..... for the

BRANCH OUT!

to Pheasant Branch Conservancy



Art courtesy of Betsy Delzer, Northside Elementary School

Educator's Guide

PLEASANT COMPANY'S

This publication was prepared by the **Friends of Pheasant Branch**, **Inc.** to provide information about the Pheasant Branch Watershed and Conservancy for **KIDS FOR THE EARTH**, a program funded in large part by the **Pleasant Company's Fund for Children**. It is designed to provide lesson plans for older students and teachers in the Middleton-Cross Plains Area School District, youth group leaders, and other interested area residents.

Friends of Pheasant Branch, Inc. was founded in 1995 to restore, preserve and promote the value of conservancy lands and other natural habitats in the Pheasant Branch watershed for today . . . and for tomorrow. Friends' volunteers, including several hundred Middleton High School ecology students, have donated thousands of hours to oak savanna and prairie restoration in the conservancy. The Friends constructed two observation platforms on Dane County Parks property in the conservancy with donations received from community residents and businesses.

The Friends have also obtained and leveraged many grants to promote research and sound environmental planning in the Pheasant Branch watershed. These projects help protect recharge areas for the Pheasant Branch springs and improve the quality of water Pheasant Branch discharges into Lake Mendota. As part of their on-going programs, the Friends encourage wildlife studies and other types of research in the conservancy, and sponsor field trips and public meeting throughout the year to educate children and adults about the importance of environmental stewardship.

For further information, visit the Friends website at **www.pheasantbranch.org**, email the Friends at **pheasantbranch@charter.net**, or write to Friends of Pheasant Branch, P.O. Box 628242, Middleton, WI, 53562.

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Dear Reader:

or the

This resource book is the result of a unique partnership between the Friends of Pheasant Branch, Inc. (the Friends) and Middleton-Cross Plains Area School District (MCPASD), who came together during the 2002-2003 school year to promote environmental and community education in the Pheasant Branch Watershed through a program called *Kids for the Earth* (KFTE).

The people who helped this partnership succeed include MCPASD Assistant Superintendent George Mavroulis, who encouraged KFTE to become a reality and Staff Development Coordinator Nancy Wyngaard, who provided invaluable advice and assistance. Legertha Champagne at the District Administration Center was also helpful.

A KFTE Advisory Committee of teachers and staff included Linda Ackerman, Betsy Delzer, Diane Dempsey, Linda Hein, Sonja Hungness, Glenn Jacobson, Sue Porter, Susan Scudder, and Gayl Stewart. They contributed countless hours to the project, and developed the lessons plans in this book.

Jim Mathews and his students at Middleton Alternative Senior High (MASH) spent untold hours filming KFTE field trips and activities at the Pheasant Branch Conservancy, which they edited into a video that promotes the stunning natural resource we have in our midst.

Dan Geocaris, who serves on the Friends Board of Directors, provided advice, services of his professional production studio, and other resources, all of which enabled MASH students to gain valuable experiences in high quality video production.

Kids for the Earth was born of a Friends conviction that children who learn to appreciate the value of their environment will become tomorrow's stewards of the earth. A grant from Pleasant Company's Fund for Children enabled the Friends to hire an Education Coordinator and convene the Advisory Committee. <u>Branch Out! to Pheasant Branch Conservancy</u> is just one of the many projects to benefit from that grant.

We hope you and your students find fun and enlightenment in *Branch Out! to Pheasant Branch Conservancy*.

Cheryl Redman Education Coordinator Friends of Pheasant Branch, Inc. Middleton, Wisconsin

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Glacial Geology

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Glacial Geology

LESSON ONE



Grade Level: Elementary School

Subject: Science

Duration: One 30- to 40-minute session

Group Size: Variable; for young students,

6 to 1 adult

Setting:

Indoors

Vocabulary:

Glacier, glacial till

Resources/Citations:

Adapted from: Recipe For a Small Glacier, http://tvl1.geo.uc.edu/ice/other/r esource/Recipe.html, accessed 28 May 03.

Edible Glacier

Objective:

Students will be able to observe how a glacier moves, pushing and picking up sediment as it goes.

Method:

Students make a small glacier of ice cream.

Materials:

Per group of students: 1 pint of marble ice cream, 3 chocolate chip cookies, 1/4 cup of marshmallow syrup, plastic lunch bag, large clear bowl (clear so you can see the deformation), spoon.

Procedure:

- 1. Crumble cookies and place in bowl.
- 2. Put two large scoops of the ice cream on top of the cookies.
- 3. Place a plastic lunch bag over your hand, then slowly push down to "shmoosh" the ice cream so that it oozes. Notice that the cookies stick to the ice cream.
- 4. To see how glaciers move (or ooze), warm up the marshmallow syrup or add a little hot water to make the syrup thinner. Then pour the syrup over the ice cream glacier.
- 5. EAT THE GLACIER AND ENJOY!!

Background:

The crumbled cookies represent the glacial till.

A glacier begins as clean snow. As a glacier travels, however, it picks up dirt and rocks from the ground and becomes "dirty". The marble ice cream represents the dirty glacier.

A glacier moves much in the same manner as "shmooshing" ice cream. As more and more ice and snow fall on the glacier, the weight causes it to ooze, pushing the dirt in all directions.

Evaluations

Elicit the following points through discussion:

- A glacier moves because more and more snow builds up, creating pressure, which causes the glacier to spread.
- As glaciers move, they pick up material such as rock and dirt, and carry it with them.

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Kids^{For The} Earth

Glacial Geology

LESSON TWO



Grade Level:

Elementary School

Subject:

Duration:

One 10-minute session and one 30-minute session

Group Size: 25 students to 1 adult

Setting:

Indoors

Vocabulary:

Glacier, glacial erratics

Resources/Citations:

Dinah Zike, *The Earth Science Book—Activities for Kids*, John Wiley & Sons, 1993.

Make a Míní-Glacíer

Objective:

Students will be able to become familiar with some effects a glacier can have on land.

Method:

Students make a small glacier of ice and observe what happens as it moves down a "valley".

Materials:

A freezer, water; dirt or sand, a small plastic container, a flat baking pan—9"x13".

Procedure:

- 1. Fill the small plastic container with water and freeze until solid.
- 2. Cover the bottom of the baking pan with dirt or sand.
- 3. Prop the pan up on a pile of books so that one end is higher than the other—simulating a hill or mountain slope.
- 4. Remove the frozen glacier from the container and place at the top of the hill.
- 5. Watch the glacier as it slowly moves down the hill.

What happens to the land below it? Does the glacier collect dirt as it moves? What would happen if the glacier were heavier? Try to find out by making a thicker glacier.

Adaptation:

Raise the slope of the hill by placing another book underneath the pan and see what the effect is of the increased slope.

Evaluation:

Determine, through discussion, that students can describe that the glacier scraped and picked up the sand and dirt and carried it down the hillside. When the mini-glacier reached the bottom and stopped moving and melted, it left a hill of sand and dirt behind. Children should be able to conclude that a glacier acts in much the same way as the simulation but on a much larger scale, scraping the land, and leaving behind hills of sand, gravel, and rocks when it melts.

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Glacial Geology





Grade Level:

Elementary and Middle School

Subject: Earth Science

Duration: Two or three 30-minute sessions

Group Size: Variable

Setting: Indoors and outdoors

Vocabulary:

Expansion, physical weathering

Resources/Citations:

Adapted from R. Sund, B Tillery, & L Trowbridge, G*lacier Lesson Plans, Elementary Science Discovery Lessons: The Earth Sciences*, Allyn and Bacon, Inc, 1973, http://www.sd5.k12.mt.us/glacier eft/glac23-8.htm, accessed 5 July 2003.

Rock & Roll on Ice

Objective:

Students will be able to:

- 1. describe how freezing water breaks rocks, and
- 2. infer where this process is most likely to occur.

Method:

Students observe the effects on various objects from the expansion of water as it turns to ice.

Materials:

Rocks, several pieces of cloth, Mason's hammer, plastic milk carton, plaster of Paris, matchbox (large), pencil, freezer.

Procedure:

- Wrap several rocks in several pieces of cloth. Place them on a sidewalk and have the students hit them several times each with a hammer. Unwrap and examine the particles; compare them with sand.
 What is sand?
 - What is sand?
- 2. Fill an empty milk carton to the top with water. Close the top securely and place the carton in a freezer until the next day.

What do you observe? What caused it? What might break rocks off a hillside?

- 3. Fill a matchbox with a plaster of Paris paste. With a pencil, make a one-inch deep groove in the block before it dries. The groove should extend to the ends of the block. Allow the block to dry.
- 4. Measure and record the width and length of the groove. Fill the groove with water and place the block in the freezer. After the water has frozen, remeasure the groove and record.

Are there any changes in the size of the groove?

5. Allow the ice to melt and refreeze.

How many times do you have to repeat the freezing until the block breaks?

How does freezing water break rocks from hillsides?

Extension:

Soak a soft red brick or piece of sandstone in water overnight. Place it in a pan and place it in a freezer overnight. What changes are observed? Repeat the thawing and freeing several times and observe.

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SECTION I—Rock & Roll on Ice 3.1

Background:

When water freezes it occupies a larger volume. As freezing water expands, it exerts a force. Such a force may widen cracks in rocks and eventually break the rocks apart. Such changes are physical changes, just as freezing water is a physical change.

Freezing water splits rocks from mountains. These rocks may be split again and again, and end up as small pebbles carried away by streams. The action of freezing water is a type of physical weathering, one of several ways rocks are broken down.

Evaluation:

Have each student describe how freezing water breaks rocks.

Kids^{For The} Earth

Glacial Geology

LESSON FOUR



Grade Level: Elementary School

Subject: Earth Science

Duration: One 45-minute session

Group Size: Variable

Setting:

Indoors

Vocabulary:

Brittle, plastic, pressure, stress

Resources/Citations:

L Douglas, D Ellis & M Magnoli, *Glacier Lesson Plans, Experiences in Earth-Space Science,* Laidlaw Brothers Publishers, 1985, http://www.sd5.k12.mt.us/glacier eft/glac3-8.htm, accessed 5 July 2003.

Physical Properties of Ice

Objective:

Students will be able to:

- 1. demonstrate that ice melts faster under pressure, and
- 2. recognize that ice can be broken up or melted by pressure and then refrozen.

Method:

Students observe the effect of pressure on ice using ice cubes and different weights.

Materials:

Mason's hammer, shallow pan, cup, piece of cloth, heavy metal key, piece of brick or other heavy object, six ice cubes per group.

Procedure:

1. Wrap two ice cubes in a piece of cloth. Use the hammer and hit the ice cubes several times. Open the cloth and notice what has happened to the ice cubes. Place the fragments of ice into a cup and wait two or three minutes. Notice what has happened to the ice. Record your observations.

What happened when you hit the ice with a hammer?

What happened when you allowed pieces of ice to touch one another in the cup?

What two properties of ice do hitting ice and allowing pieces of ice to touch one another demonstrate?

2. Place two ice cubes in a shallow pan. Put a piece of brick or another heavy object on one ice cube. Wait two or three minutes. Notice which ice cube melts faster. Also notice where the melting seems to be taking place. Record your observations.

Does ice with a weight on it seem to melt faster or slower than ice without a weight on it?

Where does the most melting seem to take place when ice has a weight on it?

How is ice with a weight on it like ice at the bottom of a glacier?

Do you think the movement of a glacier begins at the top of the glacier or the bottom? Why?

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3. Place two more ice cubes in a shallow pan. Place a heavy metal key on top of one ice cube. Put the pan in the freezer and leave it overnight. Examine the ice and notice the location of the key. Record your observations.

Where in the ice did you find the key?

How do you think ice flows around an object?

Background:

Ice has many surprising properties. Since glaciers are made up of ice, understanding the properties of ice can help to better understand glaciers and how they are able to flow.

- 1. Ice has both brittle and plastic properties. When subjected to sudden stress, ice fractures; when the stress is even and constant, it can bend. In this activity, we will illustrate the brittleness of ice; plastic properties are harder to demonstrate on a small scale.
- 2. Ice melts faster under pressure. It will even melt under pressure at subzero temperatures. This helps explain how glaciers flow. In a glacier, the pressure exerted by the mass of ice above melts the ice at the bottom of the glacier, providing a lubrication film of water, which allows the glacier to slide downhill under the force of gravity.
- 3. Ice has the ability to be broken up or melted by pressure and then refrozen. This helps explain the internal flow of a glacier and how glaciers are able to flow around an object.

Evaluation:

Have the students describe, in writing, how a glacier is able to slide downhill.

LESSON FIVE



Grade Level: Middle School

Subject: Earth Science

Duration: Two 30-minute sessions

Group Size: 25 students to 1 adult

Setting:

Indoors

Vocabulary:

Glaciation, glacial scraping

Resources/Citations:

Adapted from Frank Weisel, Tilden Middle School, Rockville, MD, Discoveryschool.com, http://school.discovery.com/lesso nplans/programs/iceberg/index.ht ml, accessed 5 July 2003.

Glacíer Scrapers

Objective:

Students will understand the following:

- 1. as glaciers move, they create a variety of patterns on landforms by a process called glacial scraping,
- 2. the scraping patterns left by a glacier depend on how the glacier moved over the landform, and
- 3. the evidence of glaciation left by glacial scraping provides clues to the climate in a particular place over a long period of time.

Method:

Students create a simulated glacier with gravel and water, then scrape it over a smooth piece of wood to observe the effect of the scraping on the piece of wood.

Materials:

You will need access to a freezer. Photographs of glacial-scraping patterns would enhance the lesson. In addition, the following materials should be available for each group: plastic cup, angular gravel, tap water, plastic wrap, tape, paper plate, smooth piece of wood.

Procedure:

- 1. Review with your students what they have learned about glaciers. They should be able to define glacier and explain why glaciers move over landforms.
- 2. Ask students how they think scientists can tell if glaciers have moved over the land in a particular area. Explain that rocks and gravel freeze into the ice and are dragged over the land by the bottom surface of a glacier.

How would the land over which a glacier has moved be affected?

What evidence of glaciation do glaciers leave behind?

- 3. Tell your students that they will participate in an activity that will simulate the way landforms are affected by glaciation.
- 4. Divide the class into groups, and have each group create its own miniature glacier as follows:
 - a. Have students half-fill a paper cup with angular gravel.
 - b. Cover the gravel with about an inch of water.
 - c. Securely tape plastic wrap over the top of the cup.
 - d. Flip the cup onto a paper plate.
 - e. Leave the inverted cup in a freezer overnight.

