



WISCONSIN'S

MILLENNIUM TREE

Wisconsin Forests Are Forever And For Everyone

Sustainable Forestry Activities For Elementary School Students

Created and Produced by
USDA Forest Service, North Central Research Station
USDA Forest Service, Northeastern Area State & Private Forestry
USDA Forest Service, Office of Conservation Education
Wisconsin Department of Natural Resources, Bureau of Forestry
Wisconsin Department of Public Instruction

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Wisconsin Forest Resource Education Alliance

For more information, visit the following:

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Conservation Education
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201 14th St., SW
Washington, DC 20090-6090
www.fs.fed.us/outdoors/nrce/welcome.htm

Order supporting curriculum materials through:

Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707

Branch Out and Get Wild...Get Involved

PUBL FR-101-95

Exploring Wisconsin's Project Learning Tree and Project WILD
Project Learning Tree - Project WILD

Publication#: IE-402-94

Forest Trees of Wisconsin, How to Know Them

PUBL-FR-053 90REV

A Look At Wisconsin's Forests

PUB-FR-122 REV 98

Sustaining Our Forest Resource, What is Your Role?

PUB-FR-117 97

Questions and Answers About Wisconsin Forests

Wisconsin Department of Natural Resources
Trees For Tomorrow, Inc.
Eagle River, WI

A Chronology of "Firsts" in Wisconsin Forest History

Education Leaflet #1 (Revised Edition 1996)
Forest History Association of Wisconsin, Inc.
403 McIndoe Street
Wausau, WI 54403



WISCONSIN'S
MILLENNIUM TREE

Dear Fourth Grade Educator:

Enclosed are a variety of activities and resource materials to help you introduce your fourth grade students to the forest resources in Wisconsin. We invite you to use all of the activities (either during a short-term unit or spread over the course of the school year) or select individual activities that fit into your curriculum. No matter how you decide to use these materials, we hope they help your students recognize that our state is blessed with an abundance of trees and water. Through conservation—the wise use of the resources—these valuable natural resources can meet our needs today as well as those of future generations. Whether you live in Wisconsin's northwoods or in an urban center of Wisconsin, trees play a critical role in your students' everyday lives. These activities can help students understand that link between their lives and the rural and urban forest resources of Wisconsin.

Wisconsin has a rich forest resource that is important for many different reasons. Our forests are critical in helping to maintain our clean water and air and the high quality of life we enjoy in Wisconsin. Forests provide a wide range of recreational opportunities. Many creatures large and small depend on the forest for food and habitat. Wisconsin residents and visitors alike appreciate Wisconsin's forests for their natural beauty. The forests in Wisconsin also are a crucial component of the state's economy—both as a tourist destination and for the jobs that are directly and indirectly dependent on the forest industry. Wisconsin forests provide the raw material for the many wood products we depend on in our daily lives today. And the forests of Wisconsin have been an economic mainstay of the region since statehood. Through the activities included in this packet, your students can learn to appreciate Wisconsin's diverse forest resource for all of these values - and many more.

Your students can learn about what kinds of trees grow in Wisconsin's 16 million acres of forests, how students can be involved in caring for the forest, and what issues surround the management of this vital resource today. Concerns about urban sprawl, impacts of management practices on the forest's biological diversity, meeting the needs of an increasing population with a decreasing base of forest land available for harvest—these are just a few of the challenges for today's leaders and natural resource professionals. Because of the wide variety of demands placed on our forests today, conflict over their use and management is inevitable. Thus, it is critical that students learn about the resource so they can become informed decisionmakers in the management of the resource.

The way our society views the forest resource has changed dramatically over the years. At the time of statehood, the forests of Wisconsin seemed endless. Early settlers viewed the land and the resources on it as inexhaustible. Trees were cut to clear the land for agriculture, and the great white pines from the Wisconsin northwoods were used to build the cities of the Midwest. In 1899 and 1900, Wisconsin led the world in lumber production. Initially the bountiful forest seemed adequate to satisfy all the demands placed on it; however, by the late 19th century, some people began to realize that the resources had limits and that conservation was necessary to provide for current needs and, even more importantly, for future generations.

Wisconsin's map of presettlement vegetation shows forests stretching from Lake Superior to Illinois and from Lake Michigan to the Mississippi and St. Croix Rivers. The fifth inventory of Wisconsin's forests, completed in 1996, also revealed a wealth of forest land in our state. But what happened between those times is the story of how sustainable forestry evolved in Wisconsin.

So what is sustainable forestry? In 1996, a diverse group of people reached consensus on the following definition, which is now in the state statutes as part of the language guiding the management of the state forests in Wisconsin:

“Sustainable forestry is the practice of managing dynamic forest ecosystems to provide ecological, economic, social and cultural benefits for present and future generations.”

Today, 46 percent of Wisconsin is forested and our forests have recovered remarkably, thanks to the planning of the legislature, foresight of leaders, and hard work of hundreds of unsung heroes who extinguished the fires raging across Wisconsin, replanted the forests, and nurtured them into the beautiful resource we enjoy today. Forests in Wisconsin are once again rich in opportunities for recreation, watershed protection, wildlife habitat, biological diversity, and wood products.

Have fun with your students as you learn about Wisconsin's valuable forests and explore the components of sustainable forestry using these activities.

“Wisconsin's forests are forever and for everyone.”

Of particular importance to Educators:

It should be noted in each activity that the Wisconsin Model Academic Standards are “addressed.” Throughout this document, the term addressed means that there is a clear connection between the activity and the standard or standards. It does not imply that the standard or standards are met by completing the activity. It is up to you as the educator to meet the standards, by drawing that clear link between the essential knowledge the student understands by doing the activity and the evidence you need to show that the student understands the essential knowledge.

To obtain copies of the details about the standards addressed, you can use the Department of Public Instruction’s website (www.DPI.state.wi.us) and then download the standards. A CD-ROM version of the standards is also available at the Department, containing all the standards for each content area.

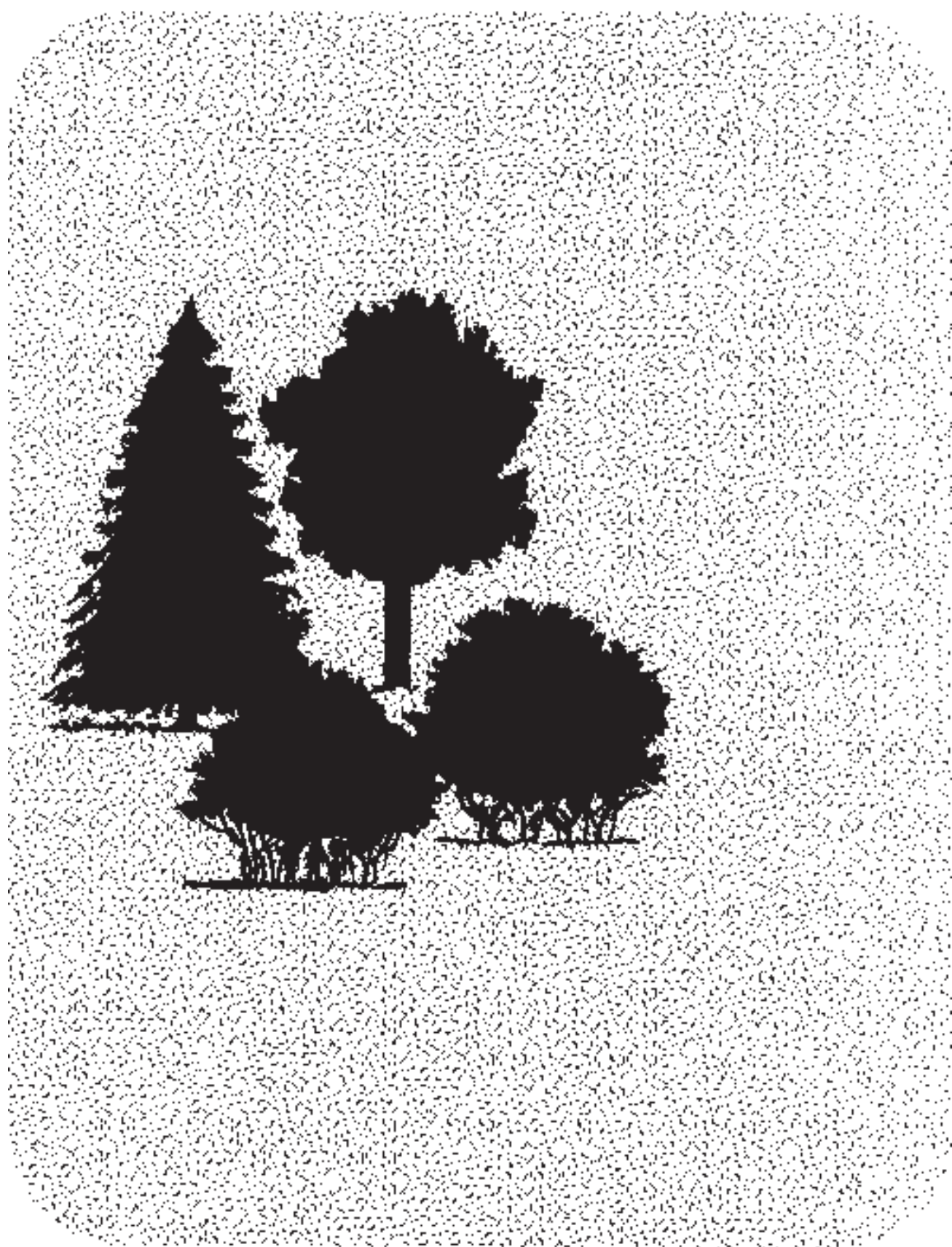
You will find the guide divided into three sections:

1. The Changing Forests
2. The Many Benefits of Trees and Forests
3. Sustaining the Forest for Present and Future Generations

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The Changing Forests



The Changing Forest

Humans have a long history of manipulating the forest. Native Americans regularly burned the forest to improve hunting, and early settlers cleared forests to make way for farm fields. Wisconsin's forests were used to build the cities of the Midwest at the turn of the century as the state's forest lands were cut and burned. Through the foresight of many natural resource professionals, lawmakers, and citizens, Wisconsin's forests are once again abundant, covering 46 percent (16 million acres) of the state today.

Throughout the century, education and research have been critical components of our understanding forest ecosystems. The profession of forestry in the U.S. celebrates its 100th anniversary in 2000. As foresters learn more about how the forest ecosystem operates, how to better use forest products, how the social demands on the forest interact, and the thousands of other areas of forestry research, they apply their new knowledge to the forests. The art and science of forest management are constantly changing along with the resource itself.

Although your students may think that a forest looks the same each time they visit it, forests are constantly changing. Some are microscopic changes on the forest floor, others are dramatic changes at the landscape level. Some changes are created by nature (insects and diseases, for example), others by humans (harvesting, planting, and introduction of exotics). Some are fast (windstorms and forest fires), while others happen more slowly (succession of forest from one type to another).

Activities in this section that help convey the concept of systemic change to your students include:

“A Tree-rif-ic Math Activity”

“Local Tree Identification Guide”

“School Grounds Timeline”

“Visiting My Schoolyard Tree”

“Forest Field Notes”

“Tree Rings”

“Watch Out for Exotic and Invasive Species in Wisconsin's Forests”

“Forest Community”

“Pollination”

“Energy in the Ecosystem”

“A Tree-rif-ic Math Activity”

Standards Addressed

Environmental Education Standard:

A. Questioning and Analysis: A.4.2.

Science Education Standards:

A. Science Connections: A.4.2, A.4.3, and A.4.4.

Key Concepts/Content

- 🌲 To increase student understanding of systems in nature.
- 🌲 To increase student awareness of change in systems.
- 🌲 To understand that plants/trees are both alike and different.
- 🌲 To apply student mathematics skills using data to real-life situations.

Teacher Background

On Veteran’s Day, November 11, 1999, our nation’s tree, “The Millennium Tree,” will be cut in northern Wisconsin and then travel to Washington, DC, to be a part of the nation’s holiday celebration. This activity is designed to be a comparative study of a classroom tree to the Millennium Tree. To find out more details about the Millennium Tree, go to the tree website listed in the references at the end of the activity.

Getting Ready

Read a news release about our state’s Millennium Tree to students. Discuss how this is an honor for all Wisconsin. Ask students to think about what criteria they’ve used when obtaining an indoor or outdoor tree for their home. Then ask students to think about how their list of criteria might be similar to that used when selecting the Millennium Tree. You will want to have an indoor classroom tree or an outside tree for this activity.

Materials Needed

- ✦ Make copies of journal pages (see Appendix)
NOTE: Throughout this curriculum, many activities will involve entries into a student journal.
- ✦ Classroom tree or an outside tree (pine tree might be easiest for this activity)
- ✦ Tape measures
- ✦ Access to the Internet
- ✦ *Wisconsin Forest Statistics*
- ✦ News Release

Procedures

1. Determine the approximate age of your classroom tree, by counting the rings from the center of the tree to the outside edge. If a pine tree, count the branches up the tree for a guess at the tree's age. Have the students guess or estimate the tree's age. (Details for finding the approximate age of a tree are found on the Millennium Tree website, listed in the reference part of the activity.) Find out how old the "Millennium Tree" is; the data on the tree are found on the website. What is the age difference between the class tree and the Millennium Tree?
2. Measure the distance between the internodes (branch whorls) (definition found on the website) to determine the classroom tree's average annual height growth.
3. Cut a clean cross section near the base of the tree. Measure the tree's lateral (diameter) growth. Divide the diameter by the number of rings. Using the Millennium Tree website, see if you can find out how your tree's annual lateral growth compares to that of the Millennium Tree.
4. Calculate the height of the classroom tree (see pages 31-33). How many times taller is the Millennium Tree? (Note: The Millennium Tree is 70 feet tall.)
5. The Millennium Tree is a white spruce tree. What type of tree is the classroom tree? If your tree is not a white spruce, answer the following questions: How are the two tree types similar? How are the two tree types different? See booklet *Forest Trees of Wisconsin*.

6. Estimate the circumference of your classroom tree in inches or centimeters. Then measure the circumference of the tree using a sewing tape or piece of string. Compare the circumference of your tree to that of the Millennium Tree.
7. Create additional math problems about the classroom tree and/or the Millennium Tree. Or ask students to develop other math problems.
8. Extension Ideas: Math Quiz Activity Sheet.

Evidence of Student Understanding

Create a Venn Diagram (a venn diagram is a diagram that shows relationships of one object to another and is typically used in math relationships) on your journal page, showing the similarities and differences between the classroom tree and the Millennium Tree.

References/ Resources

 <http://www.millenniumtree.org>

 *Wisconsin Forest Statistics*

<http://www.dnr.state.wi.us/org/land/forestry/Look/highlights1996.htm>

or

<http://www.srsfia.usfs.msstate.edu/ewdata/ewrec.htm>

 A pamphlet, *A Look at Wisconsin's Forests*

Published by the Wisconsin Department of Natural Resources, Bureau of Forestry, Box 7921, Madison, WI 53707.



The Millennium Tree
Wisconsin's Gift to the Nation



A Tree-rif-ic Math Activity

Millennium Tree News Release—Just For Kids

On November 11, Veterans Day, the Millennium Tree will be cut near Rhinelander, Wisconsin. The North Central Research Station is proud to provide the tree for our Nation's Capitol. This is the first Millennium Tree ever in America! It is also the first tree to ever be chosen from Forest Service Research, by the Landscape Architect of the Capitol – Matthew Evans. The tree was selected for its deep green color, fullness, and shape.

The tree is a white spruce (*Abies glauca*) and stands 70 feet tall — the tallest national tree ever! To prevent damage to the tree, a crane will hold it upright and gently place it in a cradle for wrapping. It takes two days to wrap the tree and prepare it for travel because it is wider than a two-lane road. If the temperature is below freezing, the tree will be moved inside to a warm place so the branches can be bent for wrapping.

Once the wrappers have finished, the tree will be placed on a special truck with a watering system to keep the tree from drying out. The truck also has special sideboards where the people of Wisconsin can sign their names and seasons greetings to the people of America. The Millennium Tree will stop in many towns and cities in Wisconsin until it reaches Milwaukee on Saturday, November 27.

Governor and Mrs. Thompson will send the tree to Washington, DC on a special Amtrak train. It will take two days to arrive in Washington where it will formally be given to the Speaker of the House, Dennis Hastert from all of the people of Wisconsin.

The tree will stand on the west slope of the Capitol overlooking the Washington Mall and Monument. Over 10,000 lights and 5,000 hand crafted ornaments made by the citizens of Wisconsin will adorn the tree. Then on Tuesday, December 7 at about 6:30 Wisconsin time, the tree will be lit as a shining beacon of hope for the new Millennium — “Wisconsin's Gift to the Nation”.



A Fun Math Test About Wisconsin's Forests

Guess first and then look up the answers on the Millennium Tree web page — <http://www.millenniumtree.org>

1. What percent of the land in Wisconsin is forested?

- a. 13%
- b. 71%
- c. 46%
- d. 25%

2. Who owns Wisconsin's Forest?

Match the correct percentage with each group.

Choose from a.) 57% b.) 5% c.) 15% d.) 9% e.) 11%

State Forests

County and Municipal Forests

National Forests

Forest Industry and Corporations

Private Individuals (Farmers, landowners etc.)

3. The first forest inventory of Wisconsin was in 1936 and the most recent in 1996.

Does Wisconsin have less forest land in 1996 than in 1936?

Yes or

No

4. The oldest trees in Wisconsin, on average, outside of parks and protected refuges, are about how old?

- a. 300 years
- b. 125 years
- c. 50 years

Local Tree Identification Guide

Standards Addressed

Environmental Education Standards:

A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.

B. Knowledge of Environmental Processes and Systems: B.4.4 and B.4.6.

Key Concepts/Content

🌲 To build students' background knowledge of the different types of trees that grow in their local environment.

🌲 To gain a basic understanding of how to classify trees based upon their leaf characteristics.

Teacher Background

A wealth of information about native trees for Wisconsin exists on the Department of Natural Resources website and in libraries or at your local arboretum. Before taking the students on a leaf-collecting trip, locate and identify several trees near the school or field trip area that are examples of typical Wisconsin trees. The very beginning of the school year would be the best time to undertake this project to ensure the availability of leaves to collect.

Getting Ready

Walk around outside to determine the types of tree leaves your students might collect. Obtain all the materials for the activity.

Safety Issues



You will need to obtain permission for the field trip and follow all district guidelines.

Materials Needed

- ✦ Trees to take samples from (it is suggested that for trees on private property, permission be obtained from the owner before samples of leaves are taken)
- ✦ Folders or large plastic bags to hold leaves
- ✦ *Forest Trees of Wisconsin*, poster and booklet (see references at the end of the activity)
- ✦ Supplies for constructing the final product

Procedures

1. Individually, in small groups, or even as a whole-class group, students should brainstorm the names of trees that they think are found in their local area. After these lists have been completed, the trees can be investigated using tree identification guides for Wisconsin to determine if they belong on the list.
2. After checking the trees on their lists against the tree identification guides, students should be encouraged to look through the guides to find any other trees they recognize and could add to their lists.
3. A field trip is then taken for the collection of leaf samples. The trip could be a walking tour around the school grounds or perhaps a nearby park. The students could be taken to the school forest or other natural area to collect samples.
4. Once the leaves are collected, and the students are back in the classroom, have the students sort the leaves, using their own sorting or classifying methods.
5. Then have the students use the tree identification guides to compare their sorting/classification systems with those used in the guides. An activity sheet is included that could be used by the students to help in the classification of their samples. Have the students reclassify the leaves according to the system listed in the reference guide *Forest Trees of Wisconsin, How To Know Them*.

6. Optional leaf collection activities:

- Books can be created containing all of the information gathered about the local tree populations. These publications can be presented to other classes, perhaps younger grades studying similar topics.
- Arranging similar leaves in a radial pattern can make leaf kaleidoscopes (see activity sheet). This pattern can then be moved onto the sticky side of one piece of clear contact paper. A second piece of clear contact paper can then be placed on top of the first piece, sandwiching the leaves inside the contact paper. The contact paper can then be trimmed around the contours of the leaf kaleidoscope. The kaleidoscopes look best when hung in direct sunlight.

Helpful Hint

Why Do Leaves Change Color In Autumn?

Trees such as oaks and maples change color in the fall. Cool fall temperatures and less daylight result in a tree producing less green pigment called chlorophyll. The other pigments in the leaf become more prominent: yellow (xanthophyll), orange (carotene), and red (anthocyanin). The brown pigment (tanin) remains after all other pigments have disappeared. The brilliance of the color depends on the amount of sugar stored in the leaf and the amount of autumn sunlight it receives. On average, a healthy mature tree will shed 200,000 leaves each year.

Evidence of Student Understanding

Develop a rubric that assesses student knowledge of sorting and classification, as well as understanding of the term classification and how leaf shapes are used to classify trees. You can develop this rubric with or without the students' participation. You can also conduct individual conferences where the students explain to you what they have learned from this activity. The students may also want to conduct conferences with each other discussing the essential knowledge they gained from doing the activity.

References/ Resources

- 📖 *Forest Trees Of Wisconsin How to Know Them*, DNR, Madison, Wisconsin, Bureau of Forestry, 1990. <http://www.dnr.state.wi.us/org/land/forestry/treeid/index.htm>

- 📖 *Urban Forestry Laboratory Exercises*, USDA Forest Service North Central Research Station, 1992 Folwell Avenue, St. Paul, MN 55108, and the USDA Forest Service National Resource Conservation and Education Program.

- 📖 Sohi, Morteza E., *Look What I Did With A Leaf!*, Walker and Company, New York, 1993.

- 📖 Gile, John, *The First Forest*, Worzalla, Stevens Point, WI, 1989.

