 - Pick one rock. What makes this rock special to you?
 4. Have the students return their rocks to a pile. Mix the rocks up and spread them out. Ask your students to find their own rock. Have them observe their rock through a magnifying glass.
 5. Ask each group to put some sand in their hands. Help him/her isolate one or two grains and observe it through a magnifier. Ask:
 - Tell us three ways that the sand grain is similar to your rock.
 - Tell us three ways that they are different.
 6. Ask the students to draw a picture of their rocks.



Intermediate and Secondary students:

The following discussion will assist you in rock identification. A visit to the nature center shows a rock identification display for you and your group.



Most of the stones, pebbles and rocks found upon the beaches of Kohler-Andrae are glacial outwash. *Outwash* is debris carried by the advance and retreat of past glaciers and washed out from the glacier by its meltwater. It differs from glacial till because it consists of sands and gravels that have been sorted and stratified by the flowing water.

Rocks are commonly divided into 3 classes; igneous, sedimentary, and metamorphic. Most often, igneous or sedimentary rocks are found on the beaches of the park.

Igneous rocks formed from molten material cooled in of two different manners

resulting in very different rocks. Lava or other volcanic material poured or erupted onto the earth's surface cooled quickly to form basalt or rhyolite. These rocks have very fine grains and small crystals.

Magma cooled slowly beneath the earth's surface formed rocks such as granite and gabbro. These rocks have large grains and crystals because their formation took longer. When these igneous rocks weathered, they produced the material needed for the formation of sedimentary rocks.

Two igneous rocks, basalt and granite, are commonly found on the park beach. Although they are both magma derived, they differed in their formation and composition. Whereas granite is composed of feldspars, quartz, and the ferro-magnesium minerals of amphibole and mica; basalt never contains quartz and is composed of feldspars and the ferro-magnesium minerals of amphibole, pyroxine, and olivine.

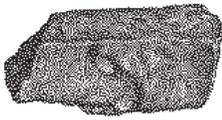
Basalt is a good guess when identifying any finely-textured *purely black* stone found on the Kohler-Andrae beach. Basalt is considered an extrusive rock since it was formed when lava poured onto the surface and cooled rapidly. The basalt found in the parks is probably derived from Precambrian rocks found far to the north of the area.

Granite was intrusively formed when magma slowly cooled deep within the earth's crust. This slow cooling allowed large mineral crystals to form within the rock giving the material a grainier appearance than basalt.

Depending upon the amounts and kinds of minerals composing the rock, granites can vary greatly in their overall color; from red, pink or salmon, to gray or white. A closer look at a granite rock will reveal many colored crystals such as smoky grey quartz, white or salmon-colored feldspars, and black biotite mica and hornblende.

Fine grain granites, which formed due to relatively more rapid cooling, has a salt and pepper pattern and glitters from the reflection of the sun upon the many tiny crystal faces. Medium grain granite cooled somewhat more slowly than fine crystals which flash when reflecting sunlight. Both fine and medium grain granite may have a glassy surface when smoothed by wave action.





Sometimes a granite rock will flash like gold in sunlight. Actually the rock contains muscovite mica, a mineral which is colorless and cleaves into paper thin sheets. It is the reflection of the sun off the sheet that gives the appearance of gold. Sheets of mica, known as "isinglass" were used as heat proof windows in old stoves and ranges.

Sedimentary rocks are made of material eroded or dissolved from pre-existing rocks, materials carried mainly by flowing water and deposited or precipitated in low places where they could accumulate and remain undisturbed. Under the compressive weight of additional layers of sediment, the sediments cemented into hardened, fossil containing sedimentary rocks. Sandstone, limestone, and conglomerates are kinds of sedimentary rocks.

Sandstones are less commonly found at Kohler-Andrae than any other sedimentary rock. The water and wind sorted quartz sand grains, which have been cemented into sandstone by silica, lime or iron oxide. Sandstones range in color from tan to the red-brown stain of iron oxide. Ripple marks and sediment layers of the stones are permanent reminders of the presence of ancient shallow seas which at one time blanketed much of Wisconsin.

Dolomitic limestone, found as commonly as granite on the beach, is composed of lime from shells, corals, and other calcareous remains of sealife. In Wisconsin, most rocks which were originally limestone have been changed to dolomite by the chemical replacement of calcium by water borne magnesium. Since limestones are composed of lime precipitates derived from the shells of ancient sea animals, they are the best source of fossils on the Kohler-Andrae beach. "Chain" (*Halysites*) and "honeycomb" (*Fayosites*) corals, as well as bivalve (shelled) brachiopods are the most common fossils found at Kohler-Andrae.