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to Pheasant Branch Conservancy

SECTION I-Glacier Scrapers 5.1

- 5. When the "glaciers" are frozen solid, have students peel off the paper and scrape them, gravel end down, over a smooth piece of wood. To simulate the action of a glacier, students should scrape in only one direction, since glaciers move only one way.
- 6. Ask students to observe the patterns the gravel has made on the wood.

How would they compare these to the patterns made on landforms by a real glacier? (If possible, provide photographs of actual glacial scraping.)

- 7. Have each student sketch their patterns and write a short paragraph explaining what they can infer about the way real glaciers affect the landforms over which they move.
- 8. Discuss with the class how patterns of glaciation provide clues to the climate in a particular area over time.

For example, if evidence of glacial scraping is found in an area that is too warm for glaciers to exist, what can we infer about how the climate in that area has changed over a long period of time?

Evaluation:

Assess each student according to how carefully and accurately he/she made the sketches. Grade the paragraph on clarity and number of errors.

Dane County Watersheds

Lesson One A Day on the River

LESSON ONE



Grade Level: Elementary and Middle School

Subjects: Environmental Education, Science

Duration: One full school day

Group Size:

4 – 5 students to 1 adult

Setting:

Outdoors—local waterway

Resources/Citations:

Jo Anne W. Kay. This article originally appeared in *Orion*, 187 Main Street, Great Barrington, MA 01230, 888/909-6568, www.oriononline.org (\$35/year for 6 issues).

Clare Walker Leslie, *Nature All Year Long*, Kendall/Hunt Publishing, 2002

Clare Walker Leslie, *Nature Drawing: A Tool for Learning*, Kendall/Hunt Publishing, 1995.

A Day on the River

Objective:

Students will gain a greater understanding and appreciation for their natural surroundings as they learn more about the major river in their watershed. They will learn to conduct scientific experiments, collect data, and write conclusions about their findings.

Method:

One of the best ways to teach about nature is to go out into nature. Get your students out of the classroom for a day on the river (or in some other area of interest in your community, e.g., Pheasant Branch Conservancy). Well ahead of the day, schedule volunteers to help with the five stations listed below.

Materials:

Students-warm clothes, hiking shoes, sack lunch, rain gear.

Classroom—Individual zip-lock bags for each student containing sample bottles, magnifying glass, tape measure, pencil, small notebook.

Stations—4 straining screens, 4 thermometers, 1 large plastic container per group; chemicals and materials for pH-balance testing, phosphate testing, and bacteria testing; field guides for birds and mammals; art paper, art pencils, drawing boards.

Stations:

WATER LIFE

At this station, students will learn about watersheds and their importance to a good water supply. They will test the river water for temperature, pH balance, phosphates, and bacteria. You will need responsible adults to help with this activity since chemicals are needed to conduct the experiments. Students will also fill a clear plastic container with river water and add specimens from the river to take back to the classroom for observation.

WILDLIFE

At this station, students will learn about some of the most common animals that live in the area around the river. They will look for signs of these animals and learn how to identify prints and birdcalls. If the river has a beach area, casts can be made of bird and animal prints. This station is also a good place to learn about food chains and interdependence.

RIVER HISTORY

Local storytellers can use this station to tell stories about the history of your area. They should be prepared to tell about the importance of the river to the development of the community and changes that have occurred in the river over the years.

Elementary School

NATURE HIKE

Hiking through the wooded area of meadows surrounding the river will add to the day. Students can identify trees, plants, and undergrowth, collect specimens for the classroom, and stop to do journal writing along the way. This is a great time to learn to identify native plants.

NATURE DRAWING

To really observe an object, it is ideal to see it in its natural state. At this station, students spend time selecting trees or other plants in the area to draw. They might also use the materials near the river to create nature sculptures, working individually or in groups of three or four. When the day is over, gather your class together to share impressions of what they have seen and heard during their experience on the river. Back at school, students should be sure to leave their specimens in the classroom so they may use them the following day.

Follow-up Activities:

POETRY WRITING—Nature makes a great subject for poetry and children will be eager to write about what they have experienced.

RESEARCH—Have students choose one subject in nature that they learned about and do a research report to learn more about it.

ART—The nature drawings that students began in the field can be refined and final copies made on heavy art paper for display. Flowers and plant specimens can be pressed and used for bookmarks.

ECOSYSTEMS—The large plastic containers that the students have brought back to class with water and land materials can be arranged and placed where students can observe them over the coming week. Live specimens collected by the students the day before can be added, but covers should be used to contain them.

Evaluation:

Compare students' knowledge before and after the field trip. This can be in the form of a written report based on guided questions. Assessment can include students' drawings and writings of their observations. Older students can compare observations of all groups and draw conclusions from the data.



Water Quality

Lesson One Go With the Flow

Lesson Two Middleton Water Quality

Lesson Three Middleton's Wonderful Water

> Lesson Four Water Quality Testing

Elementary School



Grade Level: Elementary and Middle School

Subjects:

Environmental Education, Science

Duration:

One 60- to 120-minute session

Group Size:

4 students to 1 adult

Setting:

Outdoors at a nearby stream— Pheasant Branch for Middleton students

Vocabulary:

Celsius, litmus paper, pH

Resources/Citations:

United States Geological Survey (USGS) Surface-Water Data for Wisconsin, http://waterdata.usgs.gov/nwis?pr ogram=sw&coffice=wi, accessed 6 July 2003. USGS Daily Streamflow for Pheasant Branch, http://waterdata.usgs.gov/wi/nwis /discharge/?site_no=05427948, accessed 6 July 2003.

Go With the Flow

Objective:

Students will learn basic methods to examine the quality of water in a local stream. They will learn to read a thermometer correctly. They will work cooperatively and safely in a small group. They will learn how a scientific method is applied will impact the result. They will gain an understanding about the influences of water quality on stream life.

Methods:

Students conduct water quality tests in the field and compare the results from different places.

Materials:

Five kits; each containing a thermometer, litmus paper, straining screens, clear plastic container, magnifying glass, stream life identification cards (from Wisconsin Department of Natural Resources), paper, pencil, and clipboard. Appropriate clothing for outdoors including hiking shoes or water socks.

Procedure:

Conduct a brief discussion about measures of water quality including how the measurements are used. Several water stations will be set up along the stream. An adult will monitor each station. Students will divide into small groups of about four. Each group will go to one of the stream monitoring stations. At the station:

- 1. Each student will be assigned a task as follows-measuring temperature, measuring pH, screening the water and stream sediment for stream life, and making observations of the stream station location, e.g., sunny, shady, steepness of bank, sediment type, etc.
- 2. After all measurements are made and all samples are collected, the small groups of students will gather together and record their field data.
- 3. After the data are collected, all the students will meet at an agreed upon spot to compare their data and discuss possible reasons for differing observations.

Background:

pH, temperature, and aquatic life are all indicators of stream health. The pH scale ranges from 0 to 14. A pH of 7 is considered neutral. Normal pHs for streams range from about 5 to 8. Higher or lower pH may cause problems for aquatic life.

Middle School

Fish need oxygen to live and warmer water holds less oxygen. The temperature of the stream should usually be around 10 to 20 degrees Celsius depending on the time of year.

Scientific measurements vary from place to place and different people may get different results depending on their methods.

Students should not be given detailed instructions on how to go about their tasks. Later, they can discuss how their methods were different from others and how the methods may have affected their results.

Evaluation:

Indoors, the students will compare their data with previous data collected by the USGS. Students will again discuss their methods and which methods gave results that are most comparable with the USGS data.





Grade Level:

Elementary and Middle School

Subjects:

Environmental Education, Math

Duration: One 45-minute session

Group Size: 25 students to 1 adult

Setting:

Indoors

Vocabulary:

Capacity, *Cryptosporidium*, distribution, gpm, microscopic, permeable, pollutants, pumpage, reservoir, water usage

Resources/Citations:

Strand Associates, Inc; City of Middleton; Sonja Hungness, Kromrey Middle School, Middleton, WI

Middleton Water Quality

Objective:

Students will interpret data from the Middleton Water Study Update sheets and complete the worksheet.

Method:

Students locate sources of the local water supply on maps. Then they complete a worksheet.

Materials:

Middleton Water Study Update sheets, Middleton Water Supply Facility Summary sheet, City of Middleton maps of the city, website information, http://www.ci.middleton.wi.us/water/index.htm, and worksheet (section III Page 2.5).

Procedure:

- 1. Discuss and define vocabulary.
- 2. Read and discuss the Water Supply Summary.
- 3. Locate the five active pumping stations on the Middleton map.
- 4. Look at the data table of Water Demands.
- 5. Answer together, in groups, or individually, the worksheet questions.

Background:

Recently hundreds of people became ill in the City of Milwaukee, Wisconsin. The mayor advised everyone to boil water before using it. A tiny, microscopic parasite called *Cryptosporidium* that lived in the water supply made people sick.

Do you think this could happen in Middleton?

Do you know who regulates water quality in our community?

How clean is our water supply?

Water is a solvent, which means many things can dissolve in it. Also, the ground is permeable, acting like a sponge, soaking up pollutants that seep down from above.

MAJOR WATER POLLUTANTS ARE:

Organic solvents such as chemical cleaners and oils used in industry; gasoline and other petroleum products from leaky tanks and spills; pesticides, herbicides and fungicides used to eliminate garden pests and kill weeds and fungi; road salt used to de-ice highways; fertilizers used to grow crops; septic tanks containing household waste; garbage dumps without protective linings; and lead from plumbing pipes.

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SECTION III—Middleton Water Quality 2.1

Middleton Water Study Update

Purpose

This report presents the water study update for the City of Middleton. Existing water requirements and plans for future system expansion and improvements are discussed. This update will allow system improvements and expansions to be implemented to provide an adequate and economical system as the water service area and water demands increase.

This study evaluates present day requirements as well as those expected through the year 2020. Recommendations for future improvements and expansions are based upon past water records, present conditions, and projected future growth and expansions to the existing service area. This report is an update of the 1990 Report on Water Utility Water Study.

Scope

The following items make up the scope of the study:

- 1. Determination of present water demands and adequacy of the present supply to meet those demands.
- 2. Estimation of future changes on water system demands through the year 2020.
- 3. Evaluation of Middleton's well supply, distribution system, and storage facilities to determine their ability to meet future demands.
- 4. Recommendations for system improvements along with opinions of probable costs.

Abbreviations

gallons per capita per day
gallons per day
gallons per minute
million gallons
million gallons per day
pounds per square inch
milligrams per liter
Insurance Service Office
Public Service Commission of Wisconsin
Wisconsin Department of Administration

Middleton Water Supply Facility Summary

Five wells deliver all of the water to the City of Middleton. Table 2.01-1 presents the total and firm well capacity of the system. The capacities reported in this table are the current pumping capacities reported by the City and are used for evaluating the ability of the system to meet present day and projected demands. The total well capacity is 5,600 gpm. The firm well capacity of the City of Middleton is 4,100 gpm with the largest well out of service.

Well Number 2 and Number 3 are located on Hillcrest Avenue south of the downtown area. These two wells pump to a ground level reservoir at the Quarry Reservoir. Water is then pumped to the system via high service booster pumps located at the Quarry Booster Station. This facility contains pumping equipment to serve both the low pressure zone and the Quarry high pressure zone.

TABLE 2.01-1 WELL CAPACITY				
Well Number	Capacity			
2	350 gpm			
3	1,050 gpm			
4	1,350 gpm			
5	1,350 gpm			
5	1.550 gpm			
Total Capacity 5,600 gpm				
Firm Capacity4,100 gpm(Well Number 6 out of service)				

Well Number 4 is located on High Road adjacent to the elevated tank in the northwestern section of the city. Water from Well No. 4 if pumped through an iron removal plant and then flows into the distribution system.

Well Number 5 is located on Elmwood Avenue on the southeast side of Middleton. The water from this well is also pumped through an iron removal plant and into the distribution system.

Well Number 6 is located off of Greenway Boulevard in the southwest corner of the city. The water from this well is pumped into a reservoir located at Well No. 6 and then into the distribution system.

The Greenway Booster Station is located on Greenway Boulevard just west of Pheasant Branch Creek. The booster station serves the West Middleton High Zone located west of the booster station along Greenway Boulevard.