- 📖 <http://www.millenniumtree.org>

Activity ASheet

Local Tree Identification Guide

Name: _____ Date: _____

Common Name: _____ Scientific Name: _____



CHECK OFF THE IDENTIFIED CHARACTERISTICS:

- Is it?...
- Evergreen (the leaves stay on for more than one season)
 - Deciduous (the leaves fall off at the end of a season and regrow in the spring)

EVERGREEN: Number of needles in a bundle _____
 Length of needles _____
 Needles look scalelike

Description of Cones: _____

Color of Needles: _____

- Needles are grouped (2-5) with a wrapping (sheath) at the base = bundles 
- Needles are in a cluster right at the branch with no wrapping = clustered 

Leaf Types and Arrangement:

Simple



Opposite



Alternate



Compound



Palmate



Pinnate




Leaf Margins:

Entire 

Lobed 


Number of Lobes _____

Serrated 

Wavy 

Leaf Venations:

Palmate 

Pinnate 

Parallel 

Activity ASheet

Local Tree Identification Guide continued

Some other common leaf shapes:

Acicular



Ovate



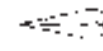
Deltoid



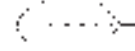
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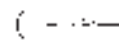
Lanceolate



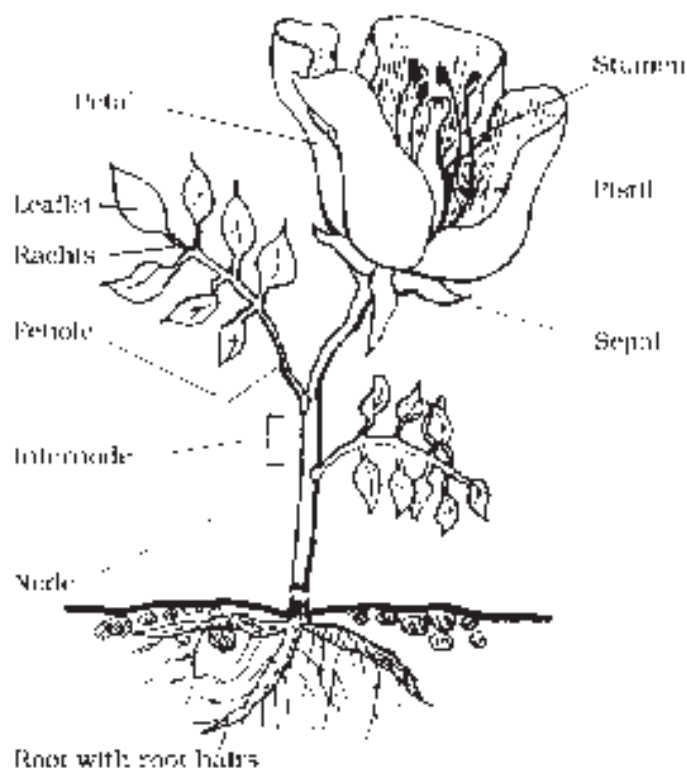
Obovate



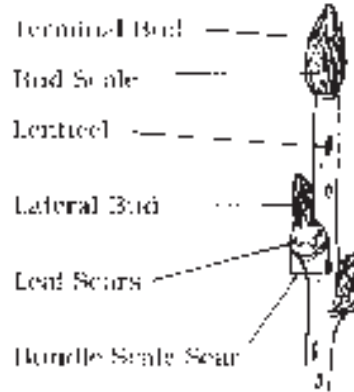
Spatulate



Inflorescence (flower) and plant parts



Buds are fun to look at
in the winter.



Conifer Seed Pod



Some other root types:

Rhizome (cattails)



Bulb (lilies)



Tuber (potato)



Fruit and Seed Types:

Pome (apple)

Drupe (cherry)

Nut (acorn)

Cone with seeds (conifers)

Capsule (cottonwood)

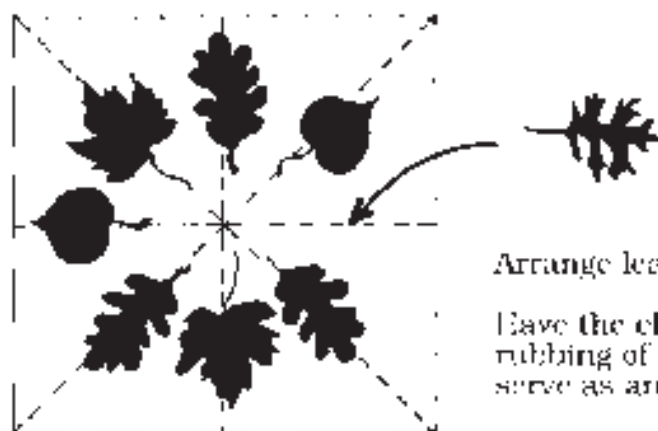
Legume (black locust)

Compound fruits with small drupelets (raspberry)

Activity Sheet

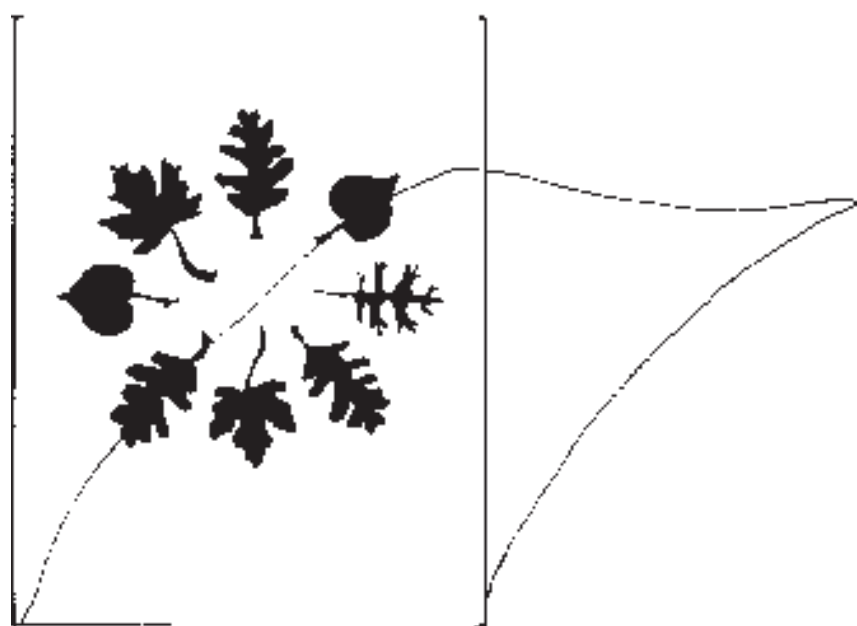
Leaf Kaleidoscopes

You can make pressed leaves fast by tracing fall or partially dried leaves.



Arrange leaves in a radial pattern.

Have the children make a quick pencil rubbing of the arrangement. This will serve as an positioning guide.



Slip the rubbing drawing under the sticky contact paper. Place the leaves in position and put the second piece on top, sandwiching the leaves inside.

Trim around the contours to create the leaf kaleidoscope. Add string and hang in a bright sunny window.



School Grounds Timeline

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.5.
- C. Environmental Issue Investigation Skills: C.4.2.

Key Concepts/Content

✳ To understand the larger picture of the changes that occur in an ecosystem over time.

Teacher Background

Before beginning this program, you will need to research the past ecological history of the school grounds or area to be shown in the timeline. Students may be able to help with this by interviewing individuals familiar with the general school area. Information should also be gathered on people in Wisconsin history who have had an impact on the treatment of the land.

As your class works on this project, a glimpse back in time can be found at your local library or historical society. Many southern Wisconsin forests were cleared for agriculture by the late 1800's. Forests in the north were heavily cut for timber to build cities, towns, and railroads by the early 1900's. During the Depression, thousands of acres of pines were planted by the Civilian Conservation Corps to replenish cut over lands. Today, Wisconsin has more forested land than anytime since 1936 when the first forest inventories were completed by scientists.

The Conservation Movement in this country is only 150 years old. It began with Thoreau and Marsh. The first school of forestry was the Biltmore School in North Carolina in 1898. The profession of forestry celebrates its 100th birthday in 1999. A great Wisconsin conservationist, Aldo Leopold, wrote *A Sand County Almanac*, just 50 years ago.

Today, we know a lot about forests and ecosystems and there is so much more to learn.

Please take a look at the Library of Congress for maps, photographs, and drawings about Wisconsin. The website is: <http://lcweb2.loc.gov/ammem/collections/finder.html>

Then select: List All Collections.

Of particular interest are:

- The Evolution of the Conservation Movement, 1850-1920
- Touring Turn of the Century America: Photographs from the Detroit Publishing Company, 1880-1920
- American Environmental Photographs, 1891-1936: Images from the University of Chicago Library
- Panoramic Maps (search for Wisconsin – your town may be listed)
- Also look at maps of presettlement vegetation and current land cover in Wisconsin at the DNR website: http://www.dnr.state.wi.us/org/at/et/go/map_gal/landcov/index.htm

Getting Ready

In small groups, have the students draw pictures of how they think their school grounds looked during recorded history.

Materials Needed

- ✦ Shoe boxes, paper, and other construction tools (depending upon presentation format selected)
- ✦ Guide to the Forestry Hall of Fame (see following pages)
- ✦ *Chronology of Firsts* pamphlet of Wisconsin forestry history (included with this packet)
- ✦ Photocopy of photos of the school grounds from the past or present

Procedures

1. Students should brainstorm about how they think their school grounds/forest looked in the recent as well as distant past (see Getting Ready).

2. As a class, develop a timeline showing the changes that most likely have occurred in the school grounds/forest over time.
3. Divide the class into groups and assign each group a time period for which to create a representation of the school grounds/forest.
4. The representations could be created as dioramas in shoeboxes, drawings on large sheets of paper, or individual slides in a computer slide show, or any other format you select.
5. When all of the representations are done, set them up so they can be viewed in order from earliest to current time. You might want to display your timeline in a hallway or display area in your school.
6. Ask each group to write a paragraph explaining what is found in its representation.
7. One group might even create a representation showing what the school grounds will look like in the future.
8. Other information could be included about Wisconsin history. Some examples are:
 - Important dates in Wisconsin and American history
 - Important dates in local history
 - Important dates in the school's or school district's history
 - Important dates of influential forestry or other resource individuals from Wisconsin

**Evidence of
Student
Understanding**

Develop a grading rubric that includes both the content learned as a result of this activity and the presentations given by the students. Use the rubric in a project post-conference to determine the final evaluation of the project. Some of the requirements for this project might be accuracy of the scenes depicted, neatness of work, and content of descriptions. Include an assessment of how students understand changes over time. This can be done through oral

class discussions, formal interviews, or by students discussing the concept with each other.

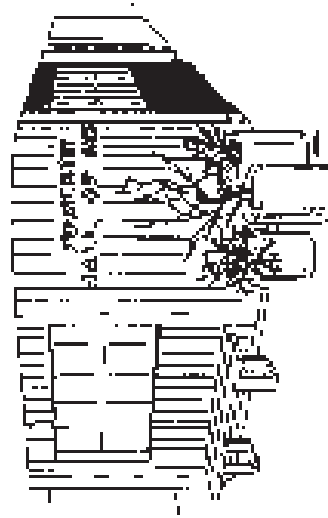
**References/
Resources**

- 📖 *Guide to the Forestry Hall of Fame* (see following pages).
- 📖 *Chronology of Firsts*, Wisconsin Forest History Association (included in this packet).

LW - STEVENS POINT



**Wisconsin Forestry
Hall of Fame**



To give special recognition to individuals, living or deceased, who have made significant contributions to the field of forestry in Wisconsin

1985
William H. Brewer - developed the state-wide nursery program that produced 500 million tree seedlings in support of the state reforestation program

Walter Mitchell - director of state 4-H forestry and conservation activities for 40 years. Best known as "Ranger Mac"

1986
John W. Kuswa - researcher in forest practices active in cooperative education and service on the Menominee Indian Study Committee

1997
Frank W. Plummer - industrial forester for the Menominee Paper Mill; active in the forest history of Wisconsin; served on boards, councils and committees

1998
George W. Blanchard - State legislator representing Rock County from 1942-52, who introduced a bill to reserve state timber lands by donation of the 19th century

1999
Frederic W. Bunn - excellent public administrator; key figure in the development of the Wisconsin Woodland Owners' Act and other forestry legislation; served on boards and committees

John Lawpelt - a natural resource manager for over 40 years and various shaped conservation activities that have influenced forestry and wildlife management in the Wisconsin landscape

For further information on the Forestry Hall of Fame, contact: Wisconsin Forestry Hall of Fame, 1809 Wisconsin Avenue, Suite 100, Stevens Point, WI 54481

**MEMBERS OF WISCONSIN
FORESTRY HALL OF FAME
COMMITTEE**

- Wisconsin Forestry Association
- Wisconsin Tree Farm Corporation
- Wisconsin Logging Timber Producers
- Wisconsin Society of American Foresters
- USF Director of Forestry
- Wisconsin's State Forest Association
- University of Wisconsin - Madison
- US Forest Service
- Wisconsin Woodland Owners Association
- University of Wisconsin - Stevens Point

HALL OF FAME INDUCTEES

The Wisconsin Forestry Hall of Fame was founded by a group of public and private forestry organizations to recognize individuals who have contributed significantly to the profession and progress of forestry in Wisconsin.

The Wisconsin Society of American Foresters is the sustaining agency of the organization.

Persons may be nominated for induction into the Hall of Fame by member organizations or representatives of member organizations or individuals through a member organization. Nominations may be professionals or non-professionals in the field of forestry or related fields, living or deceased, resident or nonresident. Eligibility is determined by the person's or establishment's contributions in Wisconsin that have influenced forestry progress in the state.

Nominations applications are reviewed by the Hall of Fame Committee each May. Successful nominees are usually inducted at a statewide meeting of a member organization from after

The Hall of Fame exhibit displaying plaques of all inductees is housed in the College of Natural Resources building on the University of Wisconsin-Stevens Point campus and is open to the public for viewing free of charge during school hours.

Raymond Zorn - theoretical forest research in member service forests - served with political and social leaders

1989

John A. Beale - professional forester and administrator who developed a state forest plan

Paul W. Thayer - first regional forester - L.S. Forest Service - was first in state and national security and use.

1990

Miss Jolke Heiser - a leader in the 1930's in results leading for forestry and enactment of the forest crop law.

George Carstigan - devoted laureate to improving the lot of the lumberjack and the cause of forests and conservation

1991

Ernest Brinkner - a private forest land owner who had a hands on approach to forestry and sound and use

1992

Corneilus L. Harrington - developed early forest policy dealing with recreation - his legacy lies in the state's forests and parks

William A. Sweeney - taught forestry students workshops for agriculture teachers and a professional forester for 40 years

1993

H. James Harding - director of the Wisconsin Department of Natural Resources - his research in the field of Wisconsin Forests

1994

John H. Sorenson - manager, The Manning family owned logging operation - pioneering professional forestry field program

Stanley W. Wasko - a public forester for 40 years - he was an advocate of the county level forestry careers program

1994

1984-1999

R.B. Conditon - leadership in forest reforestation and industrial forestry.

R.M. Griffith - insurance forester, secured northern lands for forest reserves and reforestation

R.L. Wilson - elected legislation for forestry, forests Conservation Act and first DNR Forestry Forester

1995

Calvin D. Stud - father of continuous forest inventory in Wisconsin - began forest inventories

M.A. Lamber - co-founder of TRAILS FOR TOMORROW and an advocate for conservative education.

Frederic B. Treub - Transition forester, promoter of school forests and a crusader in conservation programming.

1996

Conrad R. Connor - active in timber and logging associations and a pioneer in the management of hardwoods

George Barnhart - established the first distilling company from a saw industrial and private owners

Marion W. Meade - pioneer in the paper industry, and in sound forest management via University of Paper's book

1997

D.C. Everett - recognized for his contributions to forestry from 1925 - 55. Chaired 1987 state forestry conference.

Harriet B. Hurd - first industrial forester, advocate of forest research and 25 year president of Forest for Tomorrow

Samuel A. White - pioneer in forest research and leader in forest nurseries and plantation management

1998

F. George Kilgus - a national forestry journal in Forestation Program and a consultant in forest planning

Neil H. LeMay - Chief Forester, Wisconsin Dept of Natural Resources - highlighting techniques, equipment and techniques

Visiting My Schoolyard Tree

Standards Addressed

Environmental Education Standards:

- A. Questions and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.4 and B.4.5.
- C. Environmental Issue Investigation Skills: C.4.1.

Key Concepts/Content

- 🌲 To increase the students' awareness of the role of trees in the landscape.
- 🌲 To identify the tree on or near school grounds.
- 🌲 To describe the tree using the senses.
- 🌲 To observe a single tree during various seasons.
- 🌲 To understand changes that occur over time.

Teacher Background

Mapping the school grounds and including the identification of trees on or near the school property will be a starting point for appreciating the trees in the landscape. Observations of a single tree will be the basis for expanding the view to the importance of forests. Become familiar with the area around the school before doing this activity. Completing many of the previous activities will assist students with concepts in this activity. Be sure to note the blackline masters that accompany this activity. They provide many details about the observations the students will be making during the activity.

Getting Ready

Discuss with students the changes that will happen during the seasons.

Explain to the students they will be going on a "visit" to a tree on or near the school grounds and will be keeping a journal of their activities during the school year.

Materials Needed ✦ Paper, pencil, clipboard, student journal sheets (see Appendix), camera, ruler, tape measure, meter stick

- Procedures**
1. Plan to visit a tree on or near the schoolyard during each quarter or each month of the school year.
 2. Prepare student journals that include student journal pages, activity sheets, and additional blank pages (see Appendix).
 3. Ask the students to make observations about their tree by completing the pages in their journal called: Observations, Measurements, Snow Has Fallen, and New Growth throughout the activity (sheets are included). The students will not complete all the pages each time they make observations; you decide which pages are needed for each observation. (Perhaps the students could decide this.)
 4. Ask the students to draw or photograph their tree each time they visit it. Be sure to take pictures of the students during each visit.
 5. After the first trip, use reference books when you return to the classroom to identify each tree.
 6. The activity sheets provide a guide for the students while making observations about the tree.
 7. Books such as *A Tree in a Forest* would make good reading materials to read aloud to the class at some time during this activity.

Evidence of Student Understanding You will need to decide when to assess the activity. It is suggested you assess how the students understand change throughout the project and especially at the completion of the observations. You might want to ask the students to prepare for each other, their parents, or you, conceptually how their tree has changed during their observation period.

A rubric could be established to assess this knowledge and understanding.

**References/
Resources**

📖 *Forest Trees of Wisconsin* (included with this packet).

📖 *A Tree in a Forest*, Jan Thornhill, Simon & Schuster Books for Young Readers, 1992.

📖 Blackline Masters (included)

Visiting My Schoolyard Tree: Observations

Visiting My Schoolyard Tree: Measurements

Visiting My Schoolyard Tree: Snow Has Fallen

Visiting My Schoolyard Tree: New Growth



Visiting My Schoolyard Tree: Observations

Name _____

Season _____

Date _____

On your visit to a tree on or near your schoolyard, you will use your senses to observe your tree.

1. **Sight:** Look at your tree, around your tree, in your tree, and on the ground. In your journal, describe what you see.

2. **Touch:** Feel the bark on the trunk, the branches, and the leaves/needles. In your journal, describe what you feel.

3. **Smell:** Smell your tree, around your tree, and on the ground. In your journal, describe your tree by its smell.

4. **Sound:** Listen to your tree. In your journal, describe any sounds; be careful to describe only the sounds of your tree.

5. Do not taste your tree!!!

Collect a leaf on the ground that is from your tree or closely examine the needles. Make a leaf rubbing or drawing of the needles on the space below or on a blank page. Make a rubbing of the bark on the trunk of the tree.



Visiting My Schoolyard Tree: Measurements

Name _____

Season _____

Date _____

1. Measure the girth (circumference of your tree and record your answer in your journal).

Answer the following questions about your tree:

Use non-traditional units to measure the girth of your tree.

My tree is ____ hands around.

My tree is ____ footsteps around.

Are you still measuring your tree?

2. Measure your tree girth in metric units.

My tree is ____ centimeters around.

3. Measure the height of your tree.

Method One: Work in teams of two. Student one stands next to the tree to be measured. Student two walks away from the tree holding a ruler at full arm's length. The trick is to sight the bottom of the tree using the bottom of the ruler while also sighting the tree top through the top of the ruler. Now the ruler represents the total height of the tree and record at (a).

While keeping the ruler steady, have student two sight to the top of student one's head and record the measurement from the ruler at (b). Student one is now a ratio or part of the total height of the tree represented by the entire ruler.

- (a) Length of ruler _____ inches or _____ cm.
- (b) Top of head ruler reading _____ inches or _____ cm.
- (c) Divide (a) by (b) = (c) (your answer has **NO** units).
- (d) Measure student one's actual height and keep your units matched—inches or cm _____.
- (e) Multiply (d) x (c) = height of tree.

Method Two: Another ratio method is to compare the length of the tree shadows with student shadows.

- (a) Each student measures and records their height in inches _____ or centimeters _____.
- (b) Using a helper, measure and record the length of the student's shadow in inches _____ or centimeters _____.
- (c) Measure and record the length of the tree shadow in inches _____ or centimeters _____.
- (d) Divide (c) by (b) = (d).
- (e) Multiply (d) x (a) = tree height.

