Wisconsin's Forest Ecosystem

Artist, Kandis Elliot

Forests…More Than Just Trees

Forests today cover 46 percent of Wisconsin. They are a complex community of plants, animals, and non-living parts that constantly change, grow, and interact with each other. Some forest inhabitants depend on large areas of continuous forest cover, others prefer living near the forest's edge. Some need young forests, others require mature forests. Even dead trees lying on the forest floor become habitat and contribute to biodiversity.

Wisconsin's forests today are the result of years of research, management and care by many dedicated citizens, conservation leaders and resource professionals. Forests touch our lives daily through the products they produce and the many ways they improve our quality of life.

Sustainably-managed forests provide economic, ecological, and social benefits today and for the future.

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Wisconsin Forest Ecosystem Treasure Hunt

Greetings fellow forest ecosystem explorer! Your task is to find several of the biotic (living) components of a Wisconsin forest ecosystem located on the front side of this poster and check them off as you find them. An ecosystem is made up of both biotic (living) and abiotic (non-living) elements. Can you think of some additional elements of a forest ecosystem that are not included on this list? Good Luck!

Trees

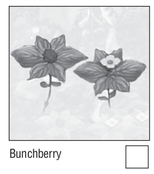

Balsam Fir ☐


White Pine ☐

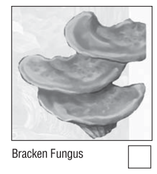

White Birch ☐


Sugar Maple ☐

Plants


Bunchberry ☐

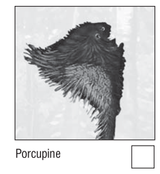

Currant ☐

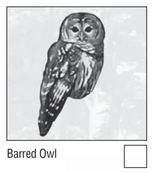

Bracken Fungus ☐

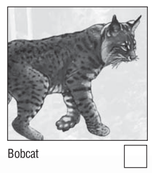

Trillium ☐

Wildlife

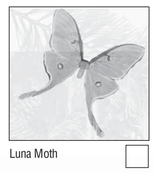

Red-backed Salamander ☐


Porcupine ☐

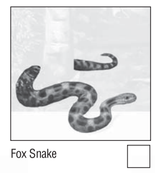

Barred Owl ☐


Bobcat ☐

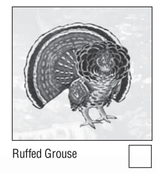

White-tailed Deer ☐


Luna Moth ☐

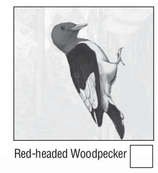

Northern Flying Squirrel ☐


Fox Snake ☐


Goshawk ☐


Ruffed Grouse ☐


Snowshoe Hare ☐


Red-headed Woodpecker ☐


Ovenbird ☐

Field, Forest, and Stream

Activity 48

In this inquiry-based activity students will conduct a field study of three different environments as they focus on sunlight, soil moisture, temperature, wind, water flow, plants, and animals in each environment. By comparing different environments, students will begin to consider how nonliving elements influence living elements in an ecosystem.

Levels
Activity: Grades 4-8
Variation: Grades 1-3

Subjects
Science, Math

Concepts
- In biological systems, energy flows and materials continually cycle in predictable and measurable patterns. (3.1)
- Plant and animal populations exhibit interrelated cycles of growth and decline. (3.2)
- Ecosystems possess measurable indicators of environmental health. (3.4)

Skills
Observing, Organizing Information, Comparing and Contrasting, Identifying Relationships and Patterns

Technology Connections
Graphic Organizer Software, Spreadsheet/Database Software

Materials
Chart paper, marking pens, paper for recording observations, trowel or stick, photographic light meter or photosensitive paper, thermometer, small strip of paper, 2 compasses, bottle of tap water, topographical map of area (optional), copies of student page

Time Considerations
Preparation: 60 minutes
Activity: one or more 50-minute periods

Related Activities
Schoolyard Safari, Web of Life, Soil Stories, Rain Reasons, Are Vacant Lots Vacant? Watch on Wetlands, Water Wonders

OBJECTIVES

- Students will describe similarities and differences they observe in the non-living (abiotic) and living (biotic) components in three ecosystems.
- Students will identify ways that abiotic components of an ecosystem affect the biotic components.

ASSESSMENT OPPORTUNITY

- Give pairs or teams of students a large sheet of paper or access to graphic organizer software. Have students place the names of each of the elements studied (sunlight, soil moisture, wind, temperature, water flow, plants, animals) in a large circle around the edge of the page. They should draw lines showing connections they observed between elements. On each line, have students briefly describe the relationship. For example, students might draw a line between sunlight and soil and then write, "When there is more sunlight, the soil is drier."

BACKGROUND

An ecosystem is a community of different species interacting with each other and with the chemical and physical factors making up its nonliving environment. It is a system of interrelationships among organisms, and between organisms and the physical environment.

Plants and animals in an environment interact with each other in various ways. For example, plants may depend on insects or birds to pollinate flowers and on earthworms to aerate the soil; animals may depend on plants for food or shelter. However, plants and animals also interact with the nonliving elements of their environment.