Reproduced with permission from Strend, Assectates, lat., Explanett, from the document "Middleton Water Study Update", January 2001

Middleton	Water	Supply	Facility	Summary	Sheet
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												diameters of	d envien u	140.4
Annusi Pumpage MG	Annuel Sales MG	Average Day MG	Maximum Day NG	Rado Maxi Average	Sales to Sumpage Racio	Residential	Commercial	Industrial	Public	Population	Residential	Commercial	Industrial	Public
\$77.5	468.1	1,582	2.635	1.60	0.83	295.2	.775	105.9	12.6	11,010	73.0	13.5	26.2	ē
589.2	478.6	-1,614	2.694	1,67	0.83	13.4*	\$3.3	87.58	9.11.6	11,430	1.52		23.3	60 01
609.4	495.0	1.670	2.999	1.60	0.63	221.0	160.4	100.6		644144	\$1.6	37.3	23.4	0) (1)
0.446	62611	1.764	3,024	1.7.1	0.83	223.4	100.5	222	14.0	11,580	-	38.1	27.9	3.2
0.050	0.602	11211	2,689	1.68	0.81	214,9	160.7	120.5	13.0	12,180	6.95	36.3	27.1	0) 01
681.3	\$66.3	1.867	3,408	1.83	0.83	263.2	183.7	114.4	15.0	12,301	0.68	40.7	26.3	0.0
6.94.9	571.6	1.904	3,268	1.72	0.82	232.6	182.8	141.3	14	12,581	2.03	0.95	00.0	r. e
636.0	1.002	1.907	3,998	2.10	0.84	263.3	186.1	129.3	14,4	12,782	643	39.9	27.7	6
692.3	0.46.0	1,697	2,996	1.58	0.79	235.6	176.6	123.1	11.1	12,963	49.7	37.3	26.0	2.5
743.0	598.1	2.018	3.820	1.89	0.60	270.2	183.3	133.3	10.4	13,163	55.2	38.1	27.72	ee ei
015.9	5.44.5	5.236	4.369	1.95	0.79	321.5	106.3	124.1	12.6	13,304	65.0	38.1	25.4	2.0
756.7	9,245,8	2,073	4.349	2.10	0.79	285.1	183.1	117.7	9,8	13,584	82.5	0.00	23.7	2.0
776.7	\$20.2	2.128	3.465	1.64	0.77	257.4	103.4	140.0	\$ 1	13,785	21.2	37.6	27.8	e ei
808.5	631.9	00 01 01 01	3.618	1.63	0.81	282.2	211.6	145.2	11.7	14,011	66.2	41.4	28.4	8
832.4	659.1	2.261	4.136	18.1	0.79	284.4	215.6	148.1	13.0	14,237	61.7	41.5	28.1	ut ci
812.0	629.2	2.225	2.982	1.34	0.77	256.8	216.7	143.2	11.6	14,454	48.6	41.0	27.1	64 64
935.0	672.4	2.268	4.342	1.50	0.01	200.1	226.9	153.4	12.0	14,690	27.2	42.3	23.6	2.2
774.1	676.5	2.121	4.047	1.91	0.87	283.0	235.9	145.3	en en	14,561	00 11 10	43.2	26.65	64 64
798.5	6.963.8	2.168	3.501	1.60	0.87	282.0	236.4	165.9	4) 11	15,133	20 20 20	00 75 75	30.0	ei
779.5	6.669	2.136	112.4	1.97	0.90	269.1	235.7	105.4	90 06	15,351	47.8	42.1	33.1	$\frac{1}{2}$
790.9	720.3	2.167	4.366	2.01	0.91	279.3	250.2	180.0	10.7	15,558	49.2	44.0	21.7	e r
618.3	746.7	2,242	4,559	2,00	0.91	287.8	5.190	187.0	4.0	10,366	40.0	1.00	10.00	4 7

WORKSHEET

NAA	AE: Date
	Answer the following questions using the Middleton Water Map and the Middleton Water Facility Summary sheet.
1.	How many wells deliver all the water to the City of Middleton?
2.	"Gpm" stands for gallons per minute. What is our total well capacity? gpm.
3.	Which well is located off of Greenway Boulevard?
4.	Which well pumps the most gpm?
5.	In which year did Middleton have the highest annual pumpage?
6.	"MG" stands for million gallons. So, 3.45 MG is 3,450,000 million gallons. How many MG were pumped in 1993?
7.	What was the maximum water usage day in 1985?
8.	Which year had the least difference between its "average day" and "maximum day" water usage, and what were the numbers? (Hint: look at the "ratio Max/Average"—the lowest number is the average.)
9.	What season of the year do you think we use the most water? Why?

10. Based on the data, what would be a good estimate of the annual Pumpage MG for 2002?





Grade Level:

Elementary and Middle School

Subjects:

Biology, Chemistry, Earth Science, Environmental Education, Math

Duration:

One 45-minute session

Group Size:

30 students to 1 adult

Setting:

Indoors

Vocabulary:

Contamination, corrosion, fluoride, groundwater, nephlometer, turbidity

Resources/Citations:

Middleton Water Utility Water Quality Report, http://www.ci.middleton.wi.us/w ater/index.htm, accessed 6 July 2003.

Míddleton's Wonderful Water

Objective:

Students will read and understand the <u>Middleton Water Quality</u> report as found on the City of Middleton website. Students will complete the attached worksheet, and gain understanding of the vocabulary words.

Method:

Students conduct Internet research and complete a worksheet.

Materials:

Middleton Water Utility Worksheet, computer lab, pencils or pens.

Procedure:

- 1. Discuss and define vocabulary.
- 2. Assign pairs of students to work together, or independently.
- 3. At the computer lab, go to http://www.ci.middleton.wi.us/, go to link, <u>Middleton Water Quality Report</u>.
- 4. Read report online and then complete the worksheet.
- 5. Discuss findings as a class.

Background:

Throughout the world, people draw water from freshwater sources such as streams, rivers, lakes, and groundwater. Groundwater provides about half of the water used by people in the United States, even for people living in cities. Everyone expects to turn on a water faucet and see sparkling, pure water, regardless of its source. However, this is not always the case!

3.1

BRANCH OUT! SECTION III-Middleton's Wonderful Water

MIDDLETON WATER UTILITY WORKSHEET

NAME: _____

Date

First, you need to read through the Water Quality Report. Then answer the questions!

- 1. What is the purpose of the Water Quality Report?
- 2. Who requires that the city continually test its water?
- 3. Define the following terms....
 - a. ppm_____
 - b. MFL _____
 - c. ppt_____
 - d. TT_____
 - e. NTU _____
 - f. ppq_____
- 4. Where does the contaminant TOLUENE come from?
- 5. What kind of contamination does "corrosion of household plumbing system" cause?
- 6. Arsenic in the groundwater is caused by:
- 7. Why is "FLUORIDE" added to the water?
- 8. Did the test results on our water supply have any violations?
- 9. Which people could still be vulnerable to the small amount of contaminants in the water?
- 10. How deep is the deepest well in Middleton? ______ feet
- 11. What kind of wells do we draw our water from?

12. **Define...**

Nephelometer: _____

Turbidity:_____

Water Wonders



Kids^{For The} Earth

Water Quality

LESSON FOUR



Grade Level:

Elementary, Middle and High School

Subjects:

Biology, Chemistry, Earth Science, Environmental Education

Duration:

Indoors, one 45- to 60-minute session; outdoors, longer

Group Size:

25 students to 1 adult

Setting:

Indoors or outdoors

Vocabulary:

Acid, base, neutral, oxygen, pH strips, Secchi disk

Resources/Citations:

Sonja Hungness, Kromery Middle School, Middleton, WI

Water Quality Testing

Objective:

Students will gain field experience with the scientific method while collecting water samples, analyzing the pH of the samples, and analyzing the water quality. Students will learn about key chemical indicators of water quality and about the health of their watershed, Pheasant Branch.

Method:

Students test and compare pH and water clarity results from a waterway and tap water.

Materials:

Water testing kits, available through Dane County Extension; Secchi disk, for measuring water clarity; pH strips and guide for use; glass jars and lids, baby food-size work well; plastic bag for garbage collection; bucket of tap water; pH Scale sheet.

For indoor testing have a bucket or two of water sample from stream source.

Procedure:

For outdoor testing, assign pairs of students to specific spots so as to avoid overcrowding. Try to test in a variety of areas to get different results.

- 1. Discuss and define vocabulary.
- 2. Assign pairs of students to go around the water's edge, or to stations around the room.
- 3. Using pH strips have students dip the strips into the water and record their results. Test at various locations. Test for water clarity if appropriate.
- 4. If possible, also have a sample of tap water for test comparison of pH.
- 5. Students should document their findings either in narrative form or as a lab write-up.

Background:

An important fact for aquatic creatures is pH (potential for hydrogen), how acidic or basic the water is. pH is measured on a scale of 0 - 14, with 7 being the center and neutral. Normal rainwater has a pH of about 5.6. It is slightly acidic because naturally present carbon dioxide from the earth's atmosphere dissolves in the raindrops to form carbonic acid. Fish and water life can typically tolerate a pH from 4.5 - 9.3. pH between 6 - 9 is ideal and is the Wisconsin Quality Standard for pH for fish life.

BRANCH OUT!

SECTION III—Water Quality Testing 4.



SECTION III—Water Quality Testing 4.2



Air Quality

Lesson One Disturbing Decibels

Lesson Two Noisy Neighbors

Lesson Three Some Things In The Air

Lesson Four Trees and Air Quality

Kids^{For The} Earth

LESSON ONE



Grade Level: Elementary and Middle School

Subjects: Science, Social Science

Duration:

One to two 50-minute sessions

Group Size:

Indoors, 24 students to 1 adult Outdoors, 20 students to 1 adult

Setting:

Indoors—lunchroom, classroom, gymnasium

Outdoors—playground, park, sidewalk near busy street

Vocabulary:

Deafening, decibel dB(A), duration, faint, frequency, intensity, loud, moderate

Resources/Citations:

League for the Hard of Hearing http://www.lhh.org, accessed 6 July 2003.

Disturbing Decibels

Objective:

Students will observe and approximate noise levels in their community to see how noise pollution may adversely affect people and animals.

Method:

Students use a point of reference sheet (sounds measured in decibels [dB(A)] matched to familiar sounds) to gauge the decibel level of sounds they hear.

Materials:

Point of reference sheet, recording sheet.

Procedure:

- 1. Introduce the activity by having students brainstorm a list of sounds under the categories "faint", "moderate", and "loud". These may or may not be noises that they have heard. Be sure to inform students that hearing loss will occur when exposed to loud noises, especially over long periods of time or if they are extremely loud.
- 2. Then lead students to a variety of areas where they will be able to listen to and record the approximate levels of noises they may encounter on a daily basis.

Background:

See Noise Facts sheet (section III, pages 1.2 & 1.3) for additional information.

Evaluation:

By the end of the lesson students should have numerous noises observed and recorded what they have heard in the community.

Have students pick 3-5 specific noises to comment on by expressing how these noises may affect local residents, passers-by, house pets, and wildlife.

What was the loudest noise you heard?

Why may this disturb people or animals who live there?

Elementary School

BRANCH OUT!



Points of Reference (measured in dB(A) or decibels)

- 0 the softest sound a person can hear with normal hearing
- 10 normal breathing
- 20 whispering at 5 feet
- 30 soft whisper

HOME

- 50 refrigerator 50 60 electric
- toothbrush
- 50 75 washing machine
- 50 75 air conditioner
- 50 80 electric shaver
- 55 coffee percolator
- 55 70 dishwasher
- 60 sewing machine
- 60 85 vacuum cleaner
- 60 95 hair dryer
- 65 80 alarm clock
- 70 TV audio
- 70 80 coffee grinder
- 70 95 garbage disposal
- 75 85 flush toilet
- 80 pop-up toaster
- 80 doorbell
- 80 ringing telephone
- 80 whistling kettle
- 80 90 food mixer or processor
- 80 90 blender
- 80 95 garbage disposal
- 110 baby crying
- 110 squeaky toy held close to the ear
- 135 noisy squeeze toys

• 50 rainfall

- 60 normal conversation
- 110 shouting in ear
- 120 thunder

RECREATION

- 40 quiet residential area
- 70 freeway traffic
- 85 heavy traffic, noisy restaurant
- 90 truck, shouted conversation
- 95 110 motorcycle
- 100 snowmobile
- 100 school dance, boom box
- 110 disco
- 110 busy video arcade
- 110 symphony concert
- 110 car horn
- 110 -120 rock concert
- 112 personal cassette player on high
- 117 football game (stadium)
- 120 band concert
- 125 auto stereo (factory installed)
- 130 stock car races
- 143 bicycle horn
- 150 firecracker
- 156 capgun
- 157 balloon pop
- 162 fireworks (at 3 feet)
- 163 rifle
- 166 handgun
- 170 shotgun

WORK

- 40 quiet office, library
- 50 large office
- 65 95 power lawn mower
- 80 manual machine tools
- 85 handsaw
- 90 tractor
- 90 115 subway
- 95 electric drill
- 100 factory machinery
- 100 woodworking class
- 105 snow blower
- 110 power saw
- 110 leaf blower
- 120 chain saw, hammer on nail
- 120 pneumatic drills, heavy machine
- 120 jet plane (at ramp)
- 120 ambulance siren
- 125 chain saw
- 130 jackhammer, power drill
- 130 air raid
- 130 percussion section at symphony
- 140 airplane taking off
- 150 jet engine taking off
- 150 artillery fire at 500 feet
- 180 rocket launching from pad

Source:

League for the Hard of Hearing, http://lhh.org/noise/decibel.htm, accessed, 25 June 2003.

Noise Facts

Noise surrounds us everywhere. It is often defined as unwanted or harmful sound. It is noise we endure in crowded, busy workplaces, the din of the city and the annoying hum of a neighbor's lawn mower early Saturday morning. However, this definition is somewhat limiting. We may be exposed to a barrage of unwanted sounds, but we also expose ourselves, quite voluntarily, to a variety of other noisy activities that we enjoy: loud concerts, loud movie theatres, high volume settings on personal cassette or CD players, fitness classes with loud music, recreational hunting and sports.

Sound is characterized by the **intensity**, **frequency**, and **duration**.

INTENSITY is a physical measurement of sound in decibels (dB), the perception of which is loudness. Intensity is not to be confused with loudness. Loudness is a perception of sound. For example, listening to something in the presence of background noise may not seem loud and yet that same sound in the absence of background noise may seem very loud. Even though our perception of the loudness of the sound changed, its intensity (the decibel level emitted by the sound) did not change.

FREQUENCY is a physical measurement of sound in Hertz (cycles per second), the perception of which is pitch (what we consider high and low sounds).

DURATION refers to the length of time the sound continues.

Depending upon the intensity of the sound, its duration and how often over time the ear is exposed to it, noise affects our human condition in a number of ways from increased stress levels to permanent hearing loss. Excessive noise exists in our homes, in our workplaces and in our recreational pursuits.

Exposure to Noise Affects our Human Condition in many Serious Ways.

- Permanent hearing loss
- Permanent tinnitus (ringing or buzzing)
- Stress
- Increase in blood pressure, hypertension
- Disturbance in rest and sleep, sleep deprivation, fatigue
- Absenteeism
- Communication difficulties
- Affected learning and education

Measurement of Noise

The decibel [dB(A)] is the unit used to measure the intensity of noise. Each increase of 3 dB(A) represents a doubling of sound energy. Therefore, to remain within safe limits, we should cut our exposure time in half for every increase of 3 dB. That is to say, an increase of only 3 dB(A) doubles the hearing hazard. (See Exposure Time Limits Chart 1). Interestingly enough, humans are rather insensitive creatures, and although a 3 dB(A) increase is noticeable, it doesn't sound much louder.

Different weighting scales are used in the measurement of decibels. The scale most often used is the A scale. The B, C, and D scales are used for more specialized readings such as airport jet engine noise. An acoustical engineer may need a sophisticated analyzer in conjunction with a bank of filters to break the noise down into its individual frequency components.

You can tell which scale has been used to measure decibels by the way it is written. dB(A) indicates a decibel reading taken on the A scale.

Exposure Time Limits

Hearing hazard doubles for every increase of 3 dB(A) 85 dB(A) over an exposure time of eight hours a day. It is the level of sound that industry and government could agree upon for industrial noise exposure regulations. 85 dB(A) should in no way be understood as a "safe" level for hearing, although it is chronically misinterpreted as such.