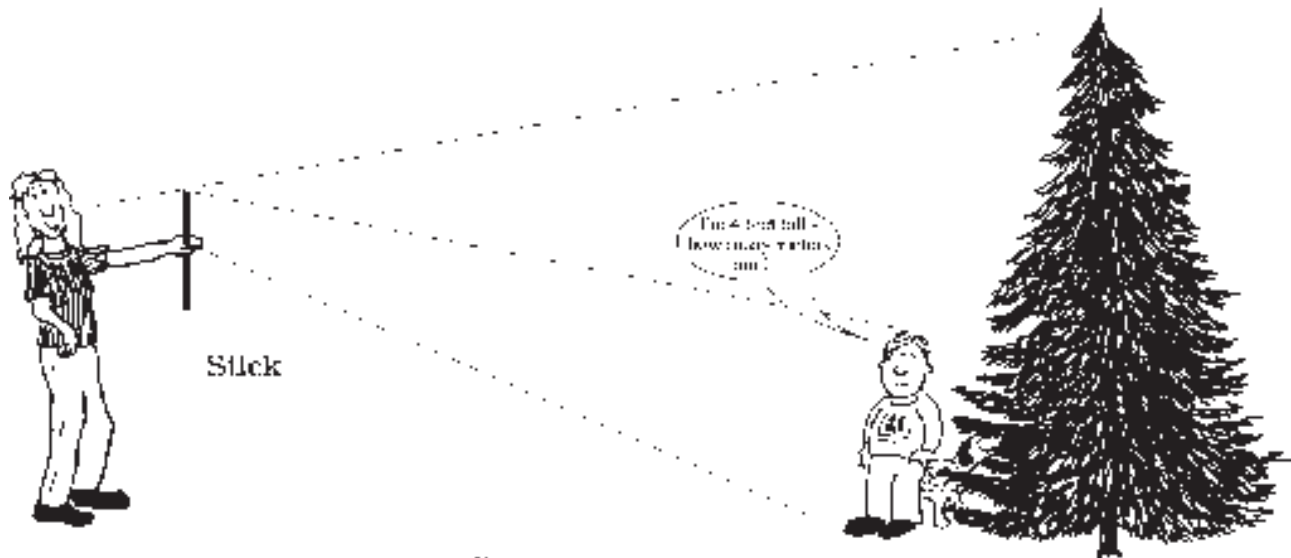
Foresters interpret the length of tree shadows from aerial photographs to estimate tree heights and many other attributes of the forest. Today, the forests are surveyed from aerial photographs and images from space. Maybe someday you will use images from space. Learn more about aerial photos on the DNR website: <http://www.dnr.state.wi.us/org/land/forestry/airphoto/index.htm>

- 4. Observations: Notice the color of the leaves/needles on your tree. Observe changes in color you are observing. What is happening to the tree? Are there any insects or animals or birds using the tree? What else can you observe about the tree? Describe how your tree looks this time of the year. What time of the year is it? Write your observations.

Activity ASheet

Visiting My Schoolyard Tree – Measurements of My Tree

Method One



Method Two





Visiting My Schoolyard Tree: Snow Has Fallen

Name _____

Season _____ Date _____

Observations

Notice if there are any footprints of people or animals under or near your tree. Describe the snow on the branches and against the trunk. If possible, measure the depth of the snow under the tree. Describe how the tree looks during this time of the year. What time of the year is it?



Visiting My Schoolyard Tree: New Growth

Name _____

Season _____

Date _____

Observations

Notice any new growth. Draw what a branch from your tree looks like now with budding leaves or growth of needles. Describe your tree in either words or even through poetry. What time of the year is it?

Forest Field Notes

Observing the Forest Community

Overview of Activity

Students will practice taking field notes of observations over time. Students will select a site to observe at various times and record their observations in their forest field notebooks. The length of time students observe their site is determined by you or in conversations with parents. This is a wonderful activity to describe the change of seasons, bird migrations, and observe the natural environment.

Standards Addressed

Environmental Education Content Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, and A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.5.

Science Content Standards:

- A. Science Connections: A.4.1 and A.4.2.
- B. Science Inquiry: C.4.1, C.4.7 C.4.8 (optional).
- E. Earth and Space Science: E.4.5 and E.4.6.
- F. Life and Environmental Science: F.4.1, F.4.2, F.4.3, F.4.4.

English Language Arts Content Standards:

- B. Writing: B.4.1.
- D. Language: D.4.2.

Key Concepts/Content

- 🌲 To identify unifying themes in a forest community such as interaction, constancy, change, evolution, energy, and form and function through observation.
- 🌲 To observe seasonal changes that occur in temperate deciduous and coniferous forests found in Wisconsin.
- 🌲 To use observation skills.
- 🌲 To recognize changes over time.
- 🌲 To make connections between classroom learning and the outside world.

**Teacher
Background**

Phe-nol-o-gy is the study of periodic changes in plants and animals as they respond to weather, climate, and the seasons. Recording observations is an interesting way to familiarize yourself with your surroundings and to make the world around you and your students more personal. People use phenology to help plan when to plant in their gardens, or to figure out when the best time is to avoid certain bugs at their favorite location. Phenology can also help define cause and effect relationships in nature. For example, owls nest in winter so that their young will hatch just as melting snow reveals a food supply of young mice born over the winter. Such observations also foster understanding of patterns of interdependency.

Getting Ready

Prepare a forest field notebook for each student. Copy student book pages back to back, including enough pages for each required week. Also include student directions, a page to draw a map of observation site, and a grading rubric. Bind books securely with card stock covers and send the parent letter home.

Materials Needed

- ✿ Parent Letter (see sample)
- ✿ Student forest field notebooks that have been developed for this activity

Procedures

1. Introduce the project to students. Sharing an example or two of prior student work can help clarify the project and provide a model. (A few examples of student forest field note entries are included with this activity.)
2. Share the grading process with students. Use the provided rubric, adapt it to your needs, or create your own with students' input. Students can practice grading samples of prior student work to get used to the rubric.

3. Take students outside with a piece of paper and a clipboard for a practice observation. Students should spread out to avoid distracting each other.
4. Pass out student books and assign first observation and map.
5. Collect student field notebooks regularly and assess student books using the predetermined rubric.
6. Consider prompting students if they need help focusing on their forest field notes. For example: The first insect you see on a flower, the first tree to change color in the fall, the first tree to lose its leaves, the first tree to open its buds, lengths of the days. For additional focus ideas, see *Backyard Almanac* by Larry Weber.

References/ Resources

School Nature Area Project

<http://www.stolaf.edu/other/snap/> (homepage)

<http://www.stolaf.edu/other/snap/cyberseasons.html>
(Cyberseasons)

CyberSeasons is a project of the School Nature Project (SNAP) of St. Olaf College. SNAP works as a partner with Minnesota schools and communities, using local nature areas to further environmental education and benefit the environment through grants, training, and resource support. CyberSeasons and SNAP's website are open to all those interested in environmental education and in using their schoolyards as a meaningful part of the school experience.

- You can collect and submit data from your class, as well as access data from other schools all school year with Following Fall, Snow, and Did Spring Snap? There are also resources, activity ideas, and galleries of student work.

EEK! Wisconsin Department of Natural Resources site for Kids

<http://www.dnr.state.wi.us/eek/>

Under Nature Notes is the current month's phenology of Wisconsin plants and animals.

📖 Missouri Botanical Gardens *What's it Like Where You Live?*

<http://www.mobot.org/MBGnet/>

Written at a 4-6 grade level, this website includes graphs, maps, and charts to research and compare biomes. Each biome page also has relevant links to other websites. Includes temperate deciduous forests, tundra, taiga, grasslands, rainforests, deserts, oceans, and freshwater environments.

- <http://www.mobot.org/MBGnet/store.htm> (Online ordering of supplemental *What's it Like Where You Live?* curriculum. The curriculum includes excellent videos, a multimedia animal reference CD, teacher's guide, and reproducibles.)

📖 *Global Schoolhouse*

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

Collection of projects and resources for teachers and students. Teachers can participate in ongoing projects or initiate their own.

📖 *ABC World Reference: Wide World of Animals*

(Online ordering information)

<http://www.learningcompanyschool.com/school/products/abcwwa.htm>

An excellent CD Rom to research animals in biomes.

Go on detailed explorations of more than 700 species of animals. Students observe animals in their natural habitats, gather remarkable facts about animal characteristics, and discover threats to their survival. Featuring text, photos, sound clips, full-screen videos, interactive taxonomy trees, time-lapse exhibits of changes in the animal world, and more.

📖 *Backyard Almanac: A 365-day guide to the plants and critters that live in your backyard* by Larry Weber, Pfeifer-Hamilton Publishers: Duluth, MN 1996. ISBN 157025-071-5

A Minnesota science teacher wrote this book. It is filled with great daily notes to share with students about the natural events happening around all year long, perfect examples for students to emulate in their forest field notebooks.

Assessment: Sample Rubric

4	<ul style="list-style-type: none"> • Forest Field Notes were turned in on time. • Student made required number of complete entries. Student entries were done once each week. • Sentences are complete and well written. Entries are neatly done. • Entries show student used senses to observe details at his/her site, including details about wildlife (if possible), plant life, and insects. • Details focus on nature's wonder and changes that have occurred since previous observations. • Student describes what he/she sees <u>and</u> what is occurring. (Example: I see a male mallard duck feeding at the edge of the pond. He is eating tiny little plants that look like miniature lily pads.) • Student asks questions about observations and shows attempts to find answers to those questions. • Student made statements that reflect knowledge of the way nature works, relationships in the ecosystem being observed, and personal reactions. • Student displays a positive attitude. Student occasionally collects samples, draws sketches, or takes pictures.
3	<ul style="list-style-type: none"> • Forest Field Notes were turned in on time, or were only a day late. • Student made required number of complete entries. Student entries were done once each week. • Sentences are complete and are thoughtfully written. Entries are fairly neatly done. • Entries show student used senses to observe details at his/her site, including details about wildlife (if possible), plant life, and insects. • Details focus on nature's wonder and changes that have occurred since previous observations. • Student describes what he/she sees <u>and</u> what is occurring. • Student asks questions about observations and shows attempts to find answers to those questions. • Student made statements that reflect knowledge of the way nature works, relationships in the ecosystem being observed, and personal reactions.
2	<ul style="list-style-type: none"> • Forest Field Notes were turned in 2-3 days late. • Student made less than required number of complete entries. Student entries were not done once each week. • Sentences may not be complete. Entries may not be neatly done. • Entries show student used few senses to observe details at his/her site. Entries include few details about wildlife. • Entries focus on what student sees. • Statements in entries reflect little knowledge of the way nature works, relationships in the ecosystem being observed, and personal reactions.
1	<ul style="list-style-type: none"> • Forest Field Notes were turned in 4-5 days late. • Student made less than required number of complete entries. Student entries were not done once each week. • Few sentences are complete. Entries are not neatly done. • Entries show student used little effort to use senses to observe details at his/her site, or include details about wildlife. • Entries focus on what student sees. • Student makes no attempt in entries to reflect any knowledge of the way nature works, relationships in the ecosystem being observed, and personal reactions.
0	<ul style="list-style-type: none"> • Forest Field Notes were not turned in within 1 week of due date.

Comments:

**Sample
Directions for
Student Book**

1. Select a habitat/area to observe near your house that you can easily and safely get to. Do not trespass onto someone else's land without permission! Observe your area at least once a week for 15-20 minutes! Your forest field notebooks will be collected at the beginning of each month and will be a part of your science grade.
2. If you have them, take along field guide, binoculars (with permission), a magnifying glass, a ruler, and a sketchpad to help you be a better observer.
3. Choose a certain spot to quietly observe your area. Don't destroy something to make the spot more comfortable. It is important that you remain quiet and relatively still so that you don't scare any animals or birds away. Don't just watch for animals and birds; there's a fascinating world under and in the grass. Look at big and little things and describe them.
4. The best time to go to this area is when the most activity occurs. This is usually in the early morning or late evening. If your parent(s) will go with you, it might be fun to observe your area as the sun rises one morning or after the sun has set. (If your parents go with you, remind them that being quiet is extremely important.) Make sure you go at a time when you can observe for 15-20 minutes.
5. Map the area in your forest field notebook on your first observation. Make sure you include the following on your map: important or larger landmarks, a compass rose, and a legend. If things in your site change a lot, draw a new map and put it inside your forest field notebooks.
6. Each time you observe the area, record data and observations in your forest field notebook. Add any sketches you make. Try to notice changes that occur over time. Notice changes in the kinds of animals, birds, plants, and bugs that you see at your site. (Example: The grass is nearly 3 inches taller than the last time I was here. I'll bet all the rain and warm weather is the reason for the change.)

7. Remember that observation means using your senses! For your own safety, do not use your sense of taste.
8. Your observations should include both what you see and what is occurring. (Example: Robins are building a nest in a nearby tree. They are carrying small twigs and what looks like fur...)
9. You should write neatly and in complete sentences. Do your best work!

Sample Parent Letter

Dear Parents/Guardians,

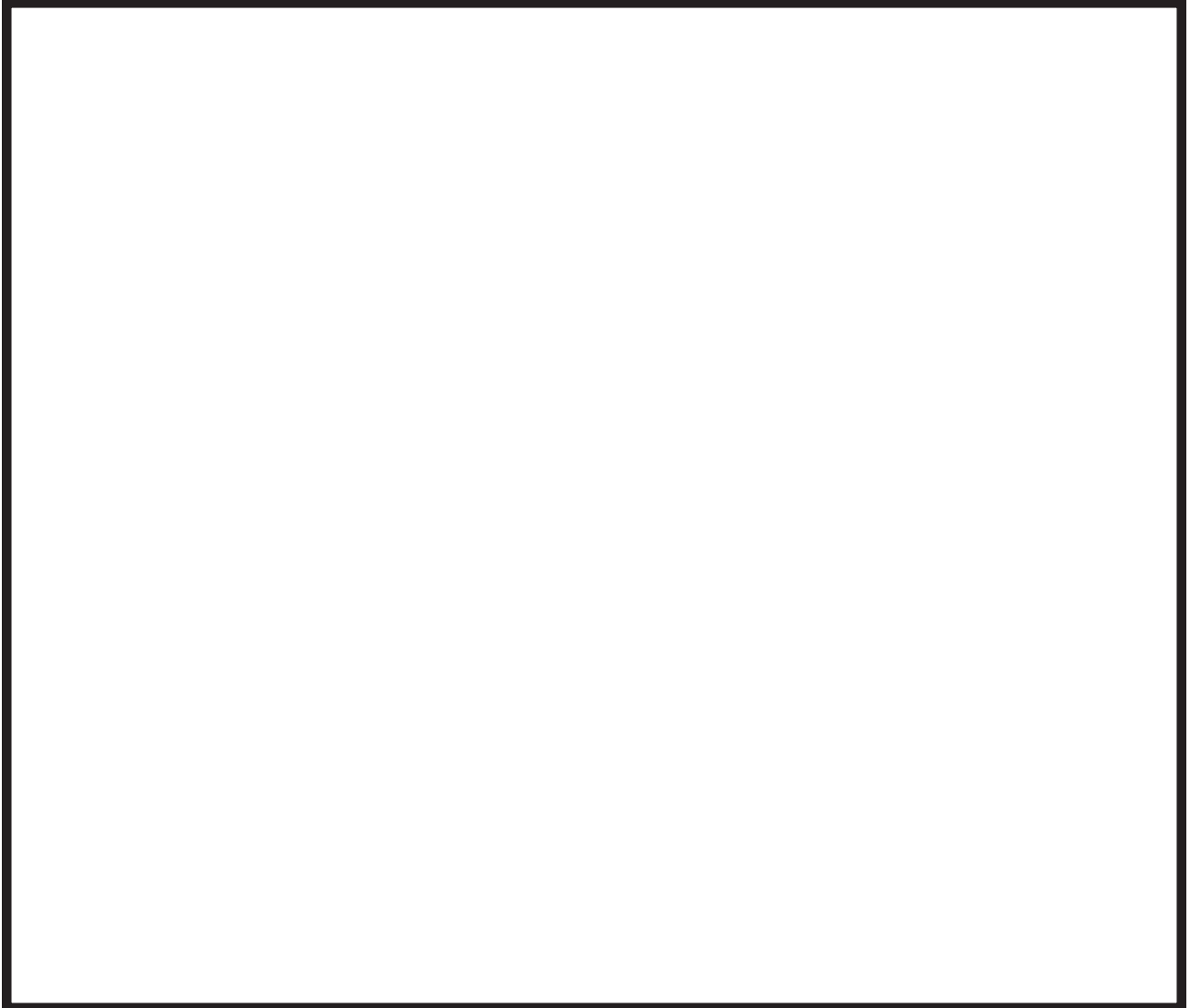
Our natural world is filled with beauty, intrigue, wonder, mystery, and excitement. Opportunities to study nature for adventure, relaxation, and enjoyment are all around us. Throughout the seasons your child will be asked to participate in an exercise that will provide the opportunity to bring to life the wonders that are a part of nature, an appreciation and concern for our natural world, and possibly spark a lifelong interest.

In addition, the forest field notebooks will help develop your child's observation, note taking, and writing skills; skills important in all academic areas. Your child's observations will be collected each month and be graded according to the rubric at the back of the book. More detailed instructions are located in the front of your child's forest field notebook. Students must be accompanied by a staff member, parent, or guardian during observations.

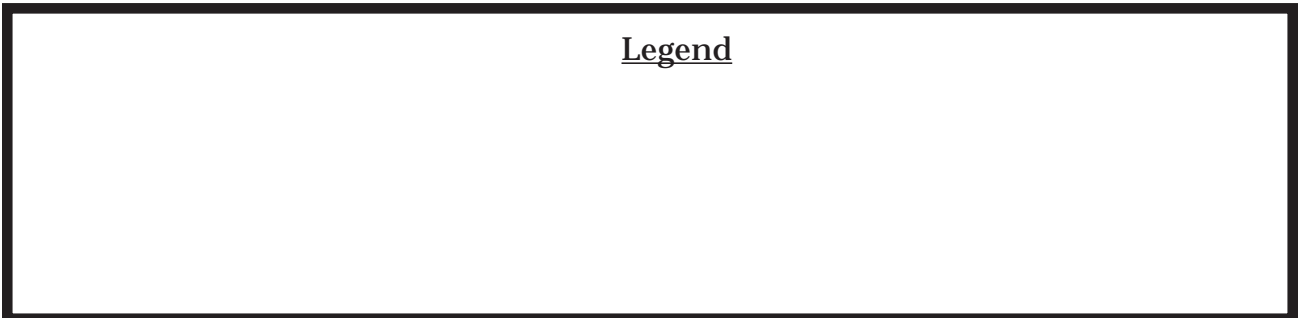
Thank you for your continued support and partnership in your child's education!



Forest Field Notes Map



Legend



**Sample Fourth
Grade Student
Entries**

1. Some of the ground is bare and sandy. There are many red ants on it. I see 23 millimeter long black beetle. Some of the leaves are beginning to fall. There is green moss on the tree. It looks like the rain made dents in the sand. There are many red glasslike pebbles in the sand.
2. There are chips of wood around the tree. The tree's bark is rough. Most of the branches are long and not very sturdy and have fern like leaves on them. There are some ants crawling up the bark of the tree! There are also tons of little bugs crawling around in the wood chips. There are dried up fern like leaves around the tree. The grass around the tree is soft and squishy and there are dandelion weeds and some other kinds of weeds too. There was tons of garbage around the tree that is including ABC gum.
3. I see a yellow butterfly flying around and a bee flying around collecting pollen from flowers. There are ants crawling on grass and weeds. There is dark yellow moss on tree. There is some more moss and it's the color of a light blue sky. The tree feels very rough. It looks like a big seed that was crushed. There are a few small dried yellowish leaves on the ground.
4. The grass is a tan-green color. I suppose that means it is dying. Have you ever realized how active ants are? They climb over anything and everything in their way. The soil looks damp, but feels dry. A breeze sends the leaves on the trees dancing. An ant is carrying another ant on its back. I think it is dead. Ants can crawl up steep things. An ant looks like a pebble of sand as it walks away. The grass underneath dead grass is damp.
5. I spent my time close to the water. All of the duckweed was gone. The water was very cold and clear. I saw a maple leaf floating down the creek. It took 3 minutes to float out of site. This purple spot was made from a berry. There was a bird's nest in a tree, but no birds in sight. The woodpecker made several holes in a dying tree. He must have been looking for bugs. I noticed as I was leaving that next year's buds can be seen.

6. The Black River is frozen, although I wouldn't trust it all the way across. The ice is starting to adjust to the cooling night air with sounds like a "phaser" going off. There is no wildlife today, or signs of it, except for 2 fish frozen in the ice. The ice inside the docks is great for ice skating, hockey, and other sports. I even taught myself to do a tight figure 8!

Tree Rings

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.2, A.4.3, and A.4.4.
- C. Environmental Issue Investigation Skills: C.4.2.
- D. Decision and Action Skills: D.4.1.

Science Education Standards:

- A. Science Connections: A.4.1, A.4.2, A.4.3, and A.4.5.
- C. Science Inquiry: C.4.1, C.4.2, and C.4.7.
- F. Life and Environmental Science: F.4.1, F.4.2, F.4.3, and F.4.4.

Key Concepts/ Content

- ✳ To determine a tree's age from its rings.
- ✳ To identify the student's birth year and other significant dates in his/her life on the tree's rings.
- ✳ To identify other significant historical dates by placing them in appropriate locations on the tree's rings.
- ✳ To identify what occurred in the tree's life cycle such as fire, insect attack, or drought in comparison to the student's own, or in comparison to dates placed upon the rings.
- ✳ To question, analyze, and investigate those things that occurred within the tree's life and demonstrate decision-making skills using data, suggest alternatives, and predict alternatives.
- ✳ To understand that every organism goes through a life cycle of growth, maturity, decline, and death while its role in the ecosystem changes.

Getting Ready

Students should know that a tree's age can be determined by its annual rings. Each ring has two parts: a wide, light part and a narrow, dark part.

Through observation of a real tree's rings, students should be able to identify changes that occurred during the tree's life and to determine the type of year, wet or dry, each ring represents.

- Materials Needed**
- ✦ Cross sections or increment bore cores from a variety of trees (contact a local forester for help: <http://www.dnr/state.wi.us/org/land/forestry/ftax/county.htm>)
 - ✦ Copies of the student worksheet
 - ✦ Significant dates in the student's, Wisconsin's, or the nation's history
 - ✦ Ruler and pencil

- Procedures**
1. Review the kind of information that can be learned from a cross section of a tree.
 2. Hand out copies of the two-page activity pages of Reading Rings, adapted from *Ranger Rick's Nature Scope*, Volume 2, Number 1, National Wildlife Federation.
 3. Have students locate the four examples in Part 1 and place them on the tree ring page, Part 2.
 4. Have students count back on the rings to locate the year in which they were born and place it on the tree ring page.
 5. Continue placing other significant dates from the students' lives, and from the history of Wisconsin and the nation they may have researched or been assigned.

- Evidence of Student Understanding**
- Students should be able to recognize the evidence of fire, drought, insect attack, and dead branches on their line drawings.
 - Students should be able to correctly place their birth year and other significant years in their lives on the line drawing.
 - Students should be able to correctly place other significant dates on the line drawing as assigned by the teacher.