Conglomerates, a mixture of pebbles, cobbles, or boulders, held in a cement-like matrix of finer rock particles, resemble concrete. For this reason, be careful when identifying this rock for what sometimes appears as sedimentary conglomerate is actually road construction waste that has washed into the lake.

Metamorphic rocks result when igneous or sedimentary rocks have been altered or

"metamorphosed" by intense heat, pressure, or chemical action. *Greenstone* is a slightly metamorphosed basalt found at Kohler-Andrae; as its name implies, it is dark green. Chlorite gives the green hue to these initially black rocks.

In addition to igneous, sedimentary, and metamorphic rocks, interesting nonrocks and minerals are commonly found. A walk upon the beach will usually turn up one or two pieces of cream city brick, a yellow brick made years ago in Milwaukee and used in the construction of old farm houses in this area. In addition, bricks were used in the hulls of old ships for weight.

Clinkers, a challenge to find, are very light in weight, brown-black, and full of holes like lava. Clinkers, which float in water, were formed when the fly ash from steamers that sailed Lake Michigan, solidified upon contact with the cold waters. Bottle rocks, often treasures to children, are pieces of broken bottles whose ragged edges have been rounded smooth by lake wave action. The last non rock is black, shiny, and lightweight. This nonrock is coal from passing ships.

Pure quartz stones are beautiful finds. Chert, is actually an impure form of flint which is a form of quartz, can prove to be a head scratcher. It will often appear as an angular rock that is grayish-brown within and a creamy white outside coating. The angularity, not commonly found in most of the wave smoothed stones, is due to the fact that when chert fractures, sharp edges are produced. Native Indians of the area took advantage of this fact when they used chert to make arrowheads.

The third mineral of special interest is seen as a film of blackened sand on the beach. This is not a pollutant. The film is actually *magnetite*, a naturally occurring mineral found in iron rich igneous and metamorphosed sedimentary rocks. When these rocks are weathered, the magnetite is released to the environment. The most interesting aspect of magnetite is that it can be easily picked up by a magnet; a fact that delights young and old.

A nature center display contains jars filled with sand and magnetite. Magnets are available to test its magnetism. Warning: Do not put a magnet directly on magnetite; it will not come off! Display its magnetism through glass or plastic.





Beach Grass

Activity: Sand Study



Grade Level: Intermediate and Secondary

Objectives: Students will be able to name at least three minerals that can be found in sand and at least two effects of the wave action on the sand through first hand observation.

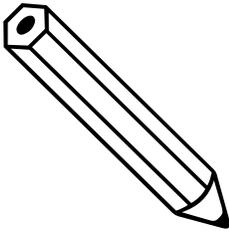
Materials:

- Clipboards
- Pencils
- Student Worksheet
- Hand lens
- Plastic bag and magnet for each group of 4-5 students

Procedure:

1. Divide your students into groups of 4-5 students. Each group gets a worksheet, clipboard, a hand lens, magnet and plastic bag.
2. On the Kohler-Andrae beach, ask your students to examine sand. Each group should fill out the questions on the worksheet.
3. Take the students into the sand dunes to compare the sand there with that of the beach. If you like, move farther west comparing beach sand you kept in a plastic bag with other sand.





Student Worksheet: Sand Study

Introduction: Have you ever wondered what sand is? Today we will take a closer look at sand and learn what makes up sand.

Directions: Each group should look over the questions on this worksheet. As you examine your sand, fill out the questions below.

Using a hand lens, examine some of the beach sand.

1. What colors do you see in the sand? _____

2. Are there more grains of any one color? If so, what color? _____

3. Are the sand grains similar to each other in size, or are there many sizes? _____

4. Is there anything else of interest to you as you look at the sand? _____

Find an area where you see black sand. Look at black sand through the hand lens.

How does this differ from the sand you looked at earlier? _____

Place some of the black sand into your plastic bag and touch your magnet to it.

Does the magnet attract some of the sand? Which part? _____

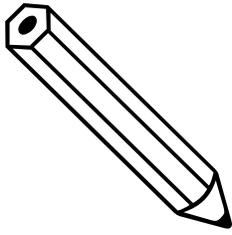
Black sand grains can be basalt or magnetite. If it is magnetite, it will be attracted by the magnet. Magnetite is an iron oxide, a form of iron ore. Basalt is a volcanic rock. The clear particles are quartzite. Other minerals found might include feldspar, calcite, hornblende, and olivine.