In a local environment, physical factors such as sunlight, moisture, temperature, wind, and water flow influence the suitability of an area for particular organisms. Those factors determine the kinds of plants and animals that live there. Physical factors may be determined by the environment's geography, such as its proximity to water, its elevation, or its geological features. In addition, the resident organisms (particularly plants) may affect the sunlight, moisture, temperature, and wind of the area. For example, the tall trees of a redwood forest tend to block sunlight and thus create a dark, moist environment, or microclimate on the forest floor that is suitable for shade-loving plants but is too shady for other kinds of plants. Microclimate refers to special conditions of light, moisture, and temperature that occur in a narrowly restricted area within an ecosystem, for example, under a bush or in a small woodland opening.

How to Measure Wind Direction Using a Compass

Wind direction tells you where the wind is coming from. So, a northerly wind blows from the north to the south. To measure wind direction:
- Turn your body so that you feel the wind at your back.
- Hold the compass flat at waist level.
- Turn the compass (without turning your body) until the red arrow matches up with the north arrow on the base of the compass.
- The direction the wind is coming from is the letter or number closest to your belly button.

Note: To measure direction of water flow, follow the same procedure except turn your body so that you face the same direction the water is flowing.

GETTING READY

1. Find three study sites that are somewhat different from each other in terms of sunlight, air temperature, soil moisture, wind, topography, and number and types of plants and animals living there. If possible, select one site that is open, like a field or lawn; one that has trees; and one that contains water. Possible study sites include a school lawn; a park, playground, or other area with many trees; a flower bed or vegetable garden; a vacant lot; a pond, stream, or marsh; an open field; and a forest.

2. Plan to visit the sites on the same day or on different days (at about the same time each day). Obtain any necessary permission to take students to visit the sites you have chosen.

3. ***Safety!*** Check the sites beforehand to identify and possibly remove any safety hazards such as deep holes, sharp objects, or poisonous or irritating plants.

4. Arrange to have at least one parent volunteer, aide, or older student to help supervise students during outdoor investigations. This person will help the activity go more smoothly, ensure students' safety, and prevent damage to the sites.

5. Photocopy the student page for each team to record their observations. Using chart paper and marking pens, prepare a large chart for compiling each team's data, or plan to use spreadsheet software.

6. Have students practice using equipment like thermometers, compasses (see box on page 203), and light meters.

DOING THE ACTIVITY

1. Ask students to think of a place they enjoy visiting. (It might be a park, a grandparent's house, or the library.) Ask them to think about these questions:
   - What did you particularly enjoy about the place? Was it the people? The physical space?
   - What did you do in this place?
   - What living things made your place enjoyable? (plants, animals)

   Name any nonliving things that made your place enjoyable. (water, mountains, climate)

   Help students see that any place has both living and nonliving parts that work together to make an ecosystem. Explain that students will investigate ecosystems at three different study sites to find out how living and nonliving elements affect each other.

2. ***Safety!*** Be sure to discuss appropriate outdoor behavior with students. All living things, including plants, are to be respected and not injured in any way. Talk with students about following the rule: look, learn, leave alone. (See Appendix 14 for more information about teaching out-of-doors.)

3. Divide your group into teams. Explain that each team will investigate and record observations of a different component of three different study sites. (If you have a large group, have two teams study each component and then average their data.) Give students instructions, a copy of the student page, and materials as described below. Later, teams will transfer their observations to the class data chart.

Team 1 – Soil
Ask this team to determine the soil moisture at the study sites. Students can use a trowel or stick to scrape the surface of the ground and to obtain a small sample of soil from underneath the surface. By feeling the soil, they should be able to tell whether it is wet, moist, or dry. (Moist soil will stick together.) They should examine the soil for other characteristics such as texture, color, and smell. They should also note plant material or organisms in the soil. (See Activity 70, "Soil Stories," for more information.)

Team 2 – Sunlight and Wind
Ask this team to determine wind movement and how much sunlight reaches the ground at each study site. For the wind, one student can hold the small strip of paper away from the body, while the others observe whether it hangs straight down or blows at an angle. They can use the compass to determine the direction from which the wind seems to be blowing. To determine light intensity, students may use a photographic light meter or photosensitive paper. If these items are not available, they can use relative terms such as shady, dark, medium light, or bright; or "Site 1 is brighter than site 2, and site 2 is brighter than site 3."

Team 3 – Temperature
Ask this team to measure each site's temperature at ground level, 1" (2.5 cm) deep in the soil, and at 1 yard (.9 m) above ground. If one site is a pond, stream, or lake, have the team measure the temperature at just above the water, at 1" (2.5 cm) deep, and at 1 yard (.9 m) above.

Team 4 – Lay of the Land
Ask this team to determine whether each site is flat or sloped and to record any other land features that affect the study site (such as tall buildings or cliffs adjacent to it). This team will also determine which direction water flows from the site. They can do so by slowly pouring water onto the ground and observing where it goes. They can use the compass to determine the direction of flow. If possible, also have them study a topographic map to locate the site and to determine the body of water into which the site drains.