- Students should be able to identify years of greater or lesser precipitation, and hypothesize years in which things such as farming, forestry, insect attack, or growth would have been good or bad.

Resources

📖 RANGER RICK'S *NATURESCOPE*, Volume 2, Number 1, National Wildlife Federation, 1400 16th Street, NW, Washington, DC 20036-2266.

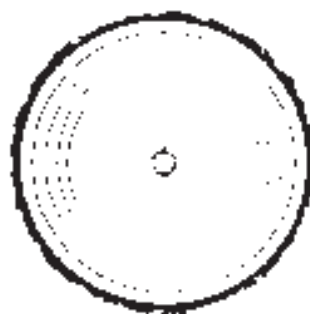
📖 Wisconsin Department of Natural Resources, *contact information*

📖 EEK-Environmental Education for Kids (<http://www.dnr.state.wi.us/ee/>)

Activity Sheet

Tree Rings Part 1

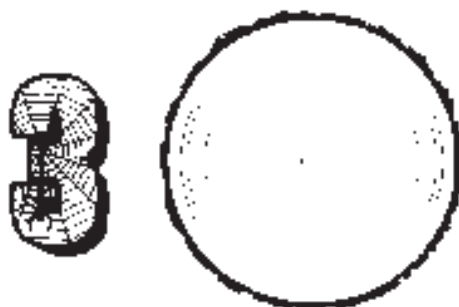
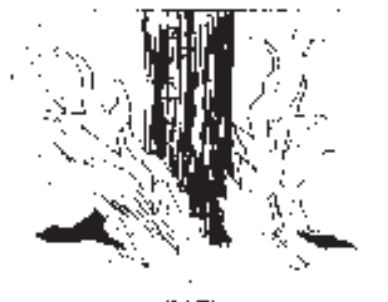
If every condition was perfect a cross cut of a tree and its rings would look like this. However no ecosystem is perfectly in balance year after year.



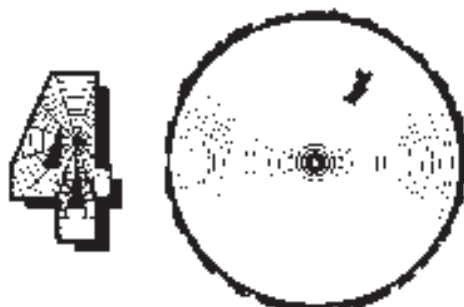
A tree falls near a smaller tree or a building is too close to a growing tree.



A forest fire damages a tree or insects lunch on it.



Summer droughts or more insects have munched away!



The tree loses a branch.



Activity ASheet

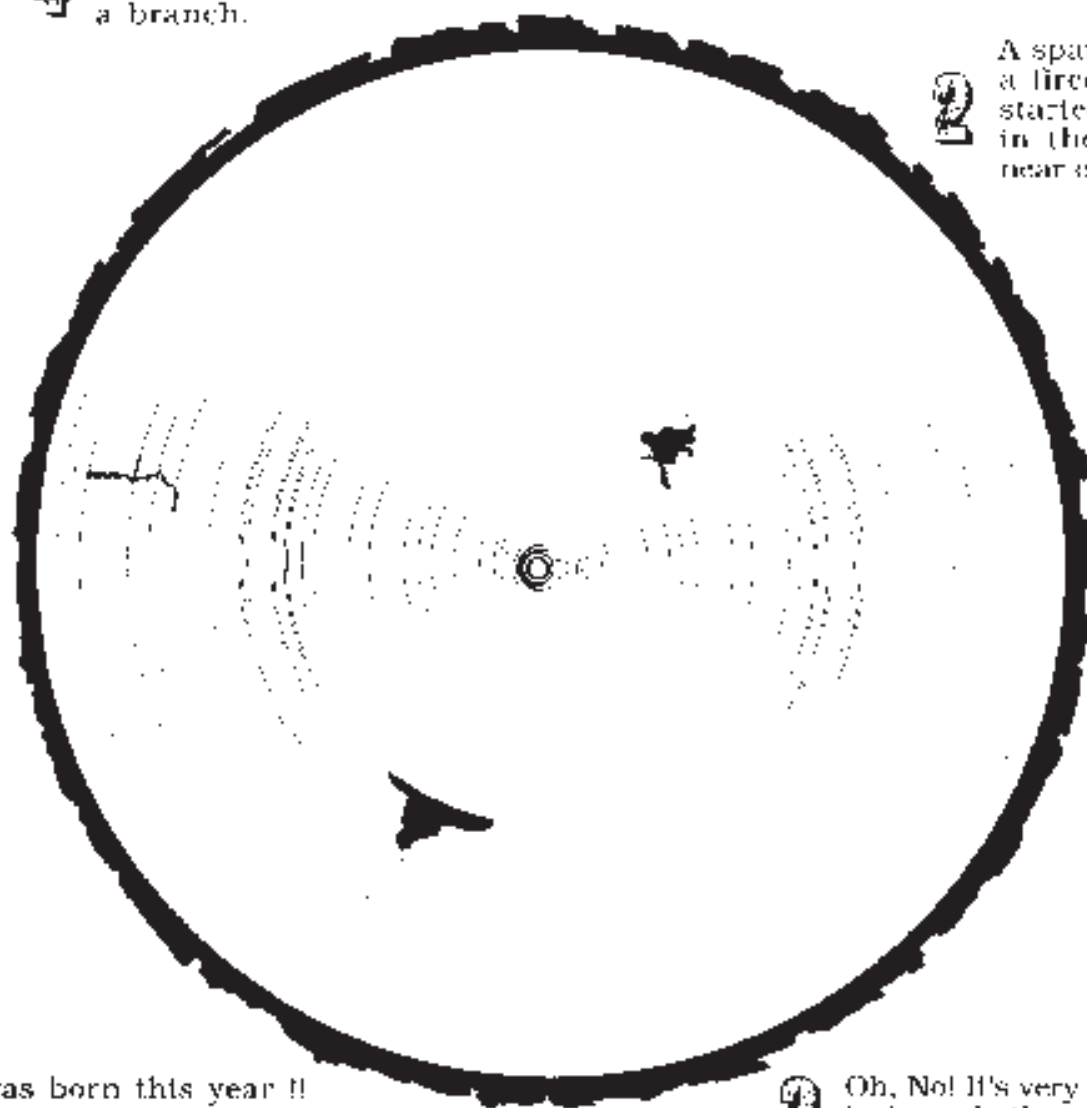
Tree Rings Part 2

Read and study the types of damage from Part 1.
Write the number on the drawing below that shows
the type of damages you see on this tree cross section.
If you need to draw pointers.

4 Lightning
breaks off
a branch.

3 Eight years
ago it was
very dry.

2 A spark from
a firecracker
started a fire
in the grass
near our tree.



I was born this year !!

My Mom's birth year
shown in the tree rings?

3 Oh, No! It's very dry and
hot and the insects
are back again!

2 Insects eat most
of the leaves off in
the spring.

1 A barn, which fell down,
used to be too close to this
tree when it was young.

Watch Out For Exotic and Invasive Species in Wisconsin's Forests

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.4.
- C. Decision and Action Skills: D.4.5.

Key Concepts/Content

- 🌲 To understand that the forest is an ecosystem that is a community of trees, plants, and animals that interact with one another.
- 🌲 To realize humans are a part of this ecosystem.
- 🌲 To realize human action has created some specific negative effects/impacts on these ecosystems.
- 🌲 To learn personal responsibility to avoid creating problems in the future and action to take in dealing with current problems.

Teacher Background

Several exotic and invasive plants and insects cause problems in Wisconsin's forests. Current efforts exist to keep them from domination and from upsetting the balance of the forest ecosystem.

Plants and animals such as common buckhorn and the gypsy moth are considered invasive species. Some invasive species are more damaging than others. Each has the potential to displace native plants or animals and alter the ecosystem.

Most of these invasive species were introduced from foreign countries where they were kept under control by native herbivores, predators, and diseases. When introduced into a new ecosystem, whether intentionally or accidentally, they may become very competitive with existing organisms. Often they are fast growing, efficient reproducers, and tolerant of a

wide range of habitat conditions. Indestructible seeds, ravenous appetites, and lack of predators are adaptations used to ensure their success often with severe consequences for people and the environment.

The issue of how to deal with invasive species is often controversial, costly, and sometimes impossible to control. Their introduction, spread, effects, and control are currently the subject of extensive debate and legislation.

Getting Ready

On the internet, visit the US Forest Service, Northeastern Area website at: <http://willow.ncfes.umn.edu/asianbeetle/beetle.htm>. Familiarize yourself with the information, especially the FAQs and “Wanted” poster.

Materials Needed

- ✦ Pencils, markers, crayons or any other art supplies for drawing.

Procedures

1. You may choose to have students work in pairs or small groups to complete this assignment. Ask students to visit the website and print a copy of the “Wanted” poster. Students will make their own “Wanted” posters using art supplies and display in the classroom or school.
2. Students will do research on the beetle mentioned in the website and report to their class. Why are people concerned with exotics? Where has the beetle been found? Is it easy to detect the beetle? What trees will beetles attack? What happened to the trees in Chicago?
3. Have students research and draw “Wanted” posters on other exotic and invasive species.

Research in Action

Scientists are trying to determine where in China the beetles come from. They do this by comparing DNA samples from China with captured beetles in the US. Scientists will also try to attract beetles to traps or sterilize the beetles. A new research area will use sonar equipment from submarines to listen in on trees to detect the beetle when visible holes and sawdust are not present.

Evidence of Student Understanding

1. Quality of "Wanted" Poster.
2. Teacher observation of student participation in classroom activities in research and presentation to class.

References/ Resources

- 📖 *Asian longhorn beetle website*
Northeastern Area State and Private Forestry
<http://willow.ncfes.umn.edu/asianbeetle/beetle.htm>.
- 📖 *Gypsy moth website:* http://willow.ncfes.umn.edu/pa_gypsymoth/gypsymoth.htm or http://willow.ncfes.umn.edu/fhh-94/wi_94.htm
- 📖 *EE News*, Spring 1999, vol. 15, No.3, Department of Natural Resources, Box 7921, Madison, WI 53707-7921.
- 📖 *Trees are Terrific* Ranger Rick's Nature Scope, National Wildlife Federation, 1400 16th St. NW Washington, DC 20036-2266.

Forest Community

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.4 and B.4.5.
- C. Environmental Issues Investigation Skills: C.4.1.

Key Concepts/Content

- 🌲 To identify five members of a forest community and show how they are dependent on each other.
- 🌲 To define and give examples of the terms interdependence, niche, and habitat.
- 🌲 To identify interrelationships between forest citizens.
- 🌲 To describe the implications of removing citizens from a forest community.

Teacher Background

All life in the forest is dependent on other organisms for survival. Trees depend on animals for seed dispersal, birds depend on trees to supply insect lunches, and deer may depend on low shrubs for cover and food. There is an endless supply of connections that can be made about the forest community. Each one is an example of the interdependence of organisms in an ecosystem.

In this activity, students will explore the habitats of animals and plants that make up a forest community. After exploring the members of their own community, they will discover ways the citizens of the forest community are interdependent.

Getting Ready

Establish a learning station by finding an area with diverse vegetation including ground plants and trees.

Word Cards—Take 5 x 8 note cards (or larger) to display vocabulary words and their definitions. One side may be filled with pictures showing examples of the vocabulary word.

Vocabulary Words: Interdependence
Niche
Consumer
Producer
Decomposer

Safety Issues



- ◆ When taking students outside, be sure to follow all district guidelines.
- ◆ Caution needs to be taken when handling insects and plants.
- ◆ Teachers should conduct a pre-survey of the area to ensure plants such as poison ivy, poison sumac, and nettles, will not pose a problem.

Materials Needed

Tools for observing the forest community members, such as:

- ✿ Activity sheet
- ✿ Hand microscopes
- ✿ Clipboards
- ✿ Binoculars
- ✿ Field guides to plants, insects, birds, etc., and bug viewing glasses
- ✿ Word cards (prepared earlier)
- ✿ Board or something to write on outside

Procedures

1. Ask the students, sitting in a circle, to define the word “community.” On a board or newsprint, list occupations in your community. Add a few if necessary for diversity. Ask the students how the different citizens are connected or dependent on each other.

2. Draw lines between the members showing the connections. Now start to erase one occupation at a time. Discuss what happens to the community.
3. Show the word cards, “niche” and “interdependence.” Explain that members of a community have their niche in society and are interdependent on each other.
4. Point out to the students that there are many kinds of communities other than human communities.
5. Explain that today they are going to examine a forest community and investigate the “citizens” of the forest.
6. Divide the group into pairs and explain that their first task will be to become familiar with the citizens that make up the forest community. Give each group a clipboard, worksheet, and any equipment they might need. Show the word cards for producer, consumer, and decomposer. Define the words together.
7. Have the students explore the designated area for signs of forest citizens. They should be able to list them on the data sheet.
8. Ask each pair of students to pick one organism and complete a data sheet before they return to one large group for presentation of that organism. Try to avoid duplication.
9. As each student presents his/her organism, record it on the board or newsprint. When everyone is finished, add a few more organisms to the forest sheet that the students feel are important. Just like in the discussion of their own community, what would happen if an organism was eliminated from the forest community?

**Evidence of
Student
Understanding**

Emphasize interdependence and promote discussion using these question topics.

- Are there any members of a community that are not dependent on other forest citizens for survival?

- Could any forest community survive without the support of surrounding communities?
- Can people live without other living things?
- What things are we dependent on for survival?
- Could a forest community survive without humans?
- Could humans survive without the forest?

**Reference/
Resources**

- 📖 Ranger Rick's Naturescope: Trees are terrific. *The forest community.* pages 34 - 35, National Wildlife Federation, 1400 16th Street NW, Washington, DC 20036-2266.

Pollination

Standards Addressed

Science Standards:

- A. Science Connections: A.4.1, A.4.2, A.4.3, and A.4.4.
- B. Science Inquiry: C.4.1, C.4.2, C.4.4, C.4.5, C.4.6, C.4.7, and C.4.8.
- C. Life and Environmental Science:
Life Cycles of Organisms: F.4.3.
Organisms and Their Environment: F.4.4.
- D. Science in Social and Personal Perspectives: H.4.1 and 4.2.

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- B. Knowledge of Environmental Processes and Systems:
Energy and Ecosystems: B.4.1, B.4.3, B.4.4, and B.4.6.

Key Concepts/ Content

- ✿✿ To explore the importance of pollination of plants.
- ✿✿ To compare and contrast pollination of flowering and non-flowering plants by organic means such as insects, and inorganic means such as wind.
- ✿✿ To see how organisms within the same ecosystem interact.
- ✿✿ To develop explanations as to why some insects are better than others when pollination occurs.
- ✿✿ To seek out information to explain the necessity of pollination in the life cycle of a plant and its reproduction.

Background Information: Tree Pollination in Wisconsin

Pollination in Wisconsin forest trees generally takes place in the spring time during May and early June. In Wisconsin, forest trees are wind pollinated. This means the wind carries the pollen grain from one tree to the flower on another tree.

The pollen is usually white to yellowish in color and in some conifer species can be seen on dry windy days in late May as a yellow cloud. Also, after a spring rain, you can see yellow rings around the rain puddles; this is pollen.

Pollination takes place for most species over a short period of time, usually a week. However, production of viable seed varies immensely from species to species. For example, silver maple and American elm pollination occurs in early May and seed is mature by early June of the same year. In white oak, sugar maple, and white spruce, pollination generally occurs in May and seed is mature in September of the same year. Whereas, for red pine, white pine, and red oak, pollination occurs in May of year one, but the seed doesn't reach maturity until September of the following year, 16 months following pollination.

Trees have several barriers to prevent inbreeding or self-pollination. Inbreeding results in deleterious genes being expressed in the offspring and usually results in stunted, poorly adapted trees. The first barrier is isolation: the male catkins that produce the pollen are generally located on the bottom portion of the tree and the female flowers are located near the top of the tree. The second barrier is pollen competition, where the female flower chemically limits related pollen from fertilizing the female gamete.

The Wisconsin DNR Tree Improvement Program uses controlled pollination to improve growth rates, disease resistance, and form for the major forest trees in Wisconsin. This is accomplished by selecting individual trees that exhibit the desired characteristics through genetic tests. Then, on the selected trees, the female flowers are isolated prior to their being receptive with a physical barrier called a pollination bag. This keeps unwanted or unknown pollen from fertilizing the flower. Next, pollen is collected from another desirable tree and extracted from the catkins in the laboratory. The selected pollen is then inserted into the pollination bag by using a hypodermic needle to fertilize the female flowers. After the pollination period ends, usually in a week or two, the pollination bag is removed from the female flowers. The branch where the controlled pollination occurred is marked,

and when the seed matures, it is then harvested for future testing.

Seeds from the improved trees are used in Wisconsin's state forest nurseries to produce reforestation and conservation nursery stock. The three state nurseries are located in Boscobel, Wisconsin Rapids, and Hayward. They produce around 18.5 million seedlings per year to sell to landowners in Wisconsin for reforestation.

This activity deals with the pollination of plants. It is important to ask the students to relate the concepts they have learned about the pollination of forest trees and their understanding of the similarities and the differences in pollination techniques.

Getting Ready

- Students should be aware of the life cycle of plants and trees. Discussion and examples of annuals and perennials as well as flowering and non-flowering plants should be done in the classroom setting.
- Diagrams should be made available to students through texts, posters, and internet resources of plant and tree reproduction.
- If possible, students should observe insects pollinating plants in an outdoor setting, taking note of the kinds of insects seen, and what they are doing.
- Since students will be using the bodies of real insects for this activity, time needs to be set aside for the collection of insects. No living insects will be used in this activity. Students should understand that an insect can be killed painlessly by placing it in a container in the freezer overnight.
- Plants will be needed for this activity, too. Pea plants will work well. Using "fast plants" as indicated in the *Wisconsin Fast Plants* activities saves time and helps accelerate this activity.

Safety Issues



- ◆ When collecting insect specimens, students need to be careful of stings and bites. They should also be reminded

to respect the rights of property owners and to not destroy any plants in the process.

- ❖ Glass containers should not be used to collect insects if possible. Also, parents should be made aware of the activity so they may help supervise the collection of the insects.

Materials Needed

- ✦ Books, posters, and internet sites as explained above and listed in the resources for this activity
- ✦ Seeds, soil, and containers (enough for each group to have 3 plants)
- ✦ Water and watering containers
- ✦ Insect bodies (a variety including bees and beetles to be shared)
- ✦ Straws, toothpicks, or popsicle sticks
- ✦ Glue
- ✦ Pencils and rulers
- ✦ Journaling pages

Procedures

1. Ask the students to plant their seeds for this activity 1 or 2 weeks prior to the beginning of this activity.
2. Begin collecting insect bodies—1 per student.
3. Discuss plant reproduction, life cycles, and pollination during this time (including forest tree pollination).
4. Prepare insects by allowing the bodies to dry out naturally. (Do not place them in covered or closed containers.) Glue or fasten each insect to the end of a stick so the bulk of the body is glue free.
5. Place students in cooperative groups of 2 or 3.
6. When the (pea) plants have bloomed, it is time to perform the activity.
 - A. Remove all the blossoms of one of the plants.
 - B. Try to blow the pollen from one blossom to another or

set the plant outside and allow the wind to blow over it naturally.

C. Using the sticks with insects mounted, simulate pollination by moving them from blossom to blossom collecting, if possible, pollen on the bodies of the insects. (Not all groups will be using the same kind of insect. Do not use more than one kind of insect for each individual plant.)

7. Allow the plants to grow and observe which plants and blossoms produce fruit (peas).

8. Record and discuss data.

**Evidence of
Student
Understanding**

- Through observation and the collecting of data, students should learn that flowering plants must have a blossom to produce fruit. They should also learn that wind is not the only means for pollination of flowering plants. In addition, the activity should produce results that indicate to the students that bees are an excellent means of pollination, but beetles and other insects with a hard exoskeleton do not collect and deliver the pollen as easily, and therefore do not pollinate as well as bees.
- Students should be able to explain this information from data collected and written in their journals.
- Students may also raise further questions for additional study, question the findings of another group, or explain findings contrary to the expected outcomes.
- Ask the student to relate this information to the pollination of forest trees.

Extensions

- You may choose to vary the types of plants used in the activity, but keep all the plants the same for each group so the variables will remain the same.
- You may choose to set a plant aside to see if it will self-pollinate.
- Recording and graphing the rate of growth of your plants and the peas they produce will allow for the students to have a visual record of what happened during the weeks spent on the activity.
- You may choose to compare types of seeds, “fast plants” vs. regular plant seeds; however, if you do, you may need to start the activity earlier with some groups since blossoms will be produced somewhat earlier.
- You may choose to cross-pollinate several plants. For example, two groups using bees may carry the pollen from their plant to the other group’s plant.

References/ Resources

 www.fastplants.cals.wisc.edu

 www.netspace.org/MendelWeb/MWflower.html

 www.whfreeman.com/life4gif/ch34/3405.gif

Energy In The Ecosystem

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.1, B.4.3, B.4.4, and B.4.6.

Science Standards:

- A. Science Connections: A.4.1, A.4.3, and A.4.4.
- C. Science Inquiry: C.4.1, C.4.2, C.4.4, C.4.5, C.4.6, C.4.7, and C.4.8.
- D. Physical Science: D.4.8.

Key Concepts/Content

- ☛ To understand heat absorption, transfer of heat energy, and how heat affects colors.
- ☛ To understand which colors found in a forest ecosystem will absorb the most heat energy.
- ☛ To use inquiry to investigate questions about energy in a forest ecosystem.

Teacher Background

The Role of Sunlight Energy in the Practice of Forestry

In many respects the practice of forest management is largely the control of sunlight and the energy it radiates on the ground and trees. Foresters control the density of forest canopies to allow just the right amount of sunlight to reach the forest floor to encourage new trees to germinate and grow. Too much energy from the sun will evaporate the moisture needed by young trees.

Each species of tree, such as white pine, aspen, or red oak requires different sunlight (energy) levels to thrive. Aspen, for instance, needs lots of sunlight and heat to sprout and grow into mature trees. Aspen cannot tolerate shade and it will die if other trees shut out the sunlight. It is a tree that thrives after the soil has been disturbed.