Chart 1				
Decibels [dB(A)]	Exposure Time			
85	8 hours/day			
88	4 hours/day			
91	2 hours/day			
94	1 hour/day			
97	30 min./day			
100	15 min./day			

The Canadian Hearing Society, http://www.chs.ca/info/noise/2002/book1.html, accessed 8:50 p.m.,25 June 2003.





Grade Level:

Elementary and Middle School

Subjects:

Environmental Education, Science, Social Studies,

Duration: Two or three 45-minute sessions

Group Size:

Any

Setting: Indoors and outdoors

Vocabulary:

correlation, consequences, decibel, hypothesis, ordinance, responsibility, street noise

Resources/Citations:

© 2002, 2000, 1992, 1985, 1983 Council for Environmental Education. Reprinted with permission from *Project WILD*, *Project WILD Aquatic K-12 Education Activity Guide*. The complete Activity Guide can be obtained by attending a Project WILD workshop. For more information, contact the National Project WILD Office at 713-520-1936, Wisconsin Project WILD at 608.264.6280. Visit, http://www.projectwild.org.

BRANCH OUT!

to Pheasant Branch Conservancy

Noisy Neighbors

Objective:

Students will be able to:

- 1. identify noise levels which can adversely affect people and wildlife, and
- 2. recommend ways in which people can change some behaviors in order to reduce negative impacts from noise for people and wildlife.

Method:

Students conduct an investigation of noise levels in their community and discuss the effect on people and wildlife.

Materials:

Writing materials.

Procedure

- 1. Initiate a discussion about noise. What seems loud? What noises hurt your ears? Do any noises frighten or bother you? What is noise? Noise to one person may be music to another. Ask one or two students to research the questions and to report back to the group.
- 2. Find out about noise ordinances. (Some communities have regulations about allowable noise levels.) Find out about recommended health standards for sound levels. What levels are considered harmful to human ears and with what consequences?
- 3. With this information about allowable and recommended noise levels, students can do a "sound search" of the community. If possible, get a decibel meter from a community agency to record decibel levels around the school, shopping center, residential area, agricultural area, city park, entrance to national park or forest, and so on. If there is correlation between noise levels and the numbers of people, domesticated animals, and wildlife in each area. If there are large numbers of people or animals in an area with high noise levels, are they experiencing negative consequences (e.g., stress)? How are they coping; with what effects? Ask students to predict the impact of noise levels on people, domesticated animals, and wildlife. Consider the sources and consequences of human-made noise on wildlife. Here are a few examples to get you started:
 - a. Recreation—backpackers, hunters, woodcutters, motorcycles, dune buggies, snowmobiles, all-terrain vehicles.
 - b. New Development—heavy construction equipment, automobiles.
 - c. Mining-drilling, explosions, construction traffic.

Generate a few hypotheses, and check them through research or by consulting local authorities.

SECTION IV—Noisy Neighbors 2.1

4. Generate a set of recommendations: What is the individual's responsibility for noise control? Society's responsibility? What can students do personally—as individuals, groups, or families—to help increase and maintain an informed awareness and responsible behavior concerning the effects of noise on people, pets, and wildlife?

Background:

People and wildlife are subject to similar environmental stresses. Loud noises, such as those from a motorcycle or snowmobile, a noisy group of people hiking, or a new road or dam construction, can affect both humans and wildlife. People, domesticated animals, and some wild animals living in metropolitan areas frequently learn to live with many loud noises. When animals in their natural habitat hear these and similar noises, they may react by running away, dying from the consequences of stress, or learning to adapt to such noises (as, for example, many animals in national parks have learned to do).

Many students may know that animals have hearing ranges different from humans. They may know from personal experience that dogs and cats can hear things that humans cannot. Loud music is easier for humans to hear than a machine's high-pitched whine, which may reach beyond our normal hearing range. Both sounds are real; although only one of them may be audible to us, both may be audible and disruptive to wildlife.

The major purpose of this activity is for students to recognize the effects that humanmade noises can have on wild animals and to consider alternative behaviors that might have less damaging consequences.

Evaluation

Identify four sources of noise that often can negatively affect wildlife. Describe the possible adverse effects.

Describe the process used to formulate and test one hypothesis concerning the effects of noise.

Explain three things that people can do to reduce the noise level caused when they are visiting wildlife habitats.

LESSON THREE



Grade Level: Elementary School

Subjects:

Environmental Education, Science, Social Science

Duration: Two 30-minute sessions

Group Size: 5 students to 1 adult

Setting: Indoors and outdoors

Vocabulary:

Factory, fuel, particle, pollution, volcano

Resources/Citations:

Adapted from: Edith Sisson, Nature With Children of All Ages: Adventures for Exploring, Learning and Enjoying the World Around Us, Prentice Hall College Division, 1982.

Some Things in the Air

Objective:

Students will be able to:

- 1. describe and compare particles that are collected on cards from different locations, and
- 2. discuss and understand some sources of air pollution in their community.

Method:

Students conduct an investigation of air pollution in their immediate community, compare results and learn about sources of air pollution.

Materials:

White index cards, permanent markers, strong tape (e.g., strapping or duct tape), petroleum jelly.

Procedure:

- 1. Choose 4 5 different locations to test for air pollution (air particles).
- 2. Set out index cards, both indoors and outdoors, (e.g., in a garden, next to a road, etc.)
- 3. Label index cards with location names and date.
- 4. Rub a thin coat of petroleum jelly over the centers of the cards. Tape each card onto a flat surface.
- 5. Leave each card for 24 hours (it can be longer). Then, collect and compare what has been collected on the cards.
- NOTE: You may want to carry this out when there is no rain in the forecast.

Background:

Wisconsin and the world are facing a huge challenge to protect and preserve the earth's fragile atmosphere. The thin layer of gases that surround the earth is changing. Today, the current composition of the earth's atmosphere is mostly nitrogen and oxygen. It also contains water droplets, fine particles, and very small amounts of carbon dioxide, nitrous oxides, methane, and other gases. Some of these substances have been present in the atmosphere for millions of years and come from natural sources like volcanoes and forest fires. Today, human sources are major contributors to air pollution. We can see some of the results of human sources in smog over our cities.

BRANCH OUT!

SECTION IV—Some Things in the Air 3.1

Volcanoes release tremendous amounts of gases and particles into the air with each eruption. Forest fires can release tons of particles into the air. Decaying organic materials in oceans, swamps, and bogs release greenhouse gases like methane and carbon dioxide.

Air pollution from human sources is the result of our increased use of fossil fuels. These sources tend to concentrate in urban areas where people live and work. Many of these pollutants come from the burning of coal, wood, oil, and other fuels we use to run our cars, factories, and power plants. Both natural and human sources of pollution can be transported almost anywhere in the world on global winds.

Evaluation:

List the areas in your immediate community that seem to have more air pollution particles than others.

List the possible sources of air pollution in your immediate community.

Discuss ways in which you might be able to reduce air pollution in your community.
LESSON FOUR



Grade Level:

Middle and High School

Subjects:

Environmental Education, Language Arts, Math, Science, Social Science

Duration: Two 50-minute sessions

Group Size:

5 students to 1 adult

Settina:

Indoors and outdoors

Resources/Citations:

Wisconsin Department of Natural Resources, Environmental Education for Kids. http://www.dnr.state.wi.us/org/ca er/ce/eek/teacher/treeact.htm, accessed, 3 July 2003.

Trees and Air Quality

Objective:

Students will be able to describe the ways in which trees benefit air quality and determine how to landscape a home with trees to decrease energy use.

Method:

Students sample particulate matter in the local air. Students discuss the effect of trees on energy savings.

Materials:

Paper for drawing maps, clean, damp white cloth.

Procedure:

- 1. Test for particulate removal. Students should draw a map to scale of their yard or school site and locate any trees on the map. Using a damp white cloth they should carefully wipe a leaf from each tree. Is the cloth dirty? Can you tell what material is on the cloth? Using your map, record which tree had the most dirt on the cloth. What was the source of the material? What will happen to the particulates that became trapped on the leaf in a week? Or a month?
- 2. Using the same map determine which trees assist in saving energy. Students should make several observations on sunny or windy days. Which trees provide shade in the summer? Students should consider the changing angle of the sun's rays during the seasons. Which trees block winter wind?

Draw in locations where you would plant trees to save energy. What types of trees would you plant? Students should consider a variety of factors including distance to buildings, soil drainage, power and gas lines.

Background:

Trees are much more than something pretty in your yard. They are important for a number of reasons, including:

- Reducing run-off of water
- Providing habitat for wildlife
- Providing people with forest products •
- Providing a recreation site
- Economic value
- Aesthetic value

BRANCH OUT!

SECTION IV—Trees and Air Quality

In addition, trees and plants have a great impact on our air quality. Trees act like filters. The leaves capture particulates like dust, soot, and pollen and remove them from the air. They also remove and store carbon and reduce our need for energy.

Trees act like a carbon warehouse. In the process of photosynthesis, plants remove carbon dioxide from the air and release oxygen. A healthy tree uses over 20 lbs. of carbon dioxide each year. The carbon is stored in the tree (wood is about 45 percent carbon) and the oxygen is released back into the atmosphere. Carbon dioxide is the most common greenhouse gas. Other greenhouse gases include a variety of nitrogen oxides, methane, and chlorofluorcarbons (CFCs).

Trees are outdoor air conditioners. They provide a natural way to shade and cool your house in summer and can shield your home from the cold winds of winter. A person can save energy by landscaping with trees. Deciduous trees planted on the south, west, and east will protect your home from the direct rays of the sun in summer. In winter, without their leaves, they allow most of the sun's energy to reach the house. Conifers to the north and west can block cold winter winds. This reduces consumption of energy to heat your home.

A successful urban tree program can also impact whole communities. Cities are often 10 degrees F warmer than suburbs, partially due to the "heat island effect" cause by concrete, steel, and asphalt. The planting and care of trees can minimize this phenomenon and greatly reduce energy consumption.



Wildlife Diversity

Lesson One Nature Hunt

Lesson Two Wildlife Is Everywhere

Lesson Three I Líve in Pheasant Branch!

> Lesson Four Follow Your Nose

> > Lesson Five Oh Deer!

Lesson Six Water Canaríes



Grade Level:

Elementary School

Subject:s: Envirnomental Education, Science

Duration: One 30- to 60-minute session

Group Size: 12 students to 1 adult

Setting:

Outdoors-in a prairie or field

Resources/Citations:

Joseph Cornell, Sharing Nature With Children, Dawn Publications, 1979. Project WILD, Council for Environmental Education, 2002.

Nature Hunt

Objective:

Students will develop observation skills and learn to think creatively.

Method:

Students take a hike outdoors. They look for objects listed on an observation sheet.

Materials:

Observation sheets, pencils, clipboards.

Procedure:

- 1. Create observation sheets. Use pictures for grades K-2. Write a list for grades 3-5.
- 2. Discuss what items the children are to look for. Tell them they will not be able to find everything on their list.
- 3. Caution children not to collect anything while on their walk.
- 4. Children work with a partner or in groups of three.
- 5. Before an item can be checked off the observation sheet, all people in the group must see it. This keeps the group working together.
- 6. Set specific areas where the children can go and have a signal that brings the children back to the leader—a whistle works well.

Background:

Children love to get out into nature to observe and investigate. Ideas for observation sheets: something soft, something sticky, something white/purple/yellow/etc., something beautiful, a bursting bud; specific plants like, big blue-stem, yellow coneflower, rattlesnake master, aster, Indian grass; an alien plant, something that flies, something not part of nature, something warm to the touch, a tunnel, a tree, something making noise, something dead, a mammal, a lichen, a nibbled leaf, three or more insects together, a plant taller than you are, a flower taller than you are, a feather, fur, a bone, something straight, a plant shorter than your shoe top, a bird, grass, a ladybug, a bee sucking nectar, a seed, an animal home, scat/droppings, tracks, butterfly, moth, moss. Change list for different seasons.

Evaluation:

Were children able to find everything on their sheet? If not, ask why they did not see everything.

Discuss their favorite item on the list and why they liked it.

Have them record their favorite item either by drawing a picture or writing a brief statement about it.

BRANCH OUT!

Wildlife Diversity



Grade Level: Elementary School

Subjects:

Environmental Education, Language Arts, Science

Duration: One 30- to 45-minute session

Group Size:

Any

Setting:

Indoors and outdoors

Vocabulary:

Domesticated, environment, evidence, wild, wildlife

Resources/Citations:

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Wildlife Is Everywhere

Objectives:

Students will:

- 1. compare human and wildlife habitat, and
- 2. generalize that wildlife is present around the world.

Method:

Students search their surroundings for evidence of wildlife.

Materials

None.

Procedure:

NOTE: Ask students to observe, but not touch or disturb, any animals they may see.

- 1. Invite the students to explore the room looking for signs of wildlife. Even in the cleanest rooms, some signs of life can be found. It might be a spider web, dead insects near lights, or insect holes along baseboards and behind books. After the search and a discussion with the students about what they might have found, introduce the idea that people and other animals share the same environment. Sometimes people do not even notice that they are sharing the environment with other living things.
- 2. Take the search for animals outside. Divide the students into pairs, and give each pair five minutes to find an animal or some sign that an animal has been there. Look for indirect evidence such as tracks, webs, droppings, feathers, and nests (be sure not to harm or seriously disturb any evidence that is found). Afterward, sit down and discuss what everyone found
- 3. Discuss with the students what they have learned. Emphasize that the experience shows that people and wildlife share the same environment. Aske the students to predict where different kinds of animals are found all over the Earth—in the deserts, oceans, mountains, and cities. They may draw from their own experiences and talk about places they have been and have seen animals.

Elementary School

BRANCH OUT!

Background:

Many people think of wildlife as the large animals of Africa, such as the lion and elephant, or the large animals of the North American forests, such as the grizzly bear and elk. However, wildlife includes all animals that have not been domesticated by people.

What may be surprising is that wildlife includes the smallest animal organisms-even those that can be seen only through a microscope. Spiders, insects, reptiles, amphibians, and most species of fish, birds, and mammals are considered wildlife. Even when animals are silent or not visible, they exist somewhere around us. Thousands of organisms live in and on human skin, hair, and bodies. In fact, the organisms that inhabit human bodies play a part in human survival. Some form of animal life is always near.

By investigating microenvironments or microhabitats, students will be able to generalize that wildlife exists in every country on the planet.