Team 5 – Plant Life
Ask this team to observe the various kinds of plants at each site (large trees, small trees, shrubs, small plants, grasses – no need to identify species). Suggest that students record the most common kinds of plants found in each location and that they note especially where each grows relative to the others.

Team 6 – Animal Life
Ask this team to record the various kinds of animals at each site (insects, birds, reptiles, fish, frogs, or tadpoles). Students should include evidence of animals such as scat, tracks, burrows, or leaves that have been chewed.

4. After teams have had sufficient time to investigate each location, have them all come together to present their findings and share what they have learned.

5. Each team should listen to the reports of the other teams, and use the information to complete their team chart.

6. Ask teams to enter their data on the large class chart you prepared or into a spreadsheet. Use this chart or spreadsheet as a basis for discussing differences between the locations and any interactions students observed among the elements. Ask the following questions:
   - Which ecosystem had the greatest number of plants? Animals? Which has the least of each? How do you explain this difference?
   - How are plants and animals the same at different sites? How are they different?
   - Which site had the highest air temperature? The lowest? The most wind? The least?
   - Which has the wettest soil? The driest?
   - Do plants seem to affect the light intensity, air temperature, and soil temperature in an area?
   - How does water seem to influence the soil temperature, air temperature, and soil moisture?
   - What relationship does light seem to have with air temperature? With soil moisture? With plants?
   - How might water flow affect soil moisture and plants?
   - Which of the elements we studied seems most important for determining the character of the environment at each site? What makes you say so?

Variation—Stake Your Claim

1. Using index cards attached to sticks or stakes, prepare enough markers so that each pair of students has two. Write one of the following labels on each marker. For *younger students,* you may use simpler words or the suggested symbols: Most Soil Moisture (faucet gushing), Least Soil Moisture (faucet dripping), Most Sunlight (sun), Least Sunlight (sun covered by cloud), Highest Temperature (thermometer with high mercury), Lowest Temperature (thermometer with low mercury), Most Wind (fluttering flag), Least Wind (limp flag), Most Plants (several plants), Least Plants (one plant), Most Animals (several insects) and Least Animals (one insect).

2. After choosing a study area such as a vacant lot, mark it off with string or rocks. Divide the class into pairs, and give each pair "most" and "least" markers for each environmental factor listed above. Invite teams to explore the study area and determine which location has the most and the least of each factor. For example, a team studying plants should decide which site has the most plants and which has the least. Students will indicate their choices by placing their markers in the ground.

3. After all students have marked their choices, examine the entire area to see where the markers of each type are located. According to the markers, which spot had the most or least sunlight? Moisture? Heat? Which spot did most animals seem to prefer? What makes you think animals prefer that spot? Did that spot have the most or least of any other factors? Which spot did most plants prefer? What makes you think plants prefer that spot?

Enrichment

- Visit each site again at a different time of year and repeat your investigations. Compare your results: How has the soil changed? The temperature? The wind? The plants and animals? What factors influenced each change?
- It's easier than you think to bring the outdoors inside! Create a class terrarium of a local ecosystem, or have teams of students create terrariums of various ecosystems. (See Appendix 15 for complete directions on setting up terrariums that represent different ecosystems)

Wisconsin Model Academic Standards

EE: A.4.1, A.4.2, A.4.3, A.4.4, B.4.4, B.8.8

M: D.4.3, D.4.4, D.8.3, D.8.4

S: C.4.2, C.4.4, C.4.5, C.8.2, E.8.4, F.4.1, F.4.2, F.4.4, F.8.8

Forestry information, publications and more can be found online.

Division of Forestry
dnr.wi.gov/org/land/forestry/

Project Learning Tree (PLT)
dnr.wi.gov/org/caer/ce/pltwild/plt.htm

Environmental Education for Kids (EEK)
dnr.wi.gov/eek/

Learning, Experiences, & Activities in Forestry (LEAF)
www.leafprogram.org

Wisconsin Forestry
www.wisconsinforestry.org

PLT Student Page

Team Chart

Team Members

Ecosystem	Site 1	Site 2	Site 3
Soil ■ Moisture: wet, moist, or dry ■ Texture and color ■ Smell ■ Organic material or organisms? ■ Sunlight and Wind ■ Shady, dark, medium light, or bright ■ Amount of wind ■ Direction from which wind is blowing			
Temperature ■ At ground level ■ At 1" (2.5 cm) into soil ■ At 1 yard (.0 m) above ground			
Lay of the Land ■ Flat or sloped ■ Other land features (tall buildings, trees, cliffs) ■ Direction of water flow ■ Body of water into which site drains			
Plant Life ■ Most common kinds of plants ■ Where each kind grows relative to others			
Animal Life ■ Animals seen ■ Animal evidence seen (such as scat, tracks, burrows, chewed twigs or leaves			