White pine, on the other hand, can germinate and grow in partial shade. If foresters want to encourage and grow white pine, they thin the tree crowns (by tree removal) and let more sunlight through to reach the forest floor.

The following chart will give you some idea of how tree characteristics vary and why the forester has to consider the needs of each tree species when managing the forest:

Species	Shade tolerance	Seed/lb	Seed fall	Germ. temp.
Sugar maple	Very tolerant	6,100	Sept.	34° F
Basswood	Tolerant	5,000	Sept.-Oct.	40° F
Red maple	Tolerant	22,800	May-June	40° F
White ash	Intermediate	10,000	Sept.-Dec.	34-64° F
Yellow birch	Intermediate	447,000	Oct.-Dec.	60° F
Red oak	Intermediate	140	2 nd Sept.	34° F
Aspen	Intolerant	Numerous	May	50+° F

As you can see, sunlight (and the energy it provides) is very important in the growth and development of the forest. Large seeds, like those from red oak, can penetrate through leaves on the forest floor to reach moist soil and germinate. Aspen seeds need exposed soil to establish their root system because they are so small. Too much sunlight and not enough rain will prevent new trees from becoming established.

Getting Ready

Students should have a working knowledge of what defines an ecosystem (a large part of the earth with similar climate, land, plants, and animals) and a habitat (a small part of an ecosystem with similar land, climate, and organisms). Students should be aware that color is a natural part of the environment of any ecosystem and that it may be a part of an organism's ability to produce food as in most plants or serve as a method to attract a mate or protect an organism as in most animals.

Students may know that dark colors tend to absorb heat, while lighter ones tend to reflect heat.

Discussion may lead to the dark soil absorbing heat in spring helping to germinate seeds and promote plant growth, while snow reflects away heat in winter.

Safety Issues



Remind students to be careful when cutting. If you use a heat lamp, be careful not to place it too close to the boxes and remind students to keep away from the lamp.

Materials Needed

- ✦ Construction paper: a variety of colors (green, yellow, gray, brown) as well as black and white (other colors may be used as inquiry)
- ✦ Scissors
- ✦ Rulers
- ✦ Glue
- ✦ Thermometers
- ✦ Graph paper
- ✦ Small boxes or lids from boxes (shoe boxes and/or their lids)
- ✦ Aluminum foil, optional
- ✦ Student-suggested materials not listed here

Procedures

1. Divide the class into cooperative groups and assign roles (recorder, measurer, cutter, gluer, drawer, etc.). In smaller groups, students may have more than one role or duty to perform.
2. Ask the students what they know about the colors you are holding.
3. Show students all the colors of construction paper that you have. Discuss what objects and organisms in forests have those colors. Then, in groups, have them predict which colors will absorb the most heat, and write the order from least to greatest, reminding them that this is their hypothesis.

4. Then have each group discuss a way in which they could test their hypothesis. (You may accept alternative methods allowing students the freedom to explore a variety of solutions to the problem. You may limit the choices to materials on hand or available to you. Not all groups need to do the same thing. This is what leads to good inquiry.)
5. One suggestion is to cover the sides of a small box with aluminum foil. This may need to be glued down. Then, cut each piece of construction paper to fit the bottom of the box. Place a thermometer in the center of the box and place in the sun for 15 to 20 minutes and record the temperature. (To get accurate results, you may wish to use a sunlit place on a window sill in the classroom or a place out of the wind outside. A sunlamp may be substituted if natural sunlight is not available.) Repeat with each color for exactly the same amount of time.
6. Record data and compare to the student's hypothesis.
7. Discuss results with other groups and compare data. Discuss reasons for differences in data.
8. Suggest alternative methods of gathering data or re-testing if necessary.

Hints

Instead of each group in the classroom testing each color, you may choose to have each group test one or two colors.

If the temperatures do not seem to vary much, place the thermometer **under** the construction paper placed in the bottom of the box.

Evidence of Student Understanding

Students should find that black will absorb the most heat, and white the least. The other colors, depending on, which ones are used, should fall in between, ranging from darker intensities to lighter ones. Ask the students to explain how their results would apply to the colors found in a forest.

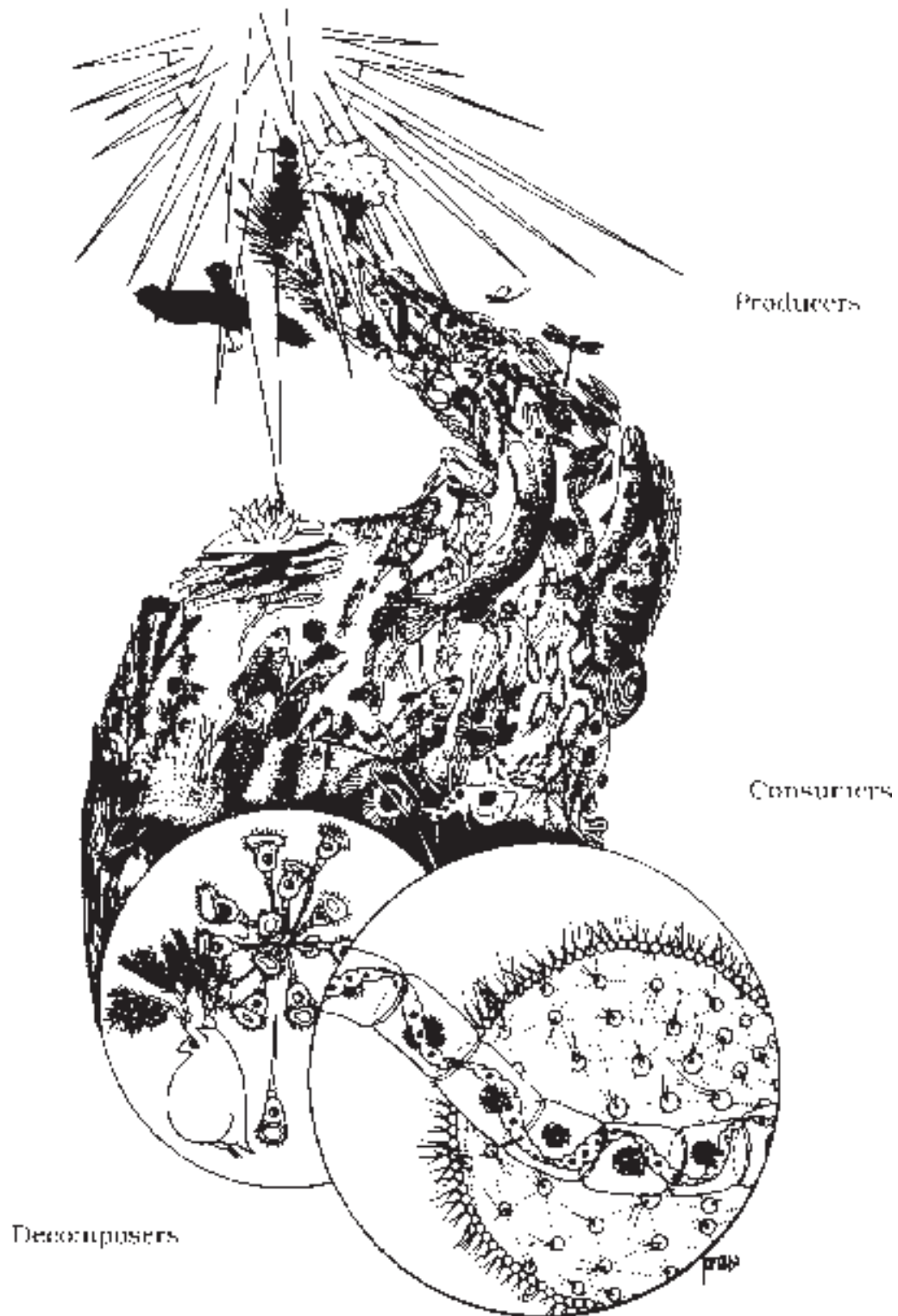
Extensions

- Have students graph their results with temperatures on the vertical axis and colors, from least to greatest, on the horizontal axis. Using a bar graph, students may choose to color each bar with the appropriate color, or color code the words as they appear on the horizontal axis.
- Have students design and build a diorama that would represent a “warm” or “cool” ecosystem or habitat depending upon the findings of the exercise and plants and animals that would inhabit it.
- Have students report on their findings from the activity, show their graphs, and explain why some habitats or ecosystems are warmer or colder than others.

Activity Sheet

Energy in the Ecosystem

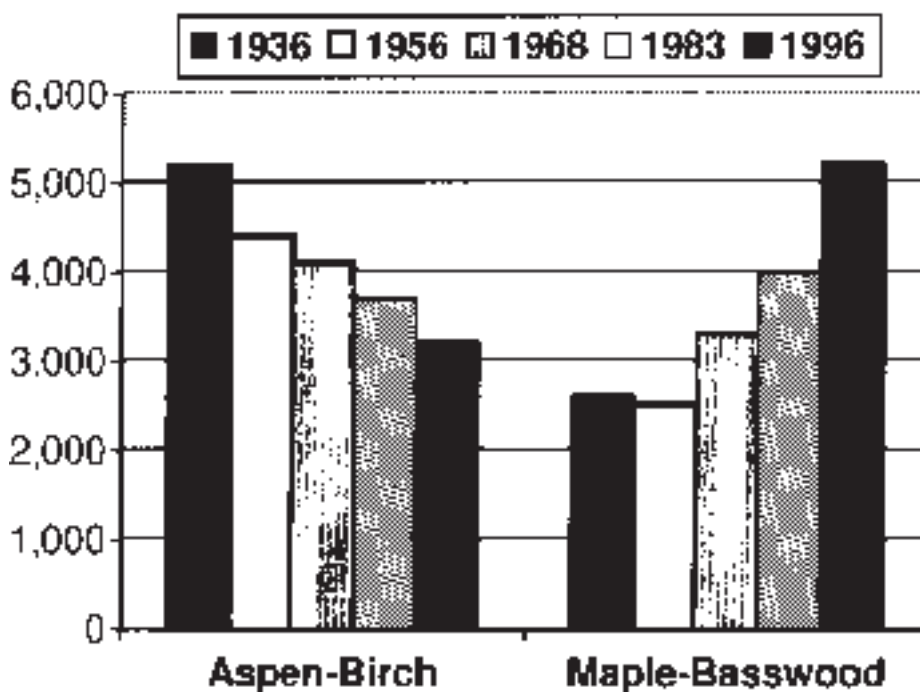
Sun



Energy in the Ecosystem

Extension:
Real Forestry Example

**Area of timberland by two forest types in
thousand acres**



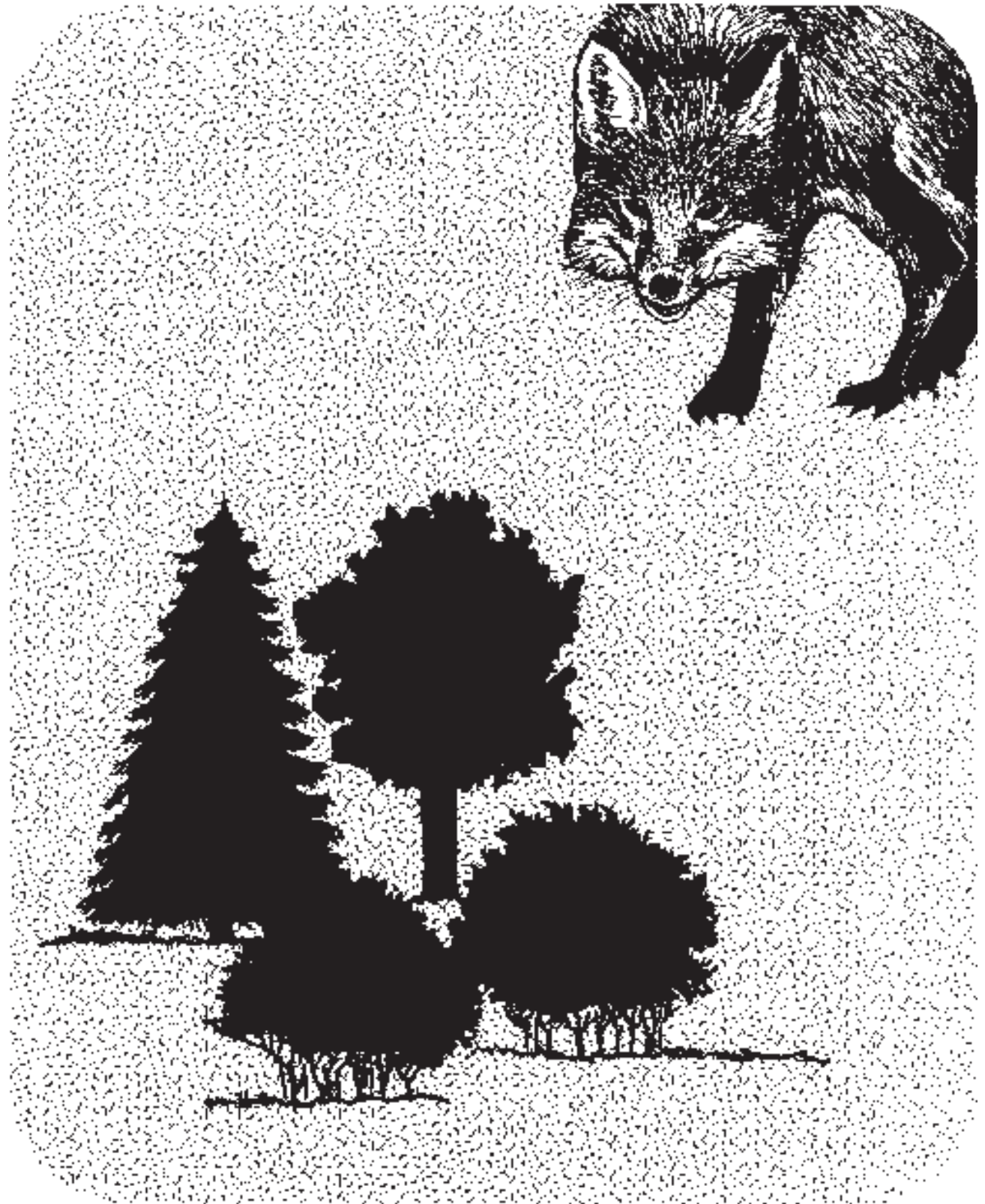
Look at the above graph.

Which forest type is declining?
Which forest type is increasing?

If you were an aspen seed would you prefer shade or sunlight?

Can you think of reasons why there are fewer aspens?

The Many Benefits of Trees and Forests



The Many Benefits of Trees And Forests

“The forest is as beautiful as it is useful. The old fairy tales which spoke of it as a terrible place are wrong. No one can really know the forest without feeling the gentle influence of one of the kindest and strongest parts of nature. From every point of view it is one of the most helpful friends of man. Perhaps no other natural agent has done so much for the human race and has been so recklessly used and so little understood.”

Gifford Pinchot, Forest Service Chief 1905-1910

We seek solitude in the forest and value the quiet beauty of the creatures of the woods. Forests are America’s playgrounds where we hike, camp, fish, hunt, snowmobile, raft, and build vacation homes.

We depend on the bounty of the forest for lumber to build our homes and paper for our schools and offices—thousands of useful products are made from the forest to support communities.

The forest is the source of our Nation’s clean water and air. The decisions society makes about its forests effect everything downstream.

“The basic point of our sustainable forest management strategy is this: not only do economic stability and environmental protection go hand in hand, economic prosperity can not occur without healthy, diverse, and productive watersheds and ecosystems.”

Mike Dombeck , Forest Service Chief 1998

The following activities are included to introduce students to the benefits of Wisconsin’s forests:

“Recreational Use Survey”

“Handmade Paper”

“Would Wood Be Needed for My Job?”

“Water, Water Everywhere”

“Trees and the Water Cycle”

“Leafscapes”

“Barrens and Butterflies”

“Design an Urban Schoolyard Forest”

Recreational Use Survey

Standards Addressed

Environmental Education Standards:

A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.

B. Knowledge of Environmental Processes and Systems: B.4.4, B.4.8, and B.4.10.

Key Concepts/Content

✳ To describe the characteristics of the students' favorite recreational area.

✳ To develop a recreational survey.

✳ To graph the results of the students' survey.

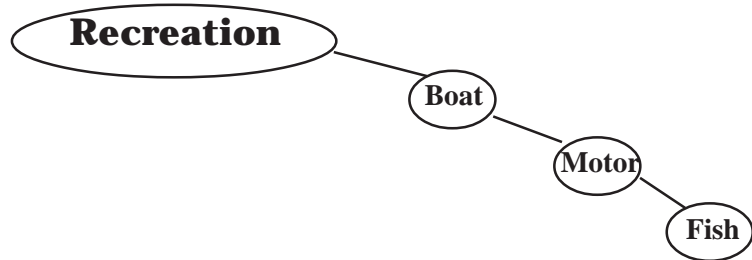
Teacher Background

To supply the increasing demand for recreational opportunities, national, state, county, and city agencies have set aside thousands of acres of land as parks and recreational areas. These areas usually contain qualities, such as trees, rivers and lakes, that people value and want to protect. Some may be of educational or historical value.

There may be a recreational place that your students and their families enjoy on a regular basis. Many of these places may be located within the community where they live; others may be located great distances away. Surveying the attitudes of your students is a good way to record and graph where students and their families travel to enjoy recreational areas and what activity they participate in the most. Ask the students what they think of when they hear the

Getting Ready

word recreation. Have them brainstorm components that make up a recreational area. Have the students work together at the board to create a word splash around the word recreation. Feelings, descriptive words, site names, and activities will be used to make up the word splash.



Materials Needed None

Procedures

1. In small groups, have students develop a set of survey questions that will identify:
 - Favorite recreational areas and characteristics
 - Favorite recreational activities
 - Frequency of visits

Surveys can include any information the students may be curious about with regard to recreational opportunities. Have students record several possible questions. *Focus on the use of forested areas important for recreational activities!*

2. Assist groups with narrowing the number of questions to a reasonable number. Create survey forms. Ask groups to determine who their target audience will be.
3. Require each student to return 5 surveys completed by students and staff members from the school building.
4. Survey information should be compiled in a simple data table using the top five responses for each question.
5. Instruct each group to select at least one item from the survey to be graphed.

- Students should present the compiled survey results to the class.

Evidence of Student Understanding

The teacher will assess the groups based upon the quality of their survey and presentations. All students will also be graded on participation.

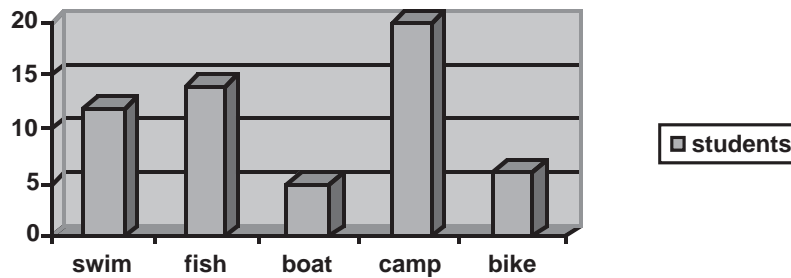
Sample Survey

Name: _____ Grade: _____

- Where does your family go on vacation?
- What do you do while you are there?
- How often do you visit areas that are forested?
- How often does your family go on vacation?
 - once a year
 - twice a year
 - once a month
 - every weekend

Sample graph

Favorite Recreational Activities



Handmade Paper

How to make paper from recycled materials

Standards Addressed

Visual Arts Standard:

B. Art History, Citizenship, and Environment: B.4.7.

Visual Environmental Education Content Standard:

C. Environmental Issue Investigation Skills: C.4.4.

Key Concepts/ Content

✳️ To compare handmade paper to papermaking processes used in mills. The basic processes are pulping, draining, drying, and finishing.

✳️ To identify environmental issues involved in papermaking.

✳️ The paper made in this exercise can be used as a cover for the students' journals.

Teacher Background

Paper was made by hand for thousands of years until, during the Industrial Revolution of the 18th century, machinery was invented that could mass-produce paper. Over 5,000 years ago, the Egyptians made a type of paper from an aquatic plant called papyrus. The stems were split, woven, and then dampened and beaten into flat sheets, which were polished smooth with stones. The Chinese patented the true paper as we know it today. Old fishing nets and ropes were beaten into a pulp with water, before draining and pressing the pulp into sheets, which were then dried in the sun before use. Later, plant fibers and silk threads were used. The Japanese have a long and continuing tradition of various plant materials used as the raw material in papermaking, e.g., gampi and mitsumata plants.

Today our western world acquires most of our raw material for paper production from wood pulp. Our state's first paper mill was started near Milwaukee in 1848 – the same year Wisconsin became a state. The amount of wood needed to produce a ton of paper varies with the kind of wood being used and with the kind of paper being produced. A general average is that it takes about 4 tons of wood (or around 10 trees, 70 feet tall and 10 inches in diameter) to make a ton of paper. Wisconsin paper mills generally produce more than 4.7 million tons of paper annually, thus leading the nation for over 40 years as America's #1 papermaking state. The first Wisconsin paper mill produced 15 reams of paper a day. Today's mills can produce some paper grades at over 6,000 feet per minute or nearly 70 miles per hour.

The trees used for paper depend upon the kind of paper that is going to be made. In general, the species include the softwood jack pine, red pine, and white pine tree species and the hardwood aspen tree species.

Getting Ready

Lay out examples of various kinds of paper for student exploration. Ask students to discuss their similarities and differences. Differences observed may be in color, surface texture, and thickness. Paper can be identified by function, e.g., computer, wallpaper, writing, packaging, and drawing. (See *Paper Makes Wisconsin Great!* in the reference section of this activity.) Ask students if they know how paper is made and the materials that are used. Provide background information on the history of papermaking and facts of forestry use. Discuss the recycling efforts in paper.

Introduce the mill papermaking process of pulping, draining, drying, and finishing. Explain that this process is simplified into art making (see activity sheet).

Safety Issues



- ◆ Students will be using electricity in this activity. Be sure the blender and all other appliances are away from water.
- ◆ Pulp spilled onto floor is slippery.