Extensions:

- 1. Observe wildlife in yards, kitchens, neighborhood, and city parks.
- 2. Search magazines and books for pictures of wildlife from all over the planet.
- 3. Invent names and descriptions for the wildlife found during wildlife searches. Students can observe the animals, write descriptions, and then check their invented names and descriptions against the scientific names and information found in reference materials.
- 4. Using state maps, look up towns, cities, and counties named after wild animals.

Aquatic Extension:

Survey your school grounds or neighborhood for any aquatic wildlife habitats. Check puddles, sprinkler systems, and, if possible, streams, beaches, and ponds. Look for evidence-direct or indirect-of any wildlife that lives in or near these water-related areas. Tell or show someone what you find, taking care not to damage any wildlife or its habitat.

Evaluation:

In which of the following places would animals be living: in a forest; in a hot, dry, desert; in a lake; at the top of a mountain; at the North Pole; in New York City? What kinds of animals would be found in those places? Name areas on Earth where animals would not be found.

What evidence did the class have (using the five senses) that showed that wildlife lives in any location where this activity was conducted?

Draw a picture of a place and include as many different animal species as possible that would be found living there. Explain your picture to a friend or adult.

Identify and describe three things that people could do to increase the numbers and kinds of wildlife living in an area that has little evidence of wildlife.

Wildlife Diversity





Grade Level:

Elementary, Middle and High School

Subjects:

Language Arts, Environmental Education, Science

Duration: One 15- to 30-minute session

Group Size: 30 students to 1 adult

Setting:

Indoors or outdoors

Vocabulary:

Attributes

Resources/Citations:

Joseph Cornell, *Sharing Nature With Children*, Dawn Publications, 1979. Friends of Pheasant Branch, http://www.pheasantbranch.org/, Nature Notes, accessed 6 July 2003.

I Líve in Pheasant Branch!

Objective:

Students will describe attributes of living and non-living objects found in Pheasant Branch Conservancy.

Method:

Students participate in a guessing game.

Materials:

Cards with pictures or words of objects on strings long enough to go over a person's head.

Procedure:

- 1. Tell students they are going to play a guessing game.
- 2. Each student will have a card hanging on his/her back.
- 3. Students have to guess what is on their card by asking yes/no questions. For variation, students may ask only one question of each person.
- 4. Students may not tell anyone what is on a card.
- 5. Demonstrate.

Background:

This activity is easily adapted to any age or ability level. Using pictures will help trigger questions. Moreover, limiting your category to just animals or plants will help younger students. Some of the living organisms in the Conservancy are:

- Animals—Sandhill cranes, barred owls, red-tailed hawks, turtles, deer, foxes, coyotes, mice, voles, rabbits, fish, crayfish, frogs, salamanders, worms, snails, insects, black birds, wrens, woodpeckers.
- Plants—big blue-stem grass, oak trees, needle grass, purple prairie clover, pasque flower, cattails, marsh marigolds, pussy-willows, silver maple trees, honeysuckle.

Evaluation:

What was the best question you were asked?

Did you guess what was on your card?

How many questions did it take?

Were some cards easier to guess than others?

BRANCH OUT!

Wildlife Diversity

LESSON FOUR



Grade Level: Elementary and Middle School

Subjects:

Environmental Education, Science

Duration: One 60- to 90-minute session

Group Size: 24 students to 2 adults

Setting:

Indoors or outdoors—woods

Vocabulary:

Predator, prey, scent trail

Resources/Citations:

Timber Wolf Education Activities, Wisconsin Department of Natural Resources

Follow Your Nose

Objective:

Students will learn about predator/prey relationships. Students will understand the role of predators in the natural world. Students will develop some empathy for predators.

Method:

Students play a game in which some are wolves and some are deer, to illustrate predator/prey relationships.

Materials:

Scent packs, scented sponge bits in 4 separate small plastic bags; extracts such as mint, anise, lemon, vanilla; deer skulls, bones, hides—optional.

Procedure:

- 1. Discuss predator/prey relationships with students.
- 2. Explain that they will be in a hunt as wolves or deer. The deer will leave 10 minutes ahead of the wolf pack, and leave a scent trail leading to their hiding places. Each wolf pack must follow the scent trail left by its own deer to try to find their deer.
- 3. Divide the students as follows: 4 deer, 4 packs of 4-5 wolves each.
- 4. One adult takes deer outside (or to the woods) and explains the "rules for deer" to them.
- 5. Another adult stays inside (or outside, away from the woods) and explains "rules for wolves."
- 6. Deer drop their scent sponges while looking for a hiding place; while wolves psych themselves up by smelling their deer's scent, practicing howling, and (optional) looking at deer skulls, hides, and bones.
- 7. About 10 minutes after deer leave, wolves start hunting. Wolves can only hunt "their" deer. When they find a deer, they must verify it by smelling its scent pack.
- 8. Once deer are all caught, wolves and deer must pick up all sponges and separate into proper containers.
- 9. Discussion: How wolves worked together, how easy or hard it was to find the deer, camouflage, advantages held by deer/wolves, what it felt like to be each one.

BRANCH OUT!

Background:

Wolves hunt in packs to kill vulnerable deer—young, sick, old, and weak ones. In this way they actually improve the health of the deer herd. The number of wolves in Wisconsin is so low compared to the deer population, that it cannot negatively impact the actual number of deer in the state.

Evaluation:

What sense is most important to a wolf that is hunting a hidden deer?

How does hunting in a pack benefit wolves?

If Wisconsin has about 250 wolves and each wolf eats about 15-20 deer/year, how many deer will all Wisconsin wolves eat in one year? Will this have an impact on a deer herd of 1 million?

Rules for Deer

- 1. You are to hide from the wolf pack that is smelling out your scent.
- 2. You have 10 minutes to leave your trail and hide before the wolves start hunting you.
- 3. You are sick, diseased, and will soon die. Since wolves catch the weakest deer, generally speaking, you are vulnerable.
- 4. You must leave a sponge "scent" every time your right foot hits the ground. Do not throw the sponges, deer don't do it that way!
- 5. Make sure you crisscross your path with the other deer. A straight, single line will be easy for the wolves to follow.
- 6. When you run out of sponges, you must then hide within 20 feet of your last sponge. Do not speak!
- 7. You may stand until you hear the howl of the wolves. When you hear the howl, that means the wolves are on their way.
- 8. When hiding, remain motionless. If you are cold, wiggle your toes, flex your muscles, do isometrics.
- 9. If the wolves find you, allow them to smell your scent bottle or bag. Don't talk to them, if they have the wrong deer, they must find their own!
- 10. On the way back to the building, collect all the sponges and sort them according to scent.
- 11. Be able to share your strategy and feelings about the hunt.

Rules for Wolves

- 1. Your pack is to find the deer leaving the scent trail assigned to you. (Scent will be on colored sponges.)
- 2. You have 10 minutes to learn your scent, examine deer bones and skulls, discuss your pack's hunting strategy, and to practice your howl.
- 3. After 10 minutes, you will be let loose to hunt. As you leave the building, give your howl (this lets the deer know you are coming so they can stop laying scent and hide.)
- 4. Hunt as a pack—look for and pick up sponges smelling for your scent. Only hunt for the deer leaving the scent assigned to your pack. Leave the scented sponges where you find them.
- 5. When you run out of scent markings, your deer should be hiding within 20 feet of the last scent marking.
- 6. When you find your deer—ask to smell their scent bag/jar. You have successfully completed the hunt and made you "kill" if the deer you found has the same scent that you were assigned.
- 7. On the way back to the building, collect all of the scent sponges and sort them according to scent.
- 8. Be able to share your strategy and feelings about the hunt.

Wildlife Diversity



Grade Level:

Elementary and Middle School

Subjects:

Environmental Education, Expressive Arts, Math, Science

Duration:

One 30- to 45-minute session

Group Size:

15 students and larger recommended

Setting:

Indoors or outdoors—large area for running needed

Vocabulary:

habitat, limiting factors, predator, prey, population, balance of nature, ecosystem

Resources/Citations:

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Oh Deer!

Objectives:

Students will:

- 1. identify and describe food, water, and shelter as three essential components of habitat,
- 2. describe factors that influence carrying capacity,
- 3. define "limiting factors" and give examples, and
- 4. recognize that some fluctuations in wildlife populations are natural as ecological systems undergo constant change.

Method:

Students portray deer and habitat components in a physical activity.

Materials:

An area—either indoors or outdoors—large enough for students to run (e.g., playing field), chalkboard or flip chart, writing materials.

Procedure:

- 1. Tell students they will be participating in an activity that emphasizes the most essential things animals need in order to survive. Review the essential components of habitat with the students: food, water, shelter, and space in a suitable arrangement. This activity emphasizes three of those habitat components—food, water, and shelter—but the students should not forget the importance of the animals having sufficient space in which to live, and that all components must be in a suitable arrangement for wildlife populations to reach their maximum size.
- 2. Ask the students to count off in fours. Have all the ones go to one area; all twos, threes, and fours go together to another area. Mark two parallel lines on the ground or floor 10 or 20 yards apart. Have the ones line up behind one line; the rest of the students line up behind the other line, facing the ones.
- 3. The ones become "deer". All deer need good habitat to survive. Again ask the students what the essential components of habitat are (food, water, shelter, and space in a suitable arrangement). For this activity, assume that the deer have enough space in which to live. The deer (the ones) need to find food, water, and shelter to survive. When a deer is looking for food, it should clamp its "hooves" over its stomach. When it is looking for water, it puts its "hooves" over its mouth. When it is looking for shelter, it holds its "hooves" together over its head. The deer can choose to look for any one of its needs during each round or segment of the activity; the deer cannot, however, change what it is

Elementary School

looking for (e.g., when it sees what is available during that round). It can change what it is looking for in the next round, if it survives.

- 4. The twos, threes and fours are food, water, and shelter-components of habitat. Each student is allowed to choose at the beginning of each round which component he or she will be during that round. The students depict which component they are in the same way the deer show what they are looking for (i.e., hands on stomach for food and so on).
- 5. The activity starts with all players lined up behind their respective lines (deer on one side, habitat components on the other side) and with their backs facing the students along the other line.
- 6. Begin the first round by asking all of the students to make their signs—each deer deciding what it is looking for, each habitat component deciding what it is. Give the students a few moments to put their hands in place—over stomachs, over mouths, or over their heads. (The two lines of students normally will display a lot of variety-with some students portraying water, some food, and some shelter. As the activity proceeds, sometimes the students confer with each other and all make the same sign. That's okay, although do not encourage it. For example, all the students in habitat might decide to be shelter. That could represent a drought year with no available food or water.

NOTE: Switching symbols in the middle of a round can be avoided by having stacks of three different tokens-or pieces of colored paper-to represent food, water, and shelter at both the habitat and deer ends of the field. At the start of each round, players choose one of the symbols before turning around to face the other group.

- 7. When the students are ready, say, "Oh Deer!" Each deer and each habitat component turn to face the opposite group, continuing to hold their signs clearly.
- 8. When deer see the habitat component they need, they should run to it. Each deer must hold the sign of what it is looking for until getting to the habitat component student with the same sign. Each deer that reaches its necessary habitat component takes the "food," "water," or "shelter" back to the deer side of the line. "Capturing" a component represents the deer successfully meeting its needs and successfully reproducing as a result. Any deer that fails to find its food, water, or shelter dies and becomes part of the habitat. That is, any deer that died will be a habitat component in the next round and so is available as food, water, or shelter to the deer that are still alive.

NOTE: When more than one deer reaches a habitat component, that student who arrives there first survives. Habitat components stay in place until a deer chooses them. If no deer needs a particular habitat component during a round, the habitat component just stays where it is in the habitat. The habitat component can, however, change which component it is from round to round.

- 9. Record the number of deer at the beginning of the activity and at the end of each round. Continue the activity for approximately 15 rounds.
- 10. At the end of the 15 rounds, bring the students together to discuss the activity. Encourage them to talk about what they experienced and saw. For example, they saw

a small herd of deer (7 students in a class size of 28) begin by finding more then enough of its habitat needs. However, because the population of deer expanded over two or three rounds of the activity until it exceeded the carrying capacity of the habitat, there was not sufficient food, water, and shelter for all members of the herd. At this point, deer starved or died of thirst or lack of shelter, and they returned as part of the habitat. Such things happen in nature also.

NOTE: In real life, large mammal populations might also experience higher infant mortality and lower reproductive rates.

11. Using an overhead projector, a flip chart pad, or chalkboard, post the data recorded during the activity. The number of deer at the beginning of the activity and at the end of each round represents the number of deer in a series of years. That is, the beginning of the activity is year one, each round is an additional year. Deer can be posted by fives for convenience. For example,



The students will see this visual reminder of what they experienced during the activity: the deer population fluctuated over a period of years. This process is natural as long as the factors that limit the population do not become excessive to the point where the animals cannot successfully reproduce. The wildlife populations will tend to peak, decline, and rebuild—as long as there is good habitat and sufficient numbers of animals to reproduce successfully.

- 12. What is realistic about this simulation? (Deer that do not survive do become recycled as nutrients, but it is not instantaneous. Deer need all habitat components to survive. Poor habitat usually results in a weakened individual that succumbs to disease, not instant death.)
- 13. In discussion, ask the students to summarize some of the things they learned from this activity. What do animals need to survive? How do these components influence carrying capacity? What are some "limiting factors" that affect the survival of animals? How do factors that limit carrying capacity affect the health, numbers, and distribution of animals? How do these factors affect competition within a species? Why is good habitat important for animals? Are wildlife populations static, or do they tend to fluctuate as part of an overall "balance" of nature? Is nature ever really in "balance" or are ecological systems involved in a process of constant change?

Notes

Background:

Carrying capacity refers to the dynamic balance between the availability of habitat components and the number of animals that habitat can support. A variety of actors related to carrying capacity affect the ability of wildlife species to successfully reproduce and to maintain their populations over time. The most fundamental of life's necessities for any animal are food, water, shelter, and space in a suitable arrangement. Without these essential components, animals cannot survive.

However, some naturally caused and culturally induced limiting factors serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support. Disease, predator and prey relationships, varying impacts of weather conditions from season to season (e.g., early freezing, heavy snows, flooding, drought), accidents, environmental pollution, and habitat destruction and degradation are among these factors. An excess of such limiting factors leads to threatening, endangering, and eliminating whole species of animals.

This activity illustrates that:

- good habitat is the key to wildlife survival,
- a population will continue to increase in size until some limiting factors are imposed,
- limiting factors contribute to fluctuations in wildlife populations, and
- nature is never in "balance," but is constantly changing.