Look closely at the wet sand at the water's edge, where you see the wave marks or mountain shaped marks. Watch the waves as they come in and form the tiny ridges.

5. How would you describe the sand that makes up the line at the place where the water comes the farthest?

6. Are there other areas of coarser sand grains in this same area? _____

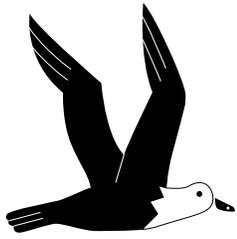




The wave action sorts out the sand particles by size and weight. There is a lot of power as the waves come in, bringing sand with them. When the water begins to move back out, much of the power has been used up. Coarser, heavier grains are left at the farthest point reached by the waves. There isn't enough power to carry them back out. The black minerals, basalt and magnetite, are heavier than the others—that explains why there are areas with concentrated amounts of dark grains. If we could get sand from a long way out on the lake bottom, we would find very fine grains or silt. The sorting process continues from shore all the way to the deeper water.

Now examine some sand from an area away from the beach. How does it differ from the beach sand?





Activity: Beach Combing Scavenger Hunt



Grade Level: Primary and Intermediate

Objective: Students will appreciate what things can be found on the beach and what Lake Michigan carries in its waters.

Materials:

- Student Worksheet: Beach Combing Scavenger Hunt
- Pencil
- Clipboard

Procedure:

1. Hand out worksheet and ask your students to try to find the items on the list. Your worksheet may be placed on notecards for easy handling.
2. Discuss how Lake Michigan carries things in its waters with wave action. Start off by finding some rocks and discussing where they came from and how they were carried here. (Glaciers moved a lot of rocks from north of here.)

Student Worksheet: Beach Combing Scavenger Hunt

Explore the sands along Lake Michigan. See if you can find some of the things listed below.

- fossil in a rock
- driftwood
- wave signatures such as ripples
- feather
- dead fish (look, don't touch!)
- insect
- interesting garbage
- footprints
- gulls



Pre-Trip Activities on Rock Identification/Geology



Primary Students: Read the story *Sylvester and the Magic Pebble*, by William Steig, 1969, Windmill Books.



Intermediate and Secondary Students: Make a simple wave tank. Take a dish pan or other basin with relatively deep sides. Have students heap sand and small rocks at one end of it. Add one or two inches of water, enough to move around, but not so much as to submerge your rock and sand pile. Lift the end opposite the "beach" gently up and down so "waves" move the rocks and sand.

Ask:

- What's happening to the rocks?
- What's happening to the sand?
- Why do they respond differently to the wave?
- Have you ever been to a beach at a lake?
- How is this like that? How is it different?
- Imagine what it feels like to be a rock or grain of sand in the wave.

(Optional: Have students do a creative drama exercise in which some are waves and some are rocks and sand. Have them show water, rock, and sand movements.)



Primary, Intermediate, and Secondary Students: Discuss the difference between rocks and minerals. (Minerals are either elements or chemical compounds that are found naturally on earth. There are more than 1,500 identified minerals. Rocks are solids that are composed of one or more minerals.) Ask your students to list how many ways minerals play a part in our everyday lives. Example: your school may be made of stone, or brick; glass in windows; cars made of steel.

Post-Trip Activities on Rock Identification/Geology



Primary Students: Plant a rock. Place a rock outdoors on the playground. Observe its surroundings. Draw a picture. Go back and observe it after 3 months, 6 months and 9 months. Look at the rock when it rains and compare it with your original picture. What do you notice? Have your students keep a daily log to record changes in their rock and its surroundings.



Intermediate and Secondary Students: Ask your students to collect some rocks and stones for this activity. Each student should find at least three rocks. The student should mark each rock so they can identify it and describe where they found the rock. Help the students identify their rocks using field guides. A guest speaker such as a local university geologist is an option. Save as many egg cartons as you can for this project; they make excellent display and collection boxes.

Cut a piece of construction paper large enough to cover entirely the outside lid of an egg carton. Glue the paper to the lid. Ask students to wash and dry their rocks. Glue one rock into each compartment of the egg carton. Number each rock.

On the lid, write the type of rock and where it was collected corresponding with the appropriate number. Your rock display can be divided into sedimentary, metamorphic and igneous rocks or by color. Discuss rock formation and weathering. Rocks weather to help form soil.