- Materials Needed**
- ✦ Used paper (newspaper, wrapping, shopping bag, lunch bag, and homework)
 - ✦ Plastic bucket (ice cream bucket works well)
 - ✦ Water
 - ✦ 8-inch or deeper plastic tub
 - ✦ 2 wooden picture frames (or constructed wood frames measuring 5 x 7 inches)
 - ✦ Blender
 - ✦ Opened sheets of newspaper
 - ✦ Sponge
 - ✦ Iron
 - ✦ Plastic window screen (7 x 9 inches)
 - ✦ Duct tape
 - ✦ Forest plant materials, e.g., flowers, grasses, feathers, ferns, leaves, or conifer needles - pulled apart.

Procedures

1. Tear up used paper into tiny pieces, 1/2 inch or smaller.
2. Soak paper pieces in bucket. The soaking is to break down and rehydrate the fibers in the paper. Hot water will speed the process up.
3. Fill blender three-quarters full of paper pieces and water. Start the blender on low with pulsing until it becomes pulp (mixture will have a “wet mush” appearance).
4. Make mould and deckle (see activity sheet). Stack the deckle and mould, and prepare paper receiving area.
5. Pour the pulp from the blender into the plastic tub and repeat the pulp blender process until there is enough in the plastic tub to submerge your screen by at least 4 inches. Depending upon the size of the plastic tub, it may take at least 8 blenders full to begin. Mix the pulp in the plastic tub with your hand.
6. Add forest plant materials into the wet pulp and mix.
7. Lower the screen into the plastic tub using the motion illustrated on the activity sheet. Lift the screen up, hold-

ing it level and letting the water drip back into the tub. The pulp will be lying on the top of the screen.

8. Remove the top frame. Turn upside down so paper is resting on the couching materials and newspaper blotter. Gently sponge the excess water off the paper through the screen. Remove most of the liquid, but don't make it too dry or it won't release when you pull up the frame.
9. Carefully peel off the screened frame. If the pulp has been blotted thoroughly, it will adhere to the couching cloth.
10. Close the opened newspaper carefully over the handmade paper and use a warm iron to dry it. Gently "blot" the iron on the paper. Turn the paper over and continue drying the paper by blotting it with the iron.
11. When completely dry, peel off your recycled paper.
12. Discussion/Conclusion:
Uses for student handmade paper:
Options:
 - Mount a pressed leaf from an adopted tree.
 - Draw or paint a picture of some aspect of our forest resource.
 - Mount a poem about trees.
 - Make more sheets and make a book.

**Evidence of
Student
Understanding**

1. Teacher observations of students engaged in successfully completing papermaking process.
2. Student participation in class discussion.
3. Evaluation of students' creative uses of handmade paper.

References/ Resources

- 📖 *Creative Handmade Paper* by David Watson, Search Press Limited, 1991.
- 📖 *Making Paper from Trees*, Forest Products Laboratory Forest Service, U.S. Department of Agriculture, Madison, WI, 1978, 753.367
- 📖 *Nature through Science & Art*, by Susie Gwen Criswell (Director Office of Environmental Awareness, Smithsonian Institution), TAB Books, Division of McGraw-Hill, Inc. 1994
- 📖 *Paper Makes Wisconsin Great! A Multi-Disciplinary Educational Program for Upper Elementary Grades* from the Wisconsin Paper Council, 250 N. Green Bay Road, P.O. Box 718, Neenah, WI, 54957-0718. (920) 722 1500, www.wipapercouncil.org
- 📖 *Forest Trees of Wisconsin*, Poster. Bureau of Forestry. Wisconsin Department of Natural Resources. PUBL FR 101 - 95 (included in this packet).
- 📖 *Educator Fact Sheets*
(see Appendix)

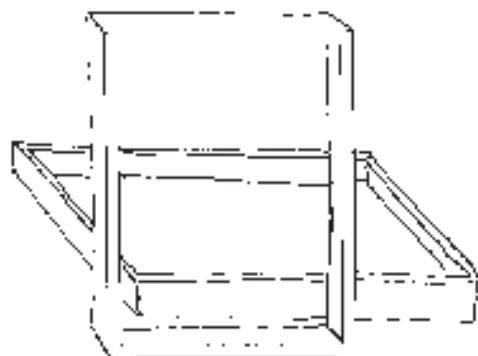
Activity AS Sheet

Handmade Paper Making the mould and deckle

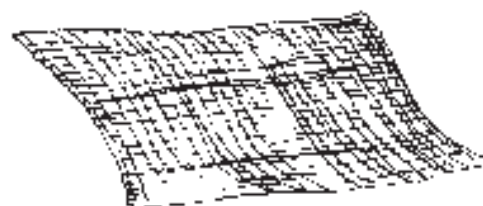
This mould and deckle setup is designed to make a 5- x 7-inch sheet of handmade paper. Use the paper as a cover for the journal entries, or cover a small box to hold the pressed leaves the students gather. If the students each make two sheets of handmade paper, they will have a front and back cover. An interesting cover can be made by cutting a circle in the center of the paper. Place a pressed, dried leaf in that center as you laminate it. Laminate the second piece as the back cover.

ASSEMBLING THE MOULD AND DECKLE:

Make two identical frames out of 2-inch-wide and 1/2-inch-thick wood strips. OR get picture frames. Mould and deckles measuring more than 5 x 7 inches are difficult for the students to handle and make it harder to produce a nice piece of handmade paper.



Cut out a 7- x 9 inch rectangle of screen. Plastic window screen works best.



Fold the screen over the frame, using a few staples to hold it in place. Tape it securely all around the frame with duct tape.



To use this setup, stack these on top of one another as shown above. The screen faces up. The top frame forms a catch tray allowing the pulp to settle on the screened frame. After most of the water has drained, take that frame off and move to the drying area.

Refer to the next activity sheet for more complete papermaking methods.

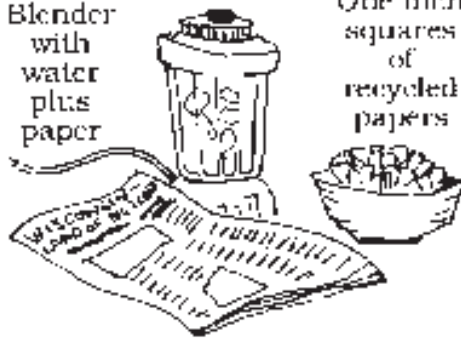
Activity A Sheet

Handmade Paper

MILL PAPER

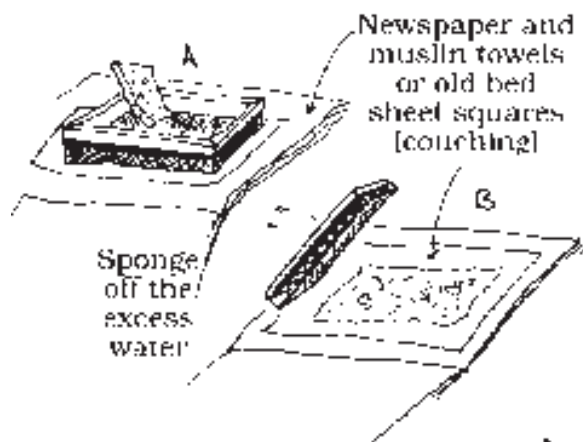
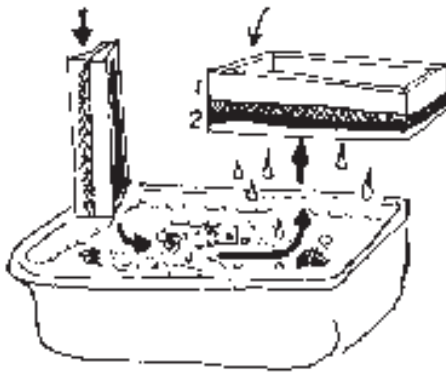
HANDMADE PAPER

Blender with water plus paper



One inch squares of recycled papers

Mould and Deckle

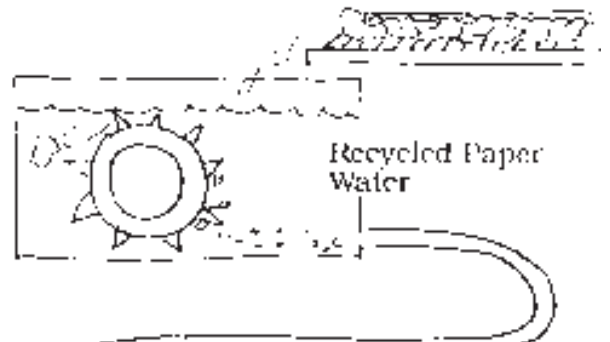


Sponge off the excess water

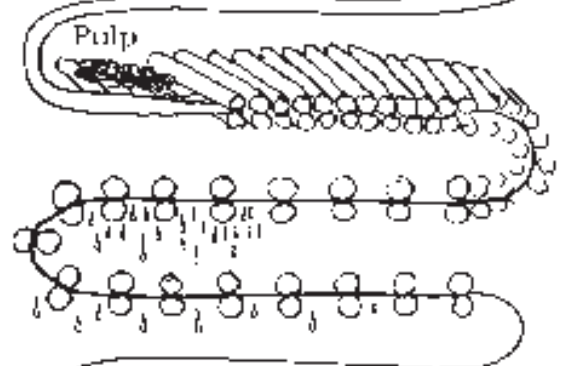
Iron dry or lay in bright sun outside



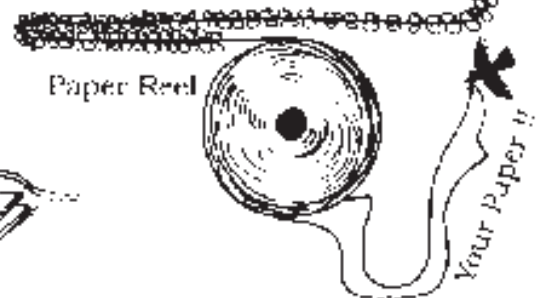
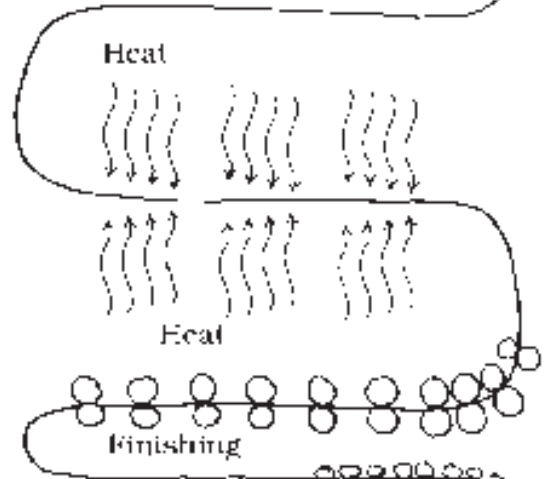
PULPING



WATER IS PRESSED OUT OF PULP



DRYING



Would Wood Be Needed for My Job?

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1 and A.4.2.
- C. Environmental Issue Investigation Skills: C.4.1 and C.4.3.

Key Concepts/Content

- 🌲 To realize the impact forests have on employment.
- 🌲 To view the value of forests for statewide employment figures.
- 🌲 To realize there are diverse community jobs that are dependent on the forest industry.

Getting Ready

Either write the following paragraph on the board or put it on a transparency:

“Forest industries are the largest manufacturing employment sector in 28 Wisconsin counties, second in 9 counties, and third in 5 counties. In addition to the 97,000+ direct employees, another 200,000 jobs are dependent on the forest products industry.”

From *A Look at Wisconsin's Forests*, (see the reference section for this activity).

Materials Needed

- 🌲 Newspaper employment ads and/or yellow pages from the telephone book for each group of three students
- 🌲 Copy of *A Look At Wisconsin's Forests* brochure

Procedures

1. Read the quote from the brochure about state employment or ask the students to read the quote. Ask the students what types of jobs might be related to the forest industry.

2. Have the students brainstorm a list of jobs that are related to the forest industry in their community. To assist with this, students can use employment ads and/or the yellow pages to find local jobs that are dependent on forests, such as a local siding company that sells cedar siding or the copy store that prints invitations and newsletters. The following is a suggested list of headings from the yellow pages:

books	cards	construction services
construction	christmas trees	consulting foresters
printers	antiques	arboretums
tree service	landscaper	boats/docks
furniture	cardboard & packaging	
paper	and many more	

3. You may want to have students work in groups of three, assigning each person a task such as reader, writer, and reporter as they list names of local services and businesses that are dependent on the forest industry.
4. Have the groups report back during group discussion.


Evidence of Student Understanding

Have students write a description of the job they found most interesting and how it was related to the forest industry. Prepare the report for others.

References/ Resources

 DNR brochure: *A Look At Wisconsin's Forests* (included in packet)

 <http://www.forestinfo.org/CoolFacts>

 <http://www.domtar.com/arbre/english/start2.htm>
<http://www.domtar.com/abre/english/saviez.htm>

 <http://www.fl-ag.com/forest/woodyou.htm>

Water, Water Everywhere— Forestry and Runoff

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.4.
- C. Environmental Issues and Investigation Skills: C.4.1, C.4.2, C.4.3, C.4.4, and C.4.5.
- D. Decision and Action Skill: D.4.2.
- E. Personal and Civic Responsibility: E.4.2.

Key Concepts/ Content

Students will:

- ✳️ Compare the rates of runoff down slopes with and without vegetation.
- ✳️ Contrast erosion of deforested soil with vegetation's effect to reduce erosion.

Teacher Background

This activity and the physical education extension are designed to simulate the effects of erosion and runoff on different land surfaces. It models the need for forests as buffers to prevent erosion and the siltification of our lakes, rivers, and streams. The unprotected soil will produce deeper erosion patterns, more runoff, and increased sediment than the soil protected by vegetation.

In an undisturbed landscape, sedimentation is a slow, naturally occurring process. However, human activities often speed it up. The result can be large amounts of sediment accumulating in lakes, streams, and wetlands that speed up the aging of lakes and bury fish spawning grounds and aquatic plants. These plants are a source of food and habitat for fish and other aquatic organisms. Suspended sediment can cloud the water, reducing the hunting success of sight-feeding fish; it can also damage the gills of some fish species, causing them to suffocate.

Wisconsin's Forestry Best Management Practices for Water Quality is a DNR program that promotes environmentally sound forestry practices. These practices minimize soil exposure and compaction in order to protect ground vegetation and the duff layer (the accumulation of needles, leaves, and decaying matter on the forest floor). The duff layer protects the deep, porous forest soil from the erosive force of raindrops and allows the rain to soak into the soil. As long as the duff layer remains in place and the soil is not compacted, forestland produces very little runoff.

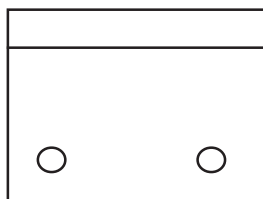
From 1995 to 1997, monitoring teams evaluated 295 timber sales across Wisconsin that were either on a wetland or within 200 feet of a stream, lake, or river. These sites, where timber had recently been harvested, were evaluated to see if the Best Management Practices (BMPs) had been applied and if they were effective. The results from this monitoring are very encouraging:

- BMPs were correctly applied 85 percent of the time where needed.
- When BMPs were applied where needed, 99 percent of the time there was no adverse impact to water quality.
- When BMPs were not applied where needed, 38 percent had no adverse impact, 57 percent had a minor impact, and 6 percent had a major impact.

Getting Ready

1. Visit website www.newforestsproject.com >Tree Education >Ecology & Trees
2. Teacher needs to manufacture tubs for activity prior to class.

(end view)



top

circles show location of drainage tubes for runoff collection

Drill (or cut) holes to receive drainage tubes. Cut tubes long enough to reach drain pans. Caulk in place with silicon or hot glue.

3. Gather sod, small trees or plants, leaf cover, sand, gravel, and topsoil to create landscapes. Ask students to bring materials, too.

Safety Issues



- ◆ Follow safety contract. (See Appendix)
- ◆ Watch for spillage on the floor. Clean up immediately so floor does not become slippery. (OR – conduct activity outside!)

Materials Needed

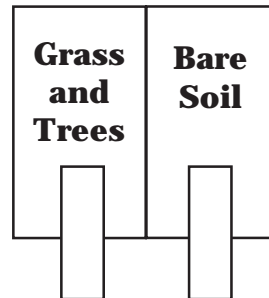
- ✿ Large plastic tubs to create models of hillside slope landscapes (wallpaper trays work well)
- ✿ 1” tubing for drains to simulate streams
- ✿ Silicon caulking or hot glue gun
- ✿ Gravel and sand to create a slope filling the tub
- ✿ Sod, small trees to cover half the slope
- ✿ Leaves and needles
- ✿ Bucket of water to simulate rainstorm
- ✿ 2 pans to simulate lakes
- ✿ Plastic tarp or newspapers
- ✿ Towels, etc. for cleanup
- ✿ Watering can

Procedures

This can be a teacher demonstration activity or students can work in small groups, depending on availability of materials and classroom setup. Optimally, students should create their own landscapes.

Students should record their observations in a journal throughout the process.

1. Fill the tubs and build in a slope with layers of gravel, sand, and topsoil covering entire tub.
2. Landscape one-half of tub with vegetation, covering slope from top to bottom. Leave the other side bare.



3. Pour water over top of slope as quickly and uniformly as possible. Using a watering can helps with this.
4. Collect runoff in drain pans.
5. Record observations.
6. Pour runoff water into clear jars and allow to settle overnight.
7. Record observations.
8. Share and analyze results.

Variations:

Create landscapes with strip plantings as buffers horizontally or diagonally instead of two vertical slopes to illustrate the differences in runoff, and record the observations.

Evidence of Student Understanding

1. Create a picture explaining “Water, Water Everywhere” and the concept of reducing erosion and runoff by planting trees and ground covers.
2. Journal entries

Extensions

Physical Education Activity – follow procedures for **Project WET Just Passing Through** (pp. 166-169). This is a whole body activity investigating “how vegetation affects the movement of water over land surfaces.”

**References/
Resources**

 *Project WET*. Montana State University. Bozeman, MT 59717, <http://www.montana.edu/wwwwet/>

 *Paddle to the Sea* . Holling Clancy Holling (Supplemental Curriculum Activities for Literature integration)

Trees and the Water Cycle

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.2 and A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.1 and B.4.7.
- D. Decision and Action Skills: D.4.6.

Key Concepts/Content

- 🌳 To understand trees, as plants, give off water vapor through transpiration.
- 🌳 To understand plants are an integral part of the water cycle.

Teacher Background

Source: <http://www.newforestsproject.com> select Tree Education and then select Ecology & Trees

Have you ever been walking on a hot day in a field or village and then entered a forest or heavily shaded area? It feels much cooler and even damp!! Why do you think this happens? Trees are often considered natural sponges, which regulate the earth's water supply by holding water. Forest waste matter, such as decomposing leaves or humus, slows down surface evaporation from the soil. Rain first falls on leaves and plants rather than directly hitting the soil, decreasing the rate of water and soil erosion.

Forests help regulate the water in the air through a process called transpiration. They absorb thousands of gallons of water into their roots. The water is carried up through the trunk and into the branches and leaves for food. Excess water is then released through the leaves back into the air.

When the air becomes saturated with enough moisture, clouds form and, if enough moisture is *transpired* into the air, rain will fall. This begins the water cycle all over again.

To see the tiny holes, or stomata, through which leaves transpire water, you must look under a microscope. However, if you wrap a broadleaf plant in clear plastic and place it in the sunlight, in a few hours you will see moisture or condensation clinging to the inside of the bag. The leaves gave off this moisture much like your skin excretes moisture when you perspire.

Getting Ready

1. Visit Missouri Botanical Garden's Website:
www.mobot.org/MBGnet
(you may want to do this with your students)
Go to *What's It Like Where You Live?* and visit the Temperate Deciduous Forest.
2. Find a nearby location with several maple, oak, or other broadleaf trees and obtain permission to use them for this demonstration.
3. Identify the species of trees (so you can answer the students' questions!)

Safety Issues



- ◆ Safety contract (See Appendix)
- ◆ Please respect private property, being careful of plantings, etc.

Materials Needed

- ✿ Plastic bags (clear gallon size, **not** self-closing)
- ✿ Twist ties
- ✿ Journals, pencils, art supplies

Procedures

This should be done on a sunny day, over several hours.
In pairs, students should:

1. Place plastic bags around clusters of leaves. Gather up and close the bag as completely as possible around the cluster or on a branch of the tree.
2. Secure the bag gently with a twist tie, being careful not to damage the tree.
3. After several hours, observe the bag.
4. Record observations.
5. Share and analyze results.
6. Write a description of and illustrate the transpiration demonstration on a journal page. Include an explanation for results observed.