Wildlife populations are not static. They continuously fluctuate in response to a variety of stimulating and limiting factors as applying to a single species, although one factor may affect many species.

Carrying capacity limitations can result in competition among domestic animals, wildlife, and humans.

Natural limiting factors, or those modeled after factors in natural systems, tend to maintain populations of species at levels within predictable ranges. This kind of "balance in nature" is not static, but is more like a teeter-totter than a balance. Some species fluctuate or cycle annually. Quail, for example, may start with a population of 100 pairs in early spring, grow to a population of 1,200 birds by late spring, and decline slowly to a winter population of 100 pairs again. This cycle appears to be almost totally controlled by the habitat components of food, water, shelter, and space, which are also limiting factors. Habitat components are the most fundamental and the most critical of limiting factors in most natural settings.

This activity is a simple but powerful way for students to grasp some basic concepts: first, that everything in natural systems is interrelated; second, that populations of organisms are continuously affected by elements of their environment; and third that populations of animals are continually changing in process of maintaining dynamic equilibrium in natural systems.

Variations:

1. After the students have played several rounds of *Oh Deer!*. introduce a predator such as a mountain lion or wolf into the simulation. The predator starts in a designated "predator den" area off to the side. The predator has to skip or hop. This impediment reduces the possibility of violent collisions between deer and predator. The predator

can tag deer only when they are going toward the habitat and are between the habitat and deer lines. Once a deer is tagged, the predator escorts the deer back to the predator den. The time it takes to escort the deer simulates the time it takes to eat. The "eaten" deer is now a predator. Predators that fail to tag someone die and become habitat. That is, in the next round the predators that died join the habitat line. They will become available to surviving deer as food, water, or shelter. During each round, keep track of the number of predators, as well as the number of deer. Incorporate those data into groups.

2. Instead of drawing the line graph for students as described in Step 11, have the students create their own graphs. Provide them with the years and numbers of deer.

Extensions:

When the students have finished tabulating and discussing the graph data, ask them

1. If they have ever heard of the Hudson Bay trappers in American history. Tell students briefly who the trappers were.

There are a hundred years or more of records of the activities of these trappers. In those records are some interesting data. The data refer to pelts shipped from America to Europe, particularly the pelts of snowshoe hares and lynx. Researches have found that snowshoe hare populations seem to peak about every seven to nine years and they crash, repeating the process over each comparable time period. A snowshoe hare population graph would look like this:



It also has been discovered that lynx populations do the same thing—except that they do it one year behind the hare populations. The combined graph would look like this:



Plot both sets of data on a graph, adding first the hares and the the lynx. Ask the students these questions:

• Which animal is the predator? Which prey?

Notes



- Are predators controlling the prey, or are prey controlling the predators? (The ٠ number of prey animals available is an indicator of how many predators can live in the area).
- How is the graph similar to the one created in the deer habitat activity? Who controls the population fluctuations? (Sometimes the habitat-when the deer population is not too large; sometimes the deer-when the deer population destroys the vegetative food and cover.)
- 2. Some recent research has added a new dimension to the story of the snowshoe hare and the lynx.

It has been found that a major winter food of the hare is a small willow. As the hare population grows, the use of the willow plants grows too. However, when the willow plant has been "hedged" or eaten back so far, the plant generates a toxin (poison) so the hare can't eat it. That is when the hare population crashes, followed by the crash of the lynx population about a year later. Then the willow is able to grow again. The hare population begins to grow in response, and last of all, within a year or so, the lynx population follows. And the cycle has begun again-over and over-every seven to nine years.

3. Discuss the "balance" of nature. Is it ever in "balance"?

Aquatic Extension:

Do the activity in exactly the same fashion, except substitute an aquatic species of wildlife. The essentials are the same. In this case, rather than assume all the water is available but space is needed, as is food and shelter. Hands on stomach is food, hands together over head is shelter, and arms out to the side is space. Otherwise, conduct the activity in the same fashion. The objective remains the same except that now food, shelter, and space are the three essential components of habitat. Examples of possible aquatic species: manatee, salmon, frog.

Evaluation:

- Identify three essential components of habitat.
- Define"limiting factors." Identify three examples.
- Examine the graph below. What factors may have caused the following population changes:
 - 1. between year 1 and 2?
 - 2. between years 3 and 4?
 - between years 5 and 6? 3.
 - between years 7 and 8? 4.



Which of the following graphs represents the more typically balanced population? 4.



LESSON SIX



Grade Level:

Middle School

Subjects: Environmental Education, Science

Duration:

One or two 45-minute sessions; may take longer if done as a field study activity

Group Size:

Any

Setting:

Outdoors

Vocabulary:

Diversity, healthy, indicator species, pH, temperature

Resources/Citations:

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Water Canaríes

Objectives:

Students will identify several aquatic organisms and assess the relative environmental quality of a stream or pond using indicators of pH, water temperature, and the presence of a diversity of organisms.

Method:

Students investigate a stream or pond using sampling techniques.

Materials:

Identification books (e.g., *The Golden Guide to Pond Life*), Student Worksheets I and II; (Section V, Page 6.6) sampling equipment, such as; sieves, trays, assorted containers, white trays (styrofoam, plastic, porcelain), magnifying lenses, eye droppers and forceps, water quality test kit (test both pH and dissolved oxygen), thermometer, meter sticks or tape measure. Optional: stereomicroscope.

Procedure:

Before the Activity

 Select a small, fairly shallow, slow-moving stream or pond near your school or organization as the sampling site for this activity e.g., Pheasant Branch. Be sensitive to the impact students may have on stream banks and beds, spawning and nesting sites, and vegetation. Have the students establish ethical guidelines for their sampling activities. If the stream is not a public site, be sure to obtain permission to visit the site. Advise the students in advance to dress for the setting—old shoes and shorts or jeans would be best.

NOTE: If a site visit is not possible, modify the activity to be conducted in the classroom.

- 2. At the sampling site, brief the students on habitat courtesies, working from the students' own list of ethical guidelines for sampling activities. Instruct them on how to minimize the potential for damaging the habitat, and encourage care in their collecting techniques. Emphasize that all the wildlife is to be returned to its habitat unharmed. Educators may choose whether to take some of the organisms back to school for further study.
- 3. Begin the activity by observing the water. Identify organisms on the surface and in the depths. Using the sampling equipment (nets, trays, sieves, etc.) have the students collect as many different forms of animal life as possible. Ask them to be alert to differing microhabitats near rocks, in riffles, and in pools. Place the animals to be observed in the white trays for viewing and drawing. The whiteness of the trays allows

Elementary School

BRANCH OUT!

SECTION V–Water Canaries ^{6.1}

to Pheasant Branch Conservancy

detail to be seen in the animals collected. Keep an adequate amount of water in the tray, and place them in a cool, shady spot. Change the water as often as needed to keep the animals cool. This is a good time to use the microscopes, if available.

4. On Worksheet I, have the students identify and draw the animals they observed in the aquatic environment and those temporarily removed for observation in the collection containers. Ask them to fill in the number of each kind found and to describe the actual location where the animal was found. Once these observations are completed, carefully return the animals to their natural habitat.

NOTE: If you choose to take some of the animals to the classroom, be sure there is adequate water as cool a that in the natural setting. To have the entire class view the organisms, place the organisms in petri dishes or any shallow transparent dish. Then use an overhead projector to project the images onto a screen or wall.

- 5. Encourage the students to discuss their observations. How diverse were the aquatic organisms? Introduce the concept of diversity, or explain that a variety of different kinds of plants and animals is usually an indication of a healthy ecosystem.
- 6. Now it is time to test the water at the field site for other indicators of quality. Using the water quality test kit, have the students determine the pH and the temperature of the water as well as the air temperature. If you choose to measure the amount of dissolved oxygen as indicated in Extension 1, include those values with water temperature and pH.

			-		-		-	-	-				
Мо	ost Aci	dic				1	Veutr	al				Most B	asic
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bac	teria												
1.0-												—13.0	
Pla	nts (alg	gae, ro	oted, e	tc.)									
					6.	.5——						—13.0	
Car	ps, suc	ckers, c	catfish,	some	insects	6							
					6.0-			8.5					
Bas	s, crap	pie			6.0-			8.5					
Sna	ils, cla	ms, m	ussels		6.	.5——		—9.0					
Largest variety of animals			6.0-			8.5							
(trout, mayfly, stonefly, caddisfly)													

pH Ranges That Support Aquatic Life

Temperature Ranges
(Approximate) Required for Certain Organisms
TemperatureGreater than 68 °F (20 °C) = Warm waterMuch plant life, many fish diseases
Most bass, crappie, bluegill, carp,
catfish, caddisfly, dragonfly, mayfly, mussels55 - 68 °F (12.8 - 20 °C = Cool waterPlant life, some fish diseases
Salmon, trout, stonefly, mayfly, caddisfly,
water beetles, small-mouth and rock bass,
various minnows and darters, musselsLess than 55 °F (12.8 °C) = Cold waterTrout, caddisfly, stonefly, mayfly,
various minnows, darters, sculpins

Dissolved Oxygen (DO) Requirements for Native Fish and Other Aquatic Life (DO is parts per million [ppm])

(Below 68 °F)

(Above 68 °F)

Cold-water organisms including salmon and trout

Warm-water organisms including fish such as bass, crappie, catfish, and carp

_5 ppm

6 ppm_____

NOTE: many educators are not able to have the students measure the dissolved oxygen (DO) because of the difficulty for younger students. If it is convenient, this measure contributes greatly to the overall picture of water quality. These data need to be recorded on Student Worksheet II. Educators may also choose to have the students measure stream velocity, which can be accomplished by timing a floating object (e.g., a ping pong ball) as it travels a known distance (e.g., 10 feet).

7. Assist the students in understanding that the values of pH, water, and air temperature affect the diversity of life forms found in aquatic environments. Ask whether they would expect the same variety of life in other locations. Help them to understand that predictions of animal diversity can be made from measurements of pH and water temperature. Likewise, certain indicator species can also disclose information about pH and water temperature.

NOTE: A simple water quality test kit can be obtained from scientific supply houses dealing with high school biology supplies. Often a hydrion or Hach kit can be borrowed from a high school biology teacher. A local wastewater treatment facility may have kits that you can borrow. Local universities or wildlife agencies may also have aquatic insect kits that you can borrow. (See Extension 8.)

Notes

8. Ideally, this activity could be repeated at other sites with different characteristics. Biologists examine hundreds of sites in order to try to understand and predict what is happening in natural systems. If another site is visited, it might be useful to divide the class into two groups with one-half doing Worksheet I and the other half doing Worksheet II. When each group is finished, the students could come together and mutually predict what the other group had found.

9. Summarize the study with a re-emphasis on the fact that diversity of animals is a useful indicator of habitat quality as well as an overall indicator of environmental quality.

Background:

In the early days of coal mining, canaries were brought into mines to be used as indicators of the mine's air quality. Because canaries are more sensitive than humans to the presence of dangerous gases in the air, their discomfort or death indicated that the air was not safe to breathe. Although this practice no longer exists, it stands as an example of how animals have differing sensitivities to environmental factors.

In streams and ponds, the presence or absence of certain organisms, called indicator species, reveals much about water quality. These creatures make up a biotic index (number of living organisms found in an ecosystem). The absence or presence of these organisms is an indicator of water quality.

Water with numerous aquatic species is usually a healthy environment, whereas water with just a few different species usually indicates conditions that are less healthy. The word healthy is used to indicate an environment supportive of life. Pollution generally reduces the quality of the environment and, in turn, the diversity of life forms. In some cases, the actual biomass will increase because of pollution, but the diversity inevitably goes down.

Extensions:

- 1. Measure and record the dissolved oxygen for the sites visited. Look at the relationships to the values for water temperature and pH.
- 2. Sample the streams both above and below the local water supply.
- 3. Find the most diverse and least diverse streams in the area.
- 4. Contact local wildlife, environmental, and conservation groups to find out what their concerns are regarding water quality. Determine what can be done as an individual and as a community to improve or maintain local water quality.
- 5. Sample streams above and below your local wastewater treatment plant.
- 6. What do the conditions in the stream mean for wildlife in and out of the water?
- 7. Research other examples of biological indicators. Determine how substance such as DDT result in bio-magnification (increased accumulation) in creatures such as birds of prey, fish, shellfish, and such.
- 8. Contact your local environment department, your state wildlife agency's aquatic education program, Project WILD coordinator, or the Izaak Walton League—www.iwla.org and then click on Save Our Streams—to see if there is an Adopt-a-Stream, river, bay, or lake monitoring project in your area.

Evaluation:

Draw a simple illustration of one or more of the following organisms: *Asellus* (water sowbug), water strider, caddisfly lava, cray-fish, scud, *Daphnia*, leech, mayfly, nymph, midge larva, stonefly nymph, or dragonfly nymph. Identify each organism by writing the correct name beside the picture.

You found a trout in a stream with a large variety of other organisms. Predict ranges you would expect to find for pH and water temperature.

Notes

Student Worksheet I					
Where Organism Was Found	Sketch of Organism	Number Found			

Student Worksheet II					
Observations	Predictions				
Water Temperature					
Air Temperature					
рН					
Dissolved O ²					



Prairie & Restoration Projects

Lesson One Insect Hunt

Lesson Two Observe a Spot

Lesson Three Prairie Shapes

Lesson Four Sweeping Discoveries

Prairie & Restoration

LESSON ONE



Grade Level: Elementary School

Subjects: Environmental Ed

Environmental Education, Math, Science

Duration: One 30- to 45-minute session

Group Size: 5 students to 1 adult

Setting:

Outdoors-prairie

Resources/Citations:

Adapted from *Earth Partnership for Schools*, University of Wisconsin-Madison Arboretum, 1207 Seminole Highway, Madison WI 53711 608-262-9925 http://wiscinfo.doit.wisc.edu/arb oretum/earth_partnership_index. htm

Insect Hunt

Objective:

Students will observe and classify insects in a prairie. Students will learn about insect camouflage.

Method:

Students go on a prairie walk.

Materials:

Field guides or laminated pictures of common insects found in the prairie, nets and containers (optional), old bed sheets (optional).

Procedure:

Take children on a prairie walk looking for insects.