Evidence of Student Understanding

Demonstration discussion and analysis
Journal entries

Sample rubric for activity:

3	Complete water cycle illustrations and written descriptions of transpiration process, showing tree, roots, conductive tissue, leaves, and stomates.
2	Drawings and writings describe transpiration process generally.
1	Incomplete journaling and illustration
0	Not done

**References/
Resources**

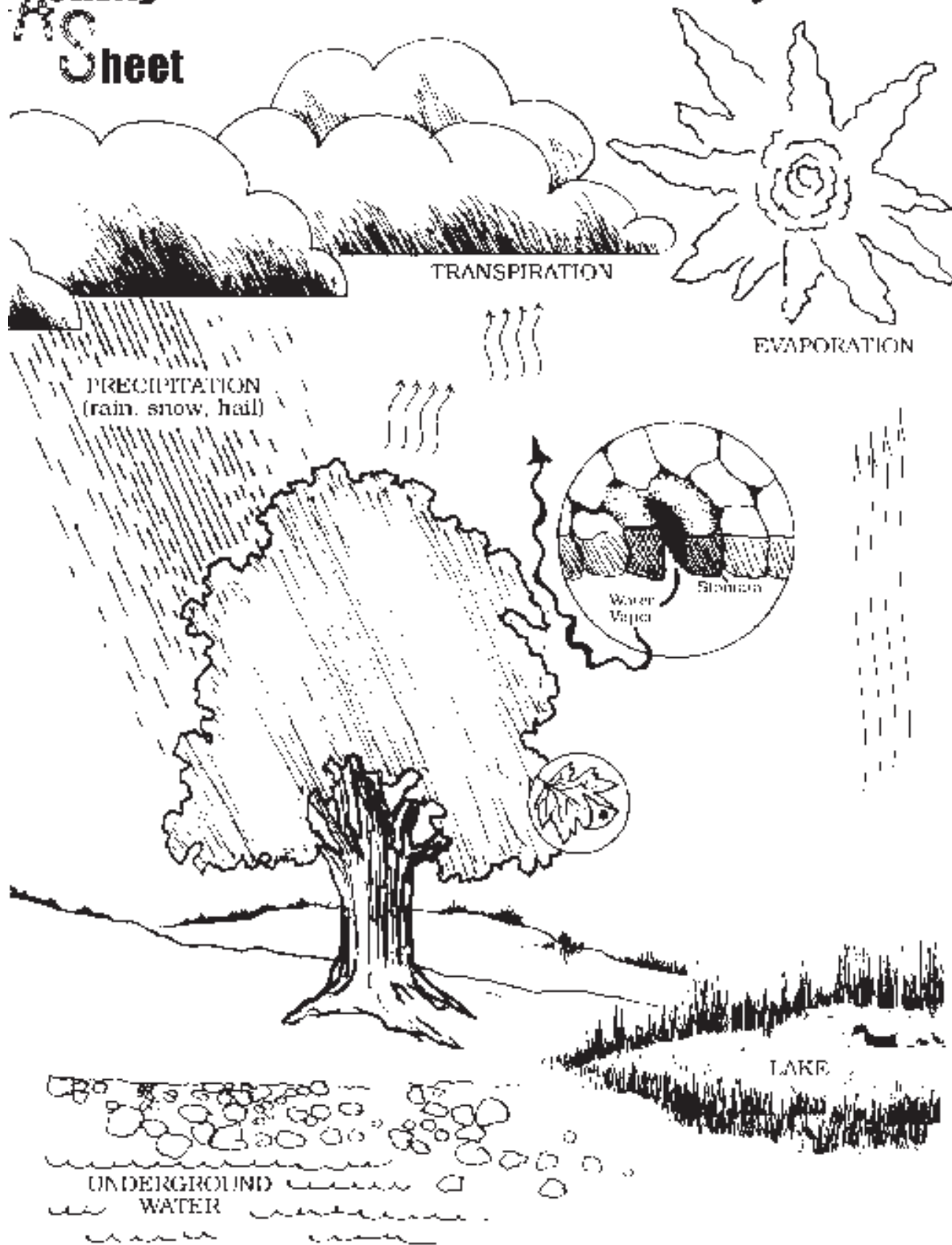
 *Forest and Water: The Green Sponge* DNR publication FR 032 85

 *Project WET*, Montana State University, Bozeman, MT 59717, <http://www.montana.edu/wwwwet/>

 *Trees in the School Grounds: Learning Through Landscapes*, by Rosemary Clark and Peter Walters, See activity “Understanding the Green Machine.”

Activity ASheet

Trees and the Water Cycle



“Leafscapes” an Artist’s View

Standards Addressed

Visual Arts Standard:

C. Visual Design and Production: C.4.5.

Environmental Education Standard:

B. Knowledge of Environmental Processes and Systems:
B.4.1.

Key Concepts/ Content

- 🌲 To know there are thousands of species of trees that share many characteristics and needs.
- 🌲 To appreciate artists and works of landscape art.
- 🌲 To appreciate the esthetic values of forests.

Teacher Background

An artist uses the space in a landscape as sky and land space. A horizon line is where the two meet. Depending upon where the viewer’s eye visualizes the horizon, the space can be varied into more or less sky or land space by placing the horizon line higher or lower across the picture.

Depth is a principle of art and is created in a work of art in many different ways. Simple perspective techniques to create a sense of depth are:

- Size—Make an object larger for it to appear to be closer to us in space and smaller for it to appear to be farther away.
- Overlap—Overlap objects to create a sense of depth by not seeing the entire object that is farthest away.
- Placement—To make an object look farther away, place it closer to the horizon line. To make an object look closer, place it farther from the horizon line.

This activity focuses on trees as part of the landscape. When observing trees ask the students to note the similarities and differences between various types of trees. All trees have roots, a trunk, branches, and leaves or needles. Roots anchor the tree in the ground and absorb water and nutrients

from the soil. The trunk provides support to make the tree stand tall but is flexible enough to bend in the wind. The leaves or needles make food for the tree. Leaves use carbon dioxide from the air, water from the roots, and the sun's energy (in the form of sunlight) to make sugar (glucose). This food-making chemical reaction, called photosynthesis, can take place only in the presence of chlorophyll - the green pigment that is found in all green plants. Chlorophyll absorbs the sunlight needed for photosynthesis. During photosynthesis, leaves release oxygen, which becomes part of the air that animals and other living things need.

The gift of expression through art, photography, and writing can transport us to places we can only imagine. Through the conservation movement and the writing and painting of such notable artists as Thomas Moran, Frederick Law Olmstead, William Henry Jackson and many more came the impetus for the creation of forest reserves and national parks.

The Library of Congress is an excellent information source on the conservation movement in the United States. The following is an excerpt from the American Memory historical collection titled "The Evolution of the Conservation Movement, 1850-1920.

Beginning around the middle of the eighteenth century, European and American literary figures had drawn increasing attention to the importance of nature; by now, in the mid-nineteenth century, travel literature in periodicals and books joins with this Romantic literary legacy to stimulate a broad popular movement of "nature appreciation."

Throughout the remaining decades of the century, the "nature essay" burgeons as an American literary genre.

Throughout the last half of the nineteenth and into the early twentieth century, popular interest in ornithology proliferates through books, articles, and local clubs, providing a grass-roots base for support of many aspects of conservation.

Prints, lithographs and engravings of American scenery, especially in the West, receive wide popular distribution between this decade and the turn of the century, stimulating broad interest in and appreciation for the special qualities of the American landscape, including its wilderness.

As you tour the Library of Congress historical collections perhaps you would like to find out more about the creative Americans who enthralled a nation with the words and pictures of the American West. Would there have been a Conservation Movement without these great communicators?

Please take a look at the Library of Congress for maps, photographs, and drawings about Wisconsin. The website is: <http://lcweb2.loc.gov/ammem/collections/finder.html>
Then select: List All Collections.

Of particular interest are:

- The Evolution of the Conservation Movement, 1850-1920
- Touring Turn of the Century America: Photographs from the Detroit Publishing Company, 1880-1920
- American Environmental Photographs, 1891-1936: Images from the University of Chicago Library
- Panoramic Maps (search for Wisconsin – your town may be listed)

Getting Ready

- Collect leaves and press them. You want a variety of leaf margins (edges of leaf), e.g., oak, maple, willow, spruce, aspen, plus both small and large leaves.
- Collect landscape art prints from famous artists and describe their lives.

Safety Issues



Follow any district guidelines for a field trip.

Materials Needed

- ✿ A variety of pressed leaves
- ✿ 12 x 18 white drawing paper, enough for the entire class
- ✿ Crayons, watercolor paints, brushes, cups for water
- ✿ Photocopies of the journal entry pages (2 per student)

Procedures

1. Introduce students to art prints of landscapes. Lead a classroom discussion about the artists chosen for this activity including a discussion about the aesthetics of the landscape; also lead a discussion about the technical aspects of the landscape, emphasizing the horizon line, sky space, land space, and a sense of depth.
2. Introduce students to simple perspective techniques that an artist uses to create a three-dimensional landscape on a two-dimensional surface.
3. Take students to a school site or park area where trees grow. Have each group of students collect leaves of various sizes, shapes, and color. Ask the students to discuss the similarities and differences among the leaves. Then lead a discussion about the purpose of the leaf and how each leaf might carry out that purpose. Relate that discussion to the discussion about similarities and differences. Create a landscape picture by having the students lay out the leaves creatively. (You might want to tie the discussion about similarities and differences, with that about the purpose for leaves.) Remove leaves to complete the color of the sky and land space with watercolors. When dry, glue leaves onto paper.
4. Conclude with a discussion about the group work. Then relate their leaf scapes to those of the artists chosen for this activity. Option: Instead of a leaf gathering trip, use leaves you have collected, pressed, and saved in the fall and do this activity in the winter.
5. Have students very lightly sketch a horizon line to create the general areas of sky and land space on a journal page.

6. Discuss a variety of tree species, their form, branch shapes and angles, size of leaves, and margins (edges) of different leaves.
7. To create a landscape, have the students look at the leaf margins. Use the margin to trace shapes that will become a landscape/leafscape. For example: an oak edge = low mountains, willows = rolling hills (erase the horizon line once it is established with these hills), maple points = high mountains, and aspen could be small trees (see diagram). Encourage the students to be creative with the margin shapes and their constructed leafscape.
8. Have the students color in their landscape. Glue the leaves they used on the other journal page. Label the leaf types and where it was used in the leafscape, using the terms used earlier in the Tree Identification activity.
9. Conclude with discussion of student work and display.

**Evidence of
Student
Understanding**

This activity is an activity primarily designed to gain an appreciation of art through leaf scapes, so an assessment might not be valuable.

**References/
Resources**

<http://www.pappi.org/paperu/artClass/artClass.htm>

Activity ASheet

Leafscapes

LEAVES TO GATHER, DRY, AND PRESS:

Willow - Get small leaves; they make great tall tree shapes; longer leaf margins (edges) are good for tracing gentle hills

Cedar - use small pieces; make good conifer tree shapes

Northern red oak - sharp points will make good high peaks on mountains

White oak - margins help the students draw lower rounded mountains

Maples - tips can look like the top of trees

Quaking aspen - get small leaves; they make great triangle-shaped trees. Use this exercise to teach the children to observe the different shapes trees have.

Conifer - use the needles on a small branch. Place at the bottom of the drawing. Have the student turn the pencil on the side and rub it over the needles. This will give them a texture that looks like grass. Teach students how to shade this off lighter and lighter as it nears the hills so it will blend into the landscape.



White Oak



Northern Red Oak



Barrens and Butterflies: The Karner Connection

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- C. Environmental Issue Investigation Skills: C.4.3.
- D. Decision and Action Skills: D.4.3, D.4.4, and D.4.6.

Key Concepts/ Content

Students will conduct an issue investigation that is relevant to Wisconsin. In doing so, they will gain the skills necessary to identify and investigate an environmental issue using both primary and secondary sources of information.

- ✱ To analyze an issue by identifying the key players and their perspectives.
- ✱ To collect pertinent data.
- ✱ To analyze data and draw conclusions.
- ✱ To identify possible solutions or actions plans.
- ✱ To gain an understanding of the importance of oak and jack pine barrens in Wisconsin.

Teacher Background

In December of 1992, the Karner blue butterfly was added to the federal list of endangered species. Wisconsin is believed to support most of the remaining Karner blues in the eastern United States and Canada.

The only known larval food plant of the Karner blue is the wild blue lupine. Lupine grows in oak and jack pine “barrens”—communities that depend upon disturbance regimes.

The DNR has been instrumental in trying to help ensure the long-term conservation of the Karner blue butterfly. Its program, the Karner Blue Butterfly Habitat Conservation Plan (HCP), is the first HCP being developed for multiple landowners and land users on a statewide basis. By conserving the butterfly’s habitat, it is hoped that the butterfly will survive and flourish.

Getting Ready

If possible, with your students, take a field trip to see an example of prime lupine habitat. If a trip is not possible, have a representative from one of the groups participating in the HCP come to the classroom to discuss efforts to improve the population of the Karner blue butterfly.

Safety Issues



Elementary Science Safety Contract (See Appendix).

Procedures

Read aloud and discuss the children's book entitled *Miss Rumphius* by Barbara Cooney.

Part 1: Help students conceptualize and carry out an investigation. Possible investigative questions might include:

1. To what extent do residents of Wisconsin feel that a Karner Blue Butterfly Habitat Conservation Plan is important? (opinionnaire)
2. What are the critical variables to successfully propagate wild blue lupine? (experimentation; data collection).
3. How much wild blue lupine vegetation is evident in our area? (physical survey)
4. To what extent do Wisconsin residents feel that it is necessary to provide incentives to private landowners who follow recommendations proposed in the Karner Blue Butterfly Habitat Conservation Plan? (opinionnaire)
5. To what extent do Wisconsin residents feel that it is necessary to provide incentives to businesses who follow recommendations proposed in the Karner Blue Butterfly Habitat Conservation Plan? (opinionnaire)

Part 2: In carrying out their investigation of the Karner blue butterfly, students should:

- 1) identify and investigate the issue using both primary and secondary sources of information. Note: Primary and secondary sources of information are listed in the “Resources” list below.
- 2) analyze the issue by identifying the participants and their perspectives
- 3) collect pertinent data
- 4) analyze data and draw conclusions
- 5) identify possible solutions or action plans

**Evidence of
Student
Understanding**

Rubric for Environmental Education Research
(One possible rubric for evaluating student research skills)

Task: Make a list of research materials relevant to your research topic.

The librarian or media specialist in your school can be of assistance here. Look for readily available resources, such as books, magazines, newspapers, and journals.

In addition, make a list of several people you might interview about this topic. These people could be public officials, instructors at a local college or university, newspaper writers, or other people who have special knowledge in the field you want to research. You may be able to phone or write letters to people who are far away, or ask them questions by e-mail.

Finally, find at least two internet sites that you might also use in your search for information.

Prepare a documented list of all your sources.

Scoring Guide—

4	Exemplary: The list includes over one dozen different sources and represents a wide variety of research resources, including books, magazines, newspapers, journals, internet sites, and persons to interview. Each item on the list includes complete information so that another researcher could easily find the item. The list of potential interview subjects includes each person's full name, address, and telephone number. Each item on the list appears to be clearly related to the topic.
3	Proficient: The list includes at least one dozen different sources. There are minor omissions in information for the reference list, but there is enough information so that another researcher can easily find each item on the list. Each item on the list appears to be related to the topic.
2	Progressing: The list has between 6 and 12 sources. The list does not contain significant resources for some important aspects of the topic. Some of the items on the list do not appear to be related to the topic.
1	Not meeting the standards: The list has fewer than 6 sources, is incomplete, or contains sources that are not closely related to the topic.

During the investigation students can be assessed on their ability to:

- 1) identify and clearly state environmental issues. An environmental issue arises when individuals or groups hold opposing points of view on how the problem should be corrected. Students should be able to make a clear statement of an issue.
- 2) analyze the issue by identifying the key players. People have opposing viewpoints on issues because they possess different value orientations. Students should be able to identify these viewpoints and the value perspectives they represent.
- 3) use primary sources of information. Students should be able to differentiate between surveys, questionnaires, and

opinionnaires. In addition, they should be able to select a sample population and identify an appropriate data collection strategy.

4) use secondary sources of information. Students should be able to write letters, interview experts, use library and media reference systems, and record notes on information obtained.

5) analyze data collected from both primary and secondary sources. This includes formulating logical conclusions, inferences, and recommendations based on data; graphing; communicating; and revising recommendations in light of new data.

6) Identify possible action plans.

References/ Resources

📖 Bleser, Cathy. 1995. *Recommendations for Conducting Wild Lupine Surveys*. Wisconsin Department of Natural Resources, Bureau of Endangered Resources. (Bleser's paper describes, in detail, survey options and techniques for finding/mapping wild lupine.)

📖 Rabuck, Jennifer. 1996. *Listening to the Lupine: A Habitat Conservation Plan*. Northbound, Volume 16, Number 3: 4. (Rabuck's article gives a detailed description of the Habitat Conservation Plan for the Karner blue butterfly, including goals and management strategies.)

📖 Wisconsin Power and Light Company in cooperation with the Wisconsin Karner Blue Butterfly Habitat Conservation Plan Partners. 1996. *Karner Blue Butterfly: Partners in Protection*. (This brochure includes pertinent information about the Karner blue. Especially important is a Wisconsin map, which depicts high potential Karner blue butterfly habitat).

📖 *Miss Rumphius*, by Barbara Cooney, The Viking Press, New York, 1982

- 📖 *Big Plans for a Little Butterfly* (pages 17-20)
Wisconsin Department of Natural Resources magazine,
June 1999, Bob Welch, Waupaca Field Station, E110
Emmons Creek Road, Waupaca, WI 54981
Note: Bob Welch and his high school students have
worked with the Karner blue butterfly and restoration of
oak savannas in central Wisconsin.
- 📖 DNR's website: <http://www.dnr.state.wi.us/org/land/er/info.htm>
- 📖 *Endangered Species of Wisconsin: Karner Blue Butterfly*
U.S. Fish and Wildlife Service, Green Bay Wisconsin Field
Office, 1015 Challenger Court, Green Bay, WI 54311
- 📖 *Karner Blue Butterfly Habitat Conservation Plan*
(Copies of the plan are available through the Wisconsin
Department of Natural Resources Bureau of Endangered
Resources)
- 📖 *Rare Species Fact Sheet: The Karner Blue Butterfly*, U.S.
Fish and Wildlife Service, New England Field Office,
400 Ralph Pili Marketplace, 22 Bridge Street,
Concord, NH 03301

Barrens and Butterflies

The Karner Connection

NAME THE PARTS OF A BUTTERFLY

Below is a picture of a Karner Blue Butterfly on its food source, the lupine flower stalk.

Draw a pointer to and label these parts:

1. Antenna
2. Head
3. Forewing
4. Hindwing
5. Thorax
6. Compound Eye
7. Abdomen
8. Proboscis*

Did you know?

All insects have a head, thorax, and abdomen.



* The proboscis is a mouth part that functions much like a straw for the butterfly. When the butterfly feeds, it uncurls the proboscis out and sucks up the nectar from the lupine. When not in use, the proboscis pulls up tightly in a spiral.

Design an Urban Schoolyard Forest

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.4, B.4.5, and B.4.8.
- C. Environmental Issues and Investigation Skills: C.4.3, C.4.4, and C.4.5.
- D. Decision and Action Skills: D.4.2 and D.4.3.
- E. Personal and Civic Responsibility: E.4.1 and E.4.2.

Key Concepts/Content

- 🌲 To understand the term soil.
- 🌲 To know the role of trees in the earth's ecosystems in our urban environment.
- 🌲 To know how to develop a learning laboratory for forest and ecosystem study in an urban environment.

Teacher Background

All forests have layers; the uppermost is the canopy where most of the photosynthesis occurs. The understory is the shrub layer, made up of smaller and younger trees. The forest floor provides nourishment for the forest as the decomposers create humus among the ferns, small plants, mosses, etc., that grow in the low light regions.

A forest is established in stages through a process called succession. Open meadows allow shrubs and small trees to start growing. As these trees grow, a young forest is formed. Mature forests support many diverse plants and animals. Old forests contain dead trees as well, supporting the species adapted to this niche.

The contribution of the forest to earth's cycles is important. The amount of carbon dioxide removed from circulation by the forest is roughly proportional to the volume of wood in the trees. The roots of the forest hold the soil, preventing erosion and water pollution by sedimentation.

There are many kinds of forests. In northern Wisconsin we have *boreal forest* (containing mostly conifers like balsam, spruce, fir, and other needle leafed trees that have adapted to a short growing season and cold winters). South of the boreal forests grow the *temperate deciduous forests* (containing some conifers and many deciduous trees).

The type of urban schoolyard forest you create depends on many factors including the soil conditions and type of plants already growing there. Although it may not be an old growth forest your urban schoolyard forest can still be a stimulating environment to learn about what makes up a forest, succession, and the benefits forests provide to the water and air cycles.

Getting Ready

- Visit the National Wildlife Federation's website and review *Why Create a Schoolyard Habitats Site?* www.nwf.org/habitats/schoolyard
Another good site to visit is: www.newforestsproject.com.
Go to >Tree Education and then to >Ecology & Trees.
- Walk and roughly map the school campus. If no trees exist, determine a possible place to create a green space with the layers of the forest. Enlist the support of school staff and administration prior to classroom presentation. Visit the Minnesota Arbor month website for an activity called "Loggin In: A Closer Look at your School Grounds" which outlines a procedure for assessing and improving your school grounds as an outdoor classroom. The website can be found at: www.startribune.com
Go to > for teachers then to > classroom activities then to > Arbor Day is Every Day.
- Parents and volunteers help with supervision and the work. This activity will make a community project.

Safety Issues



- ◆ Use the safety contract in the appendix or one you have developed.
- ◆ Be aware of traffic patterns when choosing the site. Instruct parent volunteers in safety and school policies.

Materials Needed

- ✿ Journals, for recording the process.
- ✿ Pencil, paper, markers, etc., for students' mapping of the school grounds.
- ✿ Shovels, tools for removing paving, and hand tools for planting
- ✿ Plants. Suggested species for attracting birds and wildlife include basswood, beech, birch, burning bush, bitter-sweet vine, blueberry, dogwood, elder, grape vine, hawthorne, juniper, linden, maple, mountain ash, oak, poplar, plum, redbud, rosa rugosa, raspberry, sand cherry, serviceberry (shadbush), strawberry, viburnum, virginia creeper, white ash, white spruce.
- ✿ Water source

Procedures

Option 1

1. Read aloud *A Tree in a Forest* (or other books creating interest in forest ecosystem.)
2. Brainstorm plant and animal species you would find in a forest. (Reference: *Eastern Forests*, National Audubon Society)
3. Discuss the terms interrelationships and ecosystem.
4. Have students do research on "What is a forest."
5. If possible, visit a park or a forest and while there create a photo collage or drawing.
6. Share forest writings and drawings with each other, another class, or community members.

Option 2

1. Ask groups of students to do research on possible uses for the school's green space, including how could we use this green space to simulate a forested area? Ask the students to consider inviting a forester or naturalist, or a parent to the class to discuss possible uses for the green space.
2. Ask other groups to conduct research on what will be needed to prepare the area for planting.
3. Have each student complete a yearlong journal about the project. In pairs or other small groups, map the school's green space.
4. Create plans for planting trees in varying heights to model the layers of a forest on the school grounds.
5. Enrich soil with compost, peat moss, shredded leaves, etc., to provide humus. Follow instructions for planting a tree (see Activity Sheet for Planting a Tree).
6. Plant trees, shrubs, vines, and ground covers to model the forest.
7. Continue to water and enrich the soil with fallen leaves and compost.
8. Install birdfeeders for year-round feeding to attract bird species.
9. Mulch for winter protection.