- 1. Try to identify insects.
- 2. Sit quietly and watch an insect. What do you think the insect is doing? Why do you think the insect is on a particular plant?
- 3. Chase a butterfly.
- 4. Collect insects with nets. Empty the nets on a plain old bed sheet. Identify insects and/or do an insect count. Caution: Do not collect an insect with stingers or pinchers.
- 5. Try drawing an insect. Does the critter have 2 or 3 main body sections? How many legs does the critter have? Does the critter have wings? If so, what do they look like? Where are the eyes? How many eyes? Is there a stinger? Where is it? What does the mouth look like? Is there a proboscis?
- 6. Do an insect hunt in the prairie. Then repeat in a grassy area or wetland or woods. Are the insects different?

Evaluation:

Discuss the favorite insects students saw.

Did anyone see an insect that was camouflaged on a plant?

Compare and contrast different habitats and the number of insects that were found.

Did anyone find a critter with only 2 body parts? If so, was it an insect? No? What was it?

Prairie & Restoration





Grade Level: Elementary School

Subjects: Art, Language Art, Science

Duration: One 30- to 60-minute session

Group Size: 6 students to 1 adult

Setting: Outdoors—prairie

Vocabulary:

Observation, senses

Resources/Citations:

Adapted from *Earth Partnership for Schools*, University of Wisconsin-Madison Arboretum, 1207 Seminole Highway, Madison WI 53711 608-262-9925 http://wiscinfo.doit.wisc.edu/arb oretum/earth_partnership_index. htm

Observe a Spot

Objective:

Students will practice observation skills out in the field.

Method:

Students observe a spot and record impressions.

Materials:

Observation sheets, clipboard, colored pencils (optional), yarn circles, pencil.

Procedure:

- 1. Tell students you are going to take a walk in the prairie. As students are walking, they should be looking for a spot they want to revisit.
- 2. Find a spot to observe. Students should put down a yarn circle to define the area they are to observe.
- 3. Get to know their spot. Students should sit for 10 minutes (Adjust time depending on age of child.) experiencing and observing their spot. Children could jot down their thoughts or draw a picture of what they see.

Things to Consider:

- 1. What do you see? ---Close-up, far away, colors, etc.
- 2. What do you hear? -Loud, soft, put an ear to the ground, etc.
- 3. What do you feel? —Hard, soft, big, small, wet, dry, sharp, fuzzy, etc.
- 4. What do you smell? —Tune into different objects.
- 5. What feelings do you have?
- 6. How/why is your spot part of the prairie?
- 7. What words describe your spot?

Variations:

- 1. Compare and contrast the prairie spot with a spot in the woods, grass, or wetland.
- 2. Visit the same spot periodically and record your observations of change either in writing or with pictures.
- 3. Write a poem while in your spot.

Evaluation:

Lead a discussion about what students observed. Compare and contrast observations at different sites.

to Pheasant Branch Conservancy

Prairie & Restoration





Grade Level: Elementary School

Subjects: Art, Environmental Education, Math, Science

Duration:

One 30- to 50-minute session

Group Size: 6 students to 1 adult

Setting:

Outdoors-prairie

Vocabulary:

Circle, hexagon, octagon, oval, pentagon, rectangle, triangle

Resources/Citations:

Adapted from *Earth Partnership for Schools*, University of Wisconsin-Madison Arboretum, 1207 Seminole Highway, Madison WI 53711 608-262-9925 http://wiscinfo.doit.wisc.edu/arb oretum/earth_partnership_index. htm

Prairie Shapes

Objective:

Students will find prairie plants that represent different geometric shapes.

Method:

Students search for a given shape.

Materials:

Picture cards of given shapes, red string, colored pencils.

Procedure:

- 1. Give each child one or more picture cards and tell them to look for the shape on the card.
- 2. The child can either mark the plant by tying a red string around it or by drawing the part of the plant that resembles the shape. The group would have to revisit and untie all of the plants.

Variation:

When back at school, a shape book could be made. Do the activity at different times of the year. Are the shapes students find always the same? Do leaf or stem rubbings.

Background:

This activity can easily be modified for different age levels and abilities. For older students, you could have pictures of three-dimensional shapes. Younger children would have cards with very simple shapes like a circle, rectangle, and triangle.

Evaluation:

Gather students and have them tell about what they found. Were some shapes easier to find than others?

BRANCH OUT!

Prairie & Restoration



Grade Level:

Middle and High School

Subjects:

Environmental Education, Language Arts, Math, Science

Duration:

Two 50-minute sessions

Group Size:

10 students to 1 adult

Setting:

Outdoors—in a variety of habitats and indoors

Vocabulary:

Adaptation, arthropod, camouflage, consumer, decomposer, diversity, ecosystem, exoskeleton, habitat, invertebrate, pollinator, predator, quadrant, vegetation

Resources/Citations:

Adapted from *Earth Partnership for Schools*, University of Wisconsin-Madison Arboretum, 1207 Seminole Highway, Madison WI 53711 608-262-9925 http://wiscinfo.doit.wisc.edu/arb oretum/earth_partnership_index. htm

continued on page Section VI, page 4.2

BRANCH OUT!

to Pheasant Branch Conservancy

Sweeping Discoveries

Objective:

Students will:

- 1. ask and investigate observable questions about insects,
- 2. use observation skills to collect and classify insects,
- 3. explain basic relationships between insects and the environment,
- 4. show appreciation for the diversity of insects, and
- 5. consider the impact of humans on the environment.

Method:

Outdoors:

- Sweep the insect net through the vegetation five times quickly.
- Grab the net to keep insects inside.
- Shake net contents into a container.
- Observe and record information about the insects and the type of vegetation.
- Also include information about the time of year, temperature, and weather conditions.
- Repeat in a different area.

Indoors:

- Students develop their inquiry questions.
- Research the collection data, analyze the data.
- Conclude the investigations with a class presentation.

Materials:

Sweep nets, gallon-sized zip-lock plastic bags, insect field guides, and magnifying glasses.

Procedure:

Outdoors:

- 1. Divide the class into groups of three-four students.
- 2. Students record information about vegetation, weather conditions, date, and time of day on a data sheet.
- 3. Sweep the net through the vegetation five times in one direction.
- 4. Classify insects using field guide and magnifiers.
- 5. Repeat process in different habitats.
- 6. Tally the number of insects.

Indoors:

Students work in their groups on data gathered while out in the field. They draw conclusions and develop a presentation of their findings.

SECTION VI—Sweeping Discoveries 4.

Background:

Insects are animals without backbones called invertebrates. They are classified in the phylum Arthropoda. They have a segmented body with three parts—head, thorax, and abdomen. They are usually winged, have antennae, six segmented legs and have an exoskeleton. There are nearly a million known insects.

They are important as pollinators, predators, prey, and decomposers.

Evaluation:

Assess the students' research question, data gathering methods, conclusions, and presentation.

Resources/Citations continued:

A Guide to Observing Insect Lives, Little Brown & Co, 1984. Amy Bartlett Wright, Peterson First Guide to Caterpillars of North America, Houghton Mifflin Co., 1993.UW-Madison Entomology Department., http://www.entomology.wisc.edu/insectam/trainpkt.html, accessed 6 July 2003



Urban Development

Lesson One City Construction Committees

Urban Development

LESSON ONE

Elementary School

Middle School



Grade Level:

Elementary and Middle School

Subjects:

Environmental Education, Science, Social Science

Duration: Two to five 50-minute sessions

Group Size:

24 students to 1 adult

Setting:

Indoors or outdoors

Vocabulary:

Accommodate, commerce, commercial, committee, environmental, industrial, residential

Resources and Citations:

City of Middleton Master Plan Executive Summary

http://www.ci.middleton.wi.us/ MasterPlan/summary.htm, accessed 6 July 2003.

Cíty Construction Committees

Objective:

Students will investigate and participate in city planning groups while considering the effects urban development have on wildlife habitats.

Method:

Students divide into five groups of specific interest to the proposed city to be built. Within these groups and as a class the students resolve any conflicts and examine any new suggestions that may arise.

Materials:

Students will build the city to a set scale from recycled materials after planning has been completed. Examples of materials are: cardboard boxes, cans, milk cartons, used paper, popsicle sticks, pipe cleaners, straws, and anything else you and the students can collect.

Procedure:

The teacher may place students into groups or allow them to rank their interest in each topic. The groups followed by their responsibilities and goals are:

- 1. Residential Planning
 - a. Will accommodate a range of housing options for citizens and provide a suitable living environment for all residents.
- 2. Public Utilities and Transportation
 - a. Provides efficient and effective transportation (not just use of cars) and access of public services such as electricity, water, and sewer.
- 3. Commercial and Industrial Development
 - a. Offers goods and services that accommodate the needs of the city and contribute to economic stability with commerce and jobs.
- 4. Parks and Environmental Protection
 - a. Insures adequate recreation facilities, open spaces, and environmentally sensitive lands for each part of the community.
 - b. Protects natural resources.
- 5. Voting and negotiation
 - a. Will make decisions final, and the teacher (as Mayor) can cast a vote to break a tie.

BRANCH OUT! SECTION VII-City Construction Committees 1

Evaluation:

Students should view this project as a collective assignment for the entire class where participation, cooperation, and attention to detail are stressed. Grading should be done in the five specific groups allowing students to anonymously evaluate each other according to the work they have done. The teacher will then interpret this and use it in consideration to the students' individual grades. It is expected that students may fall into roles that suit their strengths. For example, some students may prefer to present or debate the committee's ideas to the other groups, while other students will prefer the planning and construction process.



Environmental Art

Lesson One Feed the Birds!

Lesson Two Make Room for Mushroom!

> Lesson Three Branches as Brushes

> > Lesson Four Dyeing to Paint

Lesson Five Dream Weaver

Lesson Six Mosaíc Plants

Environmental Art

LESSON ONE



Grade Level: Elementary School

Subjects: Environmental Education, Visual Art

Duration: Two 30-minute sessions

Group Size: 20 students to 1 adult

Setting:

Indoors

Resources/Citations:

Adapted from Adrienne Bolles, *Easy Bird Feeder*, Kinderart.com, http://www.kinderart.com/crafts/ easybirdfeeder.shtml, accessed 3 July 2003

Feed the Birds!

Objective:

Students will learn a simple way for children to contribute to their community and the environment by providing food for birds.

Method:

Students decorate and make bird feeders.

Materials:

Cake-sized paper plates, toilet paper or paper towel rolls cut in half, tempera paint, yarn, white glue, scissors, hole punchers, paint brushes.

Procedure:

Discuss geometric designs. What kinds of shapes are used in patterns and designs?

- 1. Have the students paint a paper roll and one plate using geometric designs. Choose bright colors for contrast.
- 2. Allow roll and plate to dry slightly.
- 3. Punch three holes on the end of the paper roll evenly, forming a triangle along the edge. These holes will be used to hang the feeder, so be sure to punch the holes at equal heights and at points that will help distribute the weight evenly.
- 4. On the opposite end of the roll, cut two small half circles on opposite sides at the bottom of the roll. These cuts will enable the seeds to fall from the roll onto the plate.
- 5. Glue the roll to the center of the plate with the small half circles (cut in step 4) at the bottom.
- 6. Loop the string through the three holes on the top of the roll and tie.
- 7. Fill the roll with bird seed after the glue has dried.
- 8. Hang from a tree and make notes of birds you find snacking!

Evaluation:

Did the students use shapes and geometric design in their paintings? Are the holes punched correctly to allow this feeder to function properly?

BRANCH OUT!

SECTION VIII—Feed the Birds! 1.1

Environmental Art

ESSON



Grade Level: Elementary School

Subject: Visual Art

Duration: Two 50-minute sessions

Group Size: 25 students to 1 adult

Setting:

Indoors

Resources/Citations:

Lesson adapted from Karen E. Bledsoe and Candyce Norvell, Spore Prints, *365 Nature Crafts* & *Activities*, Publications International, May 2002

Make Room for Mushroom!

Objective:

Students will receive a one-of-a-kind experience with printmaking. They will see how natural materials will 'print' and will also create colorful prints from paint.

Method:

Students prepare spore prints using fungi.

Materials:

Mushroom caps,* white 6"x9" tag board, black paper, drinking glass or bowl, hair spray, tempera paint or printing ink, shallow trays/paper plates for paint.

Procedure:

- 1. Give each child a few mushrooms. Look underneath the cap. The gills are lined with structures that release and make spores. Each spore can grow into a new fungus, and each mushroom can make millions of spores!
- 2. Cover half of the tag board with black paper. Glue down.
- 3. Pop out the stem of the mushroom and place the head on the paper so that half of it is on the black and half of it is on the white.
- 4. Cover with a glass or bowl and let it sit overnight.
- 5. The next day upon removing the bowl you will find a print! The pale spores will show up on black paper and darker ones will show on the white.
- 6. Spray with hairspray to set.
- 7. Take the other mushrooms leftover and pop stems out. Dip mushroom heads into a shallow tray of tempera paint or printing ink.
- 8. Print the mushroom caps with bright colors onto paper. Compare the "natural" print to your painted print.

Evaluation:

Did students prepare and position the mushroom so that the spores produced a print?

* Picking mushrooms is not permitted in the Pheasant Branch Conservancy.

2.1

BRANCH OUT! SECTION VIII—Make Room for Mushroom! to Pheasant Branch Conservancy

Environmental Art





Grade Level:

Elementary School

Subject: Visual Art

Duration: One 45-minute session

Group Size: 25 students to 1 adult

Setting:

Indoors

Vocabulary:

Primary colors : RED, BLUE, YELLOW Secondary colors: ORANGE, PURPLE, GREEN

Resources/Citations:

Adapted from H. Williams, *Pine Branch Painting*, Kinderart.com, http://www.kinderart.com/painting/pinebranch.shtml, accessed 3 July 2003.

Branches as Brushes

Objective:

Students will use different media, techniques, and processes to create abstract art.

Method:

Students use tree branches as an artist's brush to create unique artwork.

Materials:

Pine tree branches (small);* aluminum pie plates for paint; red, blue, yellow tempera paints; white paper (heavier is better); Multi-colored glitter.

Procedure:

- 1. Dip the pine branch into a pie plate with tempera paint. Drag through paint.
- 2. Press branch onto white paper.
- 3. Re-apply paints onto branch and drag across the page. Mix the primary colors to make secondary colors in the painting.
- 4. Sprinkle some glitter onto the branch and sparingly across branch painting.
- 5. When the branch is dry, glue it onto the painting for added effect!

Evaluation:

Did the students mix primary colors to create secondary colors?

Was there understanding of the concepts of mixing yellow + red = orange, blue + yellow = green, blue + red = purple, conveyed in the student's paintings?

Extension:

Take a hike with your class and look for dead twigs and branches to paint with. Bring in leaves that have fallen and use them for painting as well.

*Cutting branches is not permitted in the Pheasant Branch Conservancy.

BRANCH OUT!

to Pheasant Branch Conservancy

SECTION VIII—Branches as Brushes ^{3.1}
LESSON FOUR

Elementary School



Grade Level: Elementary and Middle School

Subject: Visual Art

Duration: Two to three 40-minutes sessions

Group Size: 25 students to 1 adult

Setting:

Indoors

Vocabulary:

Pigment

Resources/Citations:

Lesson adapted from Kim Swanger, *Plant Dye Paints*, http://www.kinderart.com, accessed: March 28, 2003. J. N. Liles, *The Art and Craft of Natural Dyeing*, University of Tennessee Press, 1990. Jenny Dean, *The Craft of Natural Dyeing*, Search Press Limited, 1995.

Dyeing to Paint

Objective:

Students will learn that dyes and paints can be derived from nature. This is a great lesson to discuss early civilizations or pioneers and their methods in dying cloth.

Method:

Students use dyes produced from natural resources to create artwork.

Materials:

Four crock pots, beets, spinach or kale, black walnuts in the shell (if none available, coffee or tea will work), dry onion skins*, fallen leaves from school grounds, paint brushes, colored pencils, pencils, paper.

*Other materials for natural dyes: Red onions (pink), Goldenrod flowers (yellow), raspberries (pink), grass (green).

Procedure:

- 1. Discuss with the students that before synthetic dyes were available, people had to make their own paints and dyes using natural resources. Show the students the vegetables and nuts and have them guess how they might be used.
- 2. Before you can paint, you'll need to let the beets, spinach or kale, walnuts, and onion skins cook in separate crock pots overnight. Add water to each pot, just barely covering the vegetables/nuts.
- 3. The following morning, the water in each pot should be a natural dye. The beet water will be magenta, the onion will be amber, the spinach or kale will be light green, and the black walnut will be brown.
- 4. Pour a small amount of paint into bowls and ask the students to smell them. Discuss which vegetable made which paint.
- 5. Have the students pick an assortment of leaves. Draw a collage of leaves onto the paper with pencil, using light lines. Include details in the leaf and discuss which trees the leaves came from.
- 6. Paint the leaves using the natural dyes.
- 7. After the dyes have dried, add color to the leaves and accent detail using colored pencils.

Evaluation:

Compare the natural dyes to markers and other paints commonly used. How are they different? What are some other natural resources that might produce dyes? Middle School

BRANCH OUT!

Environmental Art





Grade Level:

Elementary and Middle School

Subject: Visual Art

Duration: Two 50-minute sessions

Group Size: 25 students to 1 adult

Setting: Indoors and outdoors

Vocabulary:

Warp, weft

Resources/Citations:

Lesson adapted from Karen E. Bledsoe and Candyce Norvell, "Dream Weaver," *365 Nature Crafts & Activities*, Publications International, May 2002.

Dream Weaver

Objective:

Students will learn to weave using materials from nature.

Method:

Students make a loom and create a weaving by using natural materials.

Materials:

Cardboard, scissors, string or yarn, dried grass, strips of bark from twigs, hay, pine needles, corn husks, cattails, etc., and glue.*

Procedure:

- 1. Create a loom. The cardboard should be a bit larger than the weaving you want to make.
- 2. Cut a row of slits in the top and bottom ends, making each slit a set number of inches apart.
- 3. Tie a knot in your string and slip the knot into one of the slits to anchor it. Run the string to the slit on the opposite side.
- 4. Slip the string behind the cardboard to the next slit on the same side, bring it through, then run it across the board again. Keep going until the whole piece of cardboard is strung.
- 5. Collect the items from nature on a hike.
- 6. Weave the materials over and under onto the loom.
- 7. When the weaving is complete, slip the ends of the string off the cardboard. Turn your weaving over and glue the edges to keep the weaving together.

Evaluation:

Do students' weavings represent an understanding of warp and weft? Have they used the natural materials in a unique way?

* Materials must be gathered outside of Pheasant Branch Conservancy.

Elementary School

BRANCH OUT!

Kids^{For The} Earth

Environmental Art

LESSON SIX



Grade Level:

Elementary and Middle School

Subject:

Visual Art

Duration:

Three to four 40-minute sessions

Group Size: 25 students to 1 adult

Settina:

Indoors and outdoors

Resources/Citations:

Lesson adapted from Karen E. Bledsoe and Candyce Norvell, "Speckled Plants," *365 Nature Crafts & Activities*, Publications International, May 2002.

Mosaíc Plants

Objective:

Students will learn techniques involved in traditional mosaic making while using natural resources.

Method:

Students make mosaics using natural items.

Materials:

A variety of dried beans, seeds, peas; cardboard squares, 1/student; yarn (optional), glue, sketch paper, pencils.

Procedure:

- 1. Discuss techniques used in making mosaics with tile. Cut the tile or ceramic, adhere it to a surface, fill in the spaces with grout. Show examples—pictures are great.
- 2. Have each student draw a sketch of a landscape. If it's nice weather, take them outdoors and have them pick a view from the school. If not, encourage the artists to think of a landscape that includes Middleton and Pheasant Branch Conservancy.
- 3. Draw the sketch onto the cardboard with pencil.
- 4. Begin making the mosaic. Draw a line of glue, place beans/seeds/peas into place. Make sure to use colors to differentiate the parts of the mosaic. Discuss color choice in detail before starting to mosaic.
- 5. Fill in the entire picture. Use yarn if necessary, to "draw" lines.

Evaluation:

Does the mosaic compare to the student's sketch? Did the student make good use of all available materials?

BRANCH OUT!



Glossary

- Acid: A compound that dissolves in water, contains hydrogen, can neutralize a base, and turns litmus paper red.
- Adaptation: The process of making adjustments to the environment over time. For example, a plant with unusually long roots, enabling it to absorb water over a large are, may be more likely to survive during periods of drought.
- Arthropod: An invertebrate animal that has an exoskeleton, and a segmented body with jointed, paired appendages. Examples include insects, spiders and crustaceans.
- Attributes: Qualities or characteristics that identify someone or something.
- **Balance of nature:** The fluctuations of organismal populations in any given habitat.
- **Base:** A compound that dissolves in water and yields hydroxyl ions, can neutralize an acid, and turns litmus paper blue. Also known as an alkaline compound.
- **Biological Diversity:** The variety and complexity of species present and interacting in an ecosystem and the relative abundance of each.
- **Brittle:** Likely to break, snap, or crack when subjected to pressure.
- **Camouflage:** Color, tones, patterns, shapes or behavior that enable an organism to blend in with its surroundings. Some organisms, for example, have a skin or coat color that enables them to hide from predators.
- **Capacity:** The dynamic balance between available habitat components and the number of animals that habitat can support.
- **Celsius:** The metric measurement of temperature.
- **Commerce:** Transactions that have the objective to supply commodities.

- **Consumer:** An organism that obtains energy by feeding on other organisms and their remains. Usually, consumers are classified as primary consumers (herbivores), secondary consumers (carnivores), and microconsumers (decomposers).
- **Corrosion:** A state of deterioration in metals caused by oxidation or chemical action.
- **Cryptosporidium:** Name of a microorganism that can infect animals including humans.
- **Decibel:** A unit of intensity of sound. A measurement of 50 decibels is considered moderate sound; 80, loud; and 100, the level beyond which the sound becomes intolerable. Abbreviation, dB.
- **dB**(**A**): A decibel reading taken on the A weighting scale. There are four scales total; A, B, C, and D; with A being the most common.
- **Decomposer:** A plant or organism that feeds on dead material and causes its mechanical or chemical breakdown.
- **Diversity:** Variety or complexity. See Biological Diversity.
- **Domesticated:** An animal or plant trained to live in a human environment and be of use to humans.
- **Duration of noise:** Refers to the length of time a sound continues.
- **Ecosystem:** The interacting system of a biological community and its nonliving environment; also, the place where these interactions occur.
- **Environment:** All of the external factors, conditions, and influences that affect an organism or a biological community.
- **Exoskeleton:** An external skeleton which is periodically shed and replaces to allow for growth and development.

- Fluoride: A binary compound of fluorine (one of the chemical elements) along with another element.
- Frequency of noise: Is a physical measurement of sound in Hertz (cycles per second). It is perceived as pitch.
- **Glacial scraping:** The process by which glaciers create a variety of patterns on landforms when they move.
- Glacier: Massive sheet of moving ice. Melting glaciers shaped the valley of Pheasant Branch Conservancy 13,000 years ago.
- **Glacial erratics:** Soil and rock left behind a glacier.
- **Glacial till:** Materials such as rocks and dirt deposited by the melting of a glacier.
- gpm: gallons per minute
- Groundwater: Water that infiltrates into the soil and is stored in slowly flowing and slowly renewed underground reservoirs called aquifers.
- Habitat: An area that provides an animal or plant with adequate food, water, shelter, and living space in a suitable arrangement.
- **Hypothesis:** A potential explanation for a condition or set of facts that can be tested through further investigation.
- **Indicator species:** A population of organisms composed of related individuals that point to conditions of the ecosystem they inhabit.
- **Intensity of noise:** Is the physical measurement of sound in decibels. It is perceived as loudness.
- **Invertebrate:** An organism that lacks a backbone or spinal column.
- Limiting factors: Components of a habitat that are essential for animals to survive in that habitat. They are: food, water, shelter, and a space in a suitable arrangement.

Litmus paper: Special paper for determining the pH of a solution.

Nephelometer: An apparatus used to measure the size and concentration of particles in a liquid by analysis of light scattered by the liquid.

Neutral: Of a solution or compound that is neither acidic nor basic.

Ordinance: A statute or regulation, especially one enacted by a city government.

Permeable: Anything that allows liquids or gases to flow through it.

pH: The measure of acidity or alkalinity of a solution. The common range is from 0 (acid) to 14 (base). pH stands for potential for hydrogen.

Physical weathering: Process by which rocks exposed to the weather undergo changes in character and rack down.

Plastic: Capable of being shaped or formed.

Pollinator: An organism that transfers pollen from the male part of a plant (anther) to the female portion of a plant (stigma). Common pollinators are bees and beetles.

Pollution: Harmful substances that are deposited in the air, water, or land, leading to a state of dirtiness, impurity, or unhealthiness.

Predator: An animal that hunts or captures other animals for food.

Prey: An animal taken by a predator as food.

Pumpage: The act or state of transferring liquids.

Quadrant: One fourth of a circumference of a circle.

Reservoir: A natural or artificial pond or lake used for storage and regulation of water.

Secchi disk: Is used to measure how deep a person can see into a body of water. It is a circular disk usually painted in alternate quadrants of black and white. It is lowered into the water until the person cannot see it anymore, measure the distance down by the length of rope used.

Stress: To subject something to mechanical pressure or force.

Turbidity: The amount of sediment or foreign particles stirred up or suspended in water.

Vegetation: The mass of plants that covers a given area.

Volcano: An opening in the earth's crust through which molten lava, ash, and gases are ejected.

Warp: To arrange (strands of yarn or thread) so that they run lengthwise in weaving.

Weft: The horizontal threads interlaced through the warp in a woven fabric, also called woof.

Wild: Not tamed or domesticated, living in a basically free condition in that it provides for it's own food, shelter, and other needs in an environment that serves as a suitable habitat.

Wildlife: Animals that are not tamed or domesticated and includes insects, spiders, birds, reptiles, fish, amphibians, and mammals.



Appendix

Project WILD Activities Suitable for Use at Pheasant Branch Conservancy

Compiled by Dreux J. Watermolen, Chief, Science Information Services, Wisconsin Department of Natural Resources, Madison.

Project WILD is an interdisciplinary, supplementary environmental and conservation education program for educators of kindergarten through high school age young people. Project WILD is a joint project of the Western Association of Fish and Wildlife Agencies and the Western Regional Environmental Education Council, Inc., both of which are founding sponsors. Other organizations and agencies, including the Wisconsin Department of Natural Resources, provide additional sponsorship for the program. Since its inception in 1983, over 500,000 educators have been trained to use Project WILD to supplement their existing curricula and meet adopted educational standards.

Listed below are activities from the Project WILD and Aquatic Project WILD activity guides that are well suited or easily adapted for use with school classes or other groups visiting the Pheasant Branch Conservancy. Activities are listed by thematic order, corresponding with Project WILD's conceptual framework, leading learners from awareness and appreciation to responsible human actions.

Project WILD AWARENESS AND **APPRECIATION** Ants on a Twig Grasshopper Gravity Habitracks Habitrekking Learning to Look, Looking to See Litter We Know Microtrek Treasure Hunt My Kingdom for a Shelter Spider Web Geometry Tracks!

ECOLOGICAL PRINCIPLES

How Many Bears Can Live in This Forest? Muskox Maneuvers Oh Deer! Quick Frozen Critters Thicket Game Urban Nature Search

MANAGEMENT AND CONSERVATION Bird Song Survey Fire Ecologies

TRENDS, ISSUES AND CONSEQUENCES Deadly Links

DIVERSITY AND WILDLIFE VALUES

Animal Poetry Drawing on Nature Environmental Barometer Let's Go Fly a Kite Seed Need Wild Edible Plants Wild Words: A Journal-Making Activity

Keeping Score Shrinking Habitat

RESPONSIBLE HUMAN ACTIONS Can Do! Playing Lightly on the Earth

Aquatic Project WILD AWARENESS AND APPRECIATION Puddle Wonders Water Plant Art

DIVERSITY OF VALUES Water Canaries

ECOLOGICAL PRINCIPLES

Blue Ribbon Niche Edge of Home Hooks and Ladders Marsh Munchers Micro Odyssey Wetland Metaphors

MANAGEMENT AND CONSERVATION Migration headaches Net Gain, Net Effect

TRENDS, ISSUES AND CONSEQUENCES Glass Menagerie

RESPONSIBLE HUMAN ACTIONS Turtle Hurdles

References for the Identification and Study of Wisconsin Animal Life

Compiled by Dreux J. Watermolen, Chief, Science Information Services, Wisconsin Department of Natural Resources, Madison.

Listed below are field guides and other references that can be used in the identification and study of the animals you might encounter while visiting Pheasant Branch Conservancy. Some are suitable for use with middle and high school classes; others are more technical.

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