Evidence of Student Understanding

Ask the students to periodically evaluate their own personal journal using criteria that you have established with each student. One such criterion might be neatness of handwriting or use of complete sentences, or even keeping a list of the knowledge gained from the project.

**References/
Resources**

- 📖 *Once There Was a Tree*, by Natalia Romanova, Dial Books, 1985.
- 📖 *A Tree in a Forest*, by Jan Thornhill, Simon & Schuster, 1992.
- 📖 *Eastern Forests*, Knopf, National Audubon Society, 1987.
- 📖 *Trees in the School Grounds: Learning Through Landscapes*, by Rosemary Clark and Peter Walters, Southgate.

Planting a Tree

Planting a Tree

1. Choose a good spot for your tree. Don't forget its ADULT size.



2. Keep your roots moist all the time. Dry roots die.



3. Dig a hole large enough to spread the roots apart. Check for underground utility lines first!



4. Plant the tree at the right depth. (See "How Deep?") Gently add loose soil.



How Deep?



5. Add more soil and firm with foot.



6. Mulch with wood chips.



7. Water regularly. Wait for shade!



Robin Warmup Exercise

One of the best examples of wildlife to observe throughout Wisconsin is the American robin, *Turdus migratorius*. Did you know that the robin is the state bird of Wisconsin? School children actually picked the robin in 1926 during Arbor and Bird Day. Every county in the state voted for the robin, except Sheboygan County which voted for the eastern bluebird. Wow, kid power in action!

Use the robin activity sheet as an example of observing a natural community and interdependence. Try to get your students to observe from the sky to below the ground. Remember the robin is dependent on many things that you might only see by digging in the ground or looking through a microscope.

All living things need:

1. Food
2. Water
3. Shelter
4. Space

Fun questions about robins:

A robin walks on the ground in a very distinct way. Have your students demonstrate the robin walk.

Robins eat a lot of worms. Observe robins on a lawn and notice how the robins tilt their heads to the side. Are they looking for worms or listening for worms?

Answer: Listening mostly but when the worms rise to the surface after a rain, eyesight probably takes over as the more important sense.

What other food do robins eat besides worms?

Answer: Insects, fruits and berries

Name some predators of robins.

Answer: Sharp-shinned and Cooper's hawks, raccoons, and cats. Predators can prey on unhatched eggs, young robins in the nest, or mature robins on the ground.

How does a robin find a mate?

Answer: Singing and showing off

Do robins have territories?

Answer: Yes and they announce their territory by singing.

Do robins migrate?

Answer: Most robins migrate to the southern United States and Central America. Some robins will remain in Wisconsin if their needs for food, water, shelter, and space can be satisfied. You will see winter robins feeding on insects and berries along lowland areas.

How can I tell the difference between male and female robins?

Answer: Males have a black head and females have a grey head but both have that famous red breast.

Other fun bird ideas:

Visit the Audobon society, participate in the Christmas bird count, set up a bird feeder, or visit a cool website at The Raptor Center at the University of Minnesota
<http://www.raptor.cvm.umn.edu>

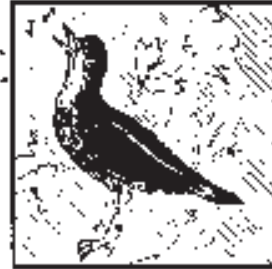
Activity ASheet

Design an Urban Schoolyard Forest

The robin uses the top of the tree and sky for singing and general showing off *



Hiding from predators



SKY

CROWN CANOPY

Sleeping



How does the ecosystem supply your needs ??



Nesting

FOLIAGE



Gathering seeds from tree



TRUNK



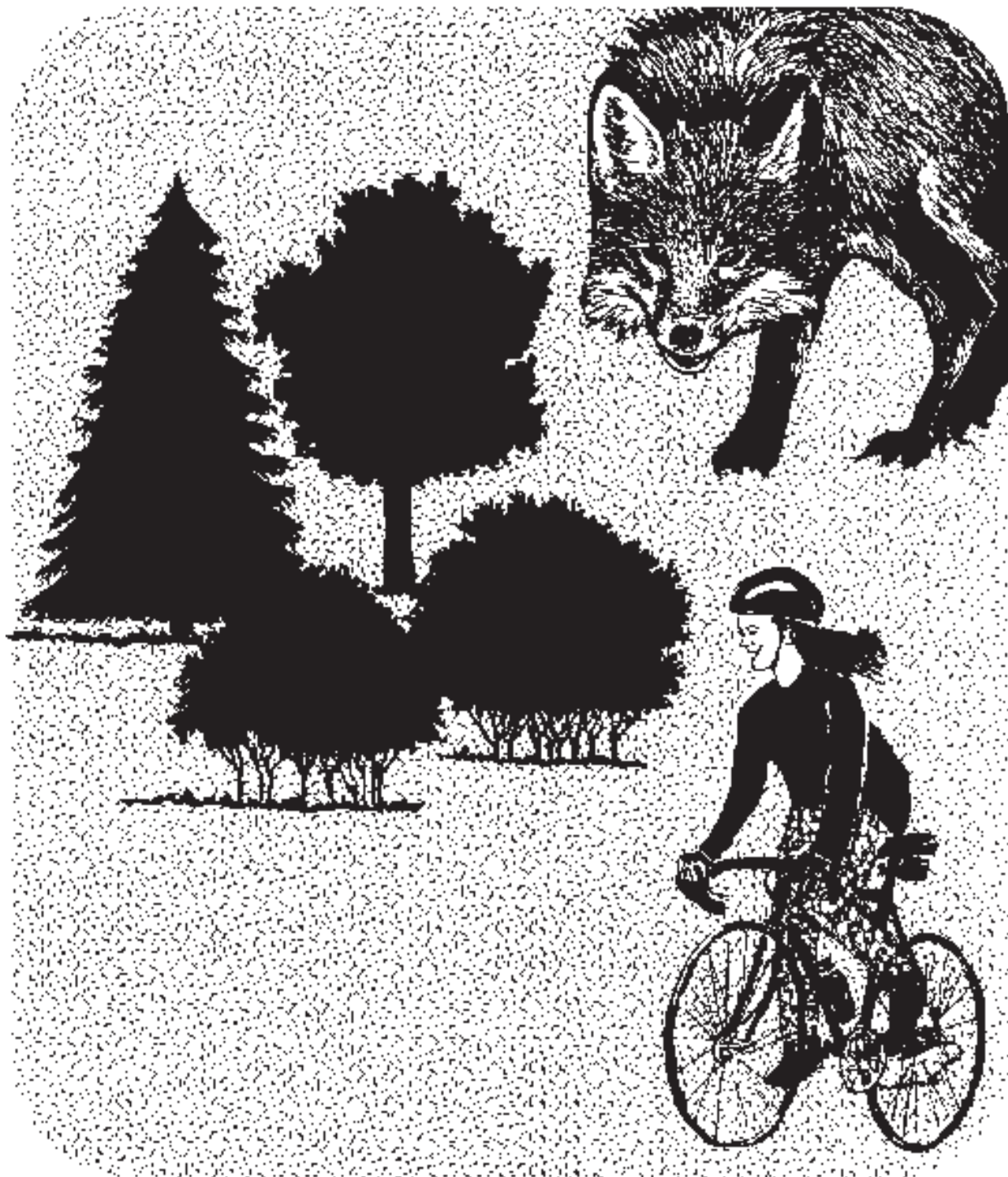
Leaf litter reveals a tasty bug *

Oops! Wrong time to take a peek !



TURF

Sustaining the Forest for Present and Future Generations



Sustaining The Forest For Present And Future Generations

“We have not inherited the Earth from our forebears, we have borrowed it from our children.” – Indian proverb

The fundamental notion of sustainable forestry is that what we do today effects our children’s options in the future. A new generation must be educated to carry on the work of understanding forest ecosystems and provide scientific information to enable citizens to make wise choices about forests and streams.

Aldo Leopold was a scientist with a love of the land. He wrote the *Sand County Almanac* which was printed 50 years ago about his outdoors experiences especially in Wisconsin.

“We abuse land because we regard it as a commodity belonging to us, when we see land as a community to which we may belong, we may begin to use it with love and respect.”—Aldo Leopold

Sustainable forestry is both a local and a global issue. It is important for your students to learn that resource decisions in Wisconsin can have impacts across the country and around the world. The following activities can also help students realize that their individual actions affect how our natural resources are impacted.

“Where in the World are the Forests?”

“So You Want to be a Forester”

“Consumer Choices and Consequences: Understanding the 3 R’s (Reducing, Recycling, Reusing)”

“Forest Issues Project”

“ABCs of Forestry”

“Forest Fact and Fiction”

These final two activities can help students summarize what they’ve learned throughout this unit. Above all, we want children to enjoy the outdoors and see its beauty.

Where in the World Are the Forests?

Standards Addressed

Environmental Education Standard:
A. Questioning and Analysis: A.4.2 and A.4.3.

Key Concepts/Content

- ✳ To increase the students' global awareness of the location and importance of forests.
- ✳ To use map skills locating and labeling the temperate deciduous forests, temperate rain forests, tropical rain forests, taiga (boreal) forests, and mountains.

Teacher Background

Biomes or bioclimatic zones describe regions around the world where organisms have adapted similarly in response to the climate, soils, landform, and geology.

Recognized terrestrial biomes include:

Desert: In general, deserts have high temperatures and annual precipitation less than 50 cm per year. Deserts cover about 20% of the earth's surface. In the United States deserts are found in Arizona, California, Utah, and New Mexico. Deserts are also found in Africa (Sahara), the middle east (Saudi Arabia *et al.*), China, and Australia. Vegetation is adapted to conserve water and endure high temperatures. This is the land of the cactus, sagebrush, rattlesnake, and burrowing animals.

Steppe or grassland: Grasslands are dominated by grasses rather than shrubs or trees. The Great Plains and prairies in the United States generally cover from Illinois west to the Rocky Mountains and north from Texas into Canada. Average annual rainfall is 20-35 inches. This is the land of the bison and prong-horned antelope.

Tundra: The coldest of all biomes meaning treeless plain. The tundra circles the northern hemisphere from the Arctic Ocean to the coniferous forests of the taiga. Precipitation is limited to less than 10 inches annually. This is the land of the caribou, lemming, arctic fox, wolves, and polar bears. Reptiles and amphibians are few because of the cold.

Taiga (Boreal) forest: Like the tundra, the taiga or boreal forest circles the northern hemisphere south of the tundra. This is the home of the spruce and fir coniferous evergreen forests. It is an area of harsh winters and the plants and animals are adapted to a short growing season. Many animals migrate to the boreal forest in spring and return south in the fall.

Temperate deciduous forests: Wisconsin is in the heart of the temperate deciduous (broadleaf) forest. This is the great hardwood forest containing maple, birch, aspen, oak of the **eastern** United States and Canada. Summers are warm and winters are cold with snowfall. These are the forests that give the blaze of red, gold, and brown color in the fall. Many of the birds migrate to warmer temperatures in the southern United States and South America. Black bears, wolves, deer, and an abundance of waterfowl can be found in this biome.

Mountain forests: In the **western** United States, Mexico, and Canada the forest is also temperate but consists of conifers such as pines, larch, and Douglas-fir. These forests are found in the Rocky Mountains, the Cascades of the northwest, the Sierra Nevada of California, and the dry forests of the southwest and Mexico. This is the land of elk, grizzly bear, trout, and most of our national forests and parks. Note: On the internet site for the Temperate Forest Foundation forest - zones, the map does not break out the mountain forests as a separate zone. Please make sure your students understand that the western forests are mostly evergreen and coniferous while the eastern forest is mostly broadleaf and deciduous.

Temperate rain forests: In North America, a thin sliver of land along the coastal range from California to the panhandle of Alaska is home to a temperate rain forest. This is the land of the redwood, Sitka spruce and coastal streams

filled with steelhead and salmon. Fog is persistent throughout the year and rainfall exceeds 100 inches per year. The temperature is always cool because of the marine influence.

Tropical rain forests: From the Yucatan peninsula in Mexico through Panama lies the central American rain forest. This forest is evergreen and receives moisture throughout the year. The canopy of the forest is multilayered and the soils lack nutrients and organic matter because of rapid decomposition. The tropical rainforest also receives over 100 inches of rainfall each year but the temperature is always hot because of the proximity to the equator.

Please have your students visit the Temperate Forest Foundation for a simple yet comprehensive map of the world's forested regions. You can find the website at <http://www.forestinfor.org/>

Select: Cool Facts

Then select: Forest Zones

The nonforested land on the map will be grey/white in color and tundra is the northern-most biome. The grey/white area of northern Africa is the Sahara desert. The Saudi Arabian peninsula is also desert. The rest of the grey/white areas are smaller deserts and the Great Plains in North America or the steppe in central Asia.

A key point is much of the inhabited world is forested and the same type of forest can and does occur all around the Earth.

Ask your students to compare biomes for climate, plants, animals, or physical geography.

Getting Ready

Assign students to work in cooperative groups and divide the students into groups as needed for the areas of the work being investigated in the activity. You must decide if this activity should be limited to a part of the world such as North America or a specific continent, or perhaps even to

just the state of Wisconsin. Be sure to provide the type of maps your students will need for this activity.

The activity is written so your students can investigate the locations of forests using the entire world. You will need to modify the procedures if you are going to have your students work with a more specific map.

Materials Needed

- ✦ Activity sheet of North America
- ✦ Colored pencils or crayons
- ✦ Descriptions of the forests

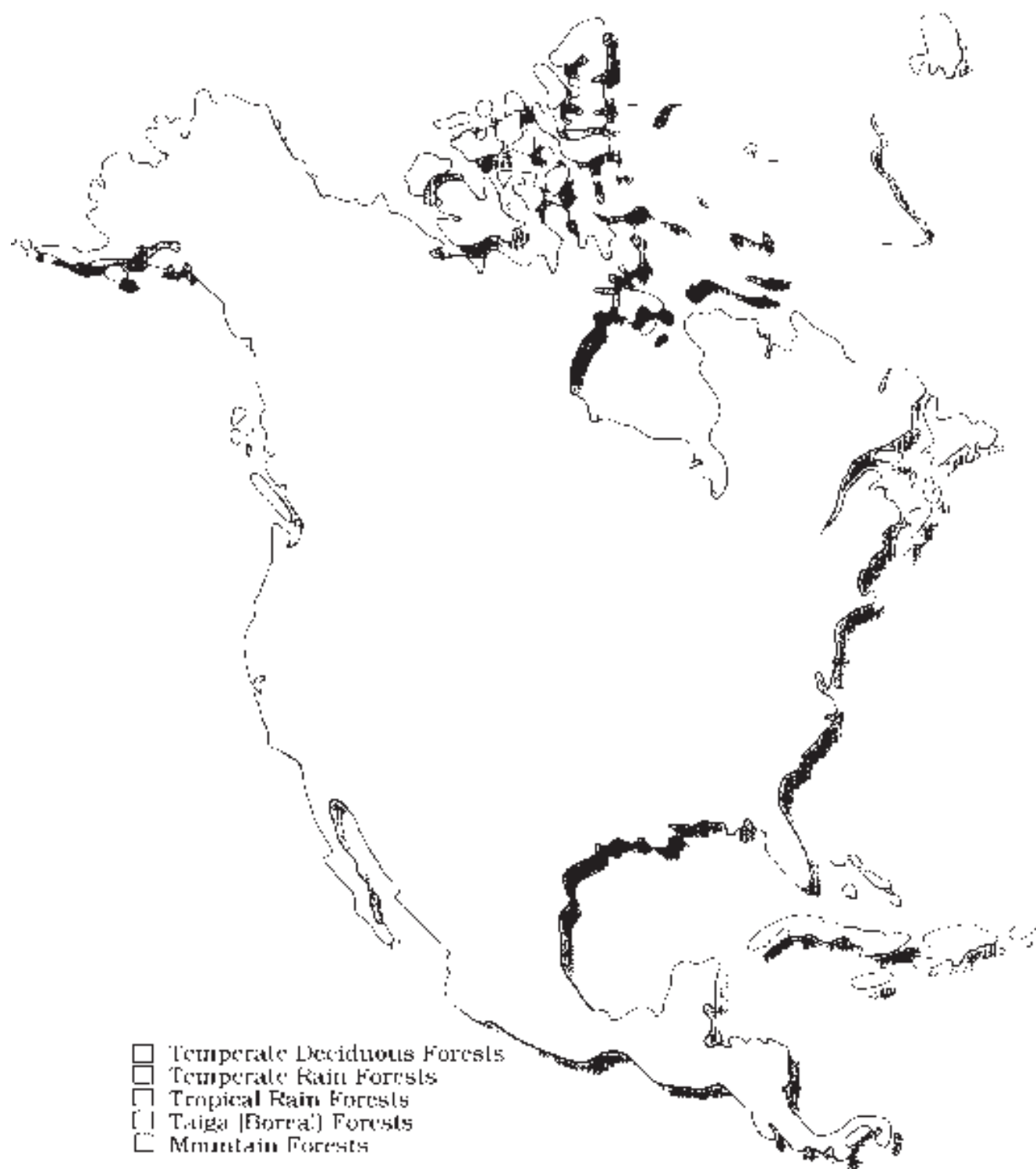
1. Students will be assigned to groups that will research the location of forests on their assigned continent.
2. They will create a map that shows the location of the forests on their continent. They may use the outline maps that you have provided or create the map on large posterboard.
3. Groups will report back to the class the location and types of forests found. The maps can be displayed together to create a view of the world. (You might want to have the students develop a large-scale map for general classroom use and display.)
4. Students will complete individual world maps that include the location of the temperate deciduous forest, temperate rain forests, tropical rain forests, taiga (boreal forests), and mountains.

Evidence of Student Understanding

Develop a rubric with the students for assessing the world maps they will each complete.

Activity ASheet

Where In The World Are The Forests ?



So You Want To Be A Forester?

Standards Addressed

Environmental Education Standards:

B. Knowledge of Environmental Processes and Systems:

B.4.11.

Key Concepts/Content

🌲 To better understand the roles of a forester.

🌲 To investigate the knowledge needed to be a forester.

🌲 To know what one needs to do to pursue a career in forestry.

Teacher Background

To be a forester, you generally must have a college degree from a school offering professional forestry education. The University of Wisconsin at Stevens Point and Madison offer such a degree. There are many disciplines related to forestry also. These include specialty jobs such as forest entomologist, researcher, forest pathologist, or soil scientist.

The Society of American Foresters (SAF) is the national scientific and educational organization representing the forestry profession in the United States. Founded in 1900 by Gifford Pinchot, it is the largest professional society for foresters in the world. The mission of the Society of American Foresters is to advance the science, education, technology, and practice of forestry; to enhance the competency of its members; to establish professional excellence; and, to use the knowledge, skills, and conservation ethic of the profession to ensure the continued health and use of forest ecosystems and the present and future availability of forest resources to benefit society.

The Society of American Foresters lists over 700 job categories and nearly 14,000 separate employers among its members. Most forestry positions in the federal government are with the U.S. Forest Service, but opportunities also exist with other agencies, such as the Bureau of Land Manage-

ment, the U.S. Army Corps of Engineers, the Soil Conservation Service, and the National Park Service. Other forestry positions can be found with state natural resource agencies, private industry, and as an independent consultant.

Beginning salaries in forestry are comparable with other resource-based professions. Advancement opportunities are readily available, depending largely upon individual initiative and capability.

Forestry is a dynamic occupation that is constantly changing. Therefore, foresters need to be aware of new techniques in forestry, products, and equipment that are constantly being developed.

Getting Ready

Ask a forester or forest technician to come into your classroom to discuss his/her career. The list of references contains information on how to contact a forester.

There are many aspects of forestry so your guest speaker's presentation might be geared to the interests of your students; some considerations include: 1) Industrial forester, unit manager for a pulp and paper company; 2) District ranger in a national forest; 3) DNR forester; 4) Consulting forester (provides specialized services to private landowners); 5) Urban forester (inventories street-side and park trees to aid the city forestry department in a systems approach to managing the urban forest and fire protection); 6) Forest geneticist (selects, tests, and develops new trees for better quality, faster growth, and resistance to insects and disease); or 7) Forestry technician (supports foresters in caring for the forest).

Safety Issues



- ◆ None specific to this activity.
- ◆ Elementary Science Safety Contract (see Appendix).

- Materials Needed**
- ✦ You may want to obtain *So You Want to be a Forester* (see the reference section in this activity).
 - ✦ Bulletin board or butcher paper; poster paper; magazines that contain pictures of forestry-related occupations; index cards with one forestry-related occupation listed on each card (for charades).

Procedures

Use a strategy such as the KWL (Know-Want to Know-Learned) strategy to find out what students know about forestry. Possible questions to use might include: What is forestry? What do foresters and forest technicians do? What does one need to do to pursue a career in forestry?

The KWL strategy is used throughout this procedure.

KWL Information

KWL asks students to record what they know and what they want to know about a topic at the beginning of a unit.

KWL sequence:

Divide a piece of chart paper into three columns: K W L

Ask the group to share what they already know about the topic and jot ideas in the K column. The group then categorizes the items under the K.

Next ask the group what they would like to know about the topic and jot their remarks down in the W column. The group then categorizes items under W.

After the activity, ask the group to reconsider what they have under the K.

1. Invite a forester to come to the classroom to discuss his/her career.

2. Using a graphic organizer, review key concepts. Then add additional information to the KWL chart. Did students discover that any of their initial ideas were inaccurate?
3. Research early foresters in Wisconsin and report on their lives, challenges, and achievements.

Extensions to the activity:

1. Working in teams, ask student groups to identify key individuals who are foresters and write about his or her career. One individual might be the Chief State Forester for the Department of Natural Resources.
2. Ask students to develop a timeline about the changes in the forest profession in Wisconsin.
3. Play charades with the class and act out forestry-related occupations for teams to guess.
4. Make a collage of people working in forestry-related jobs (forest ranger, sawmill worker, game warden, paper mill worker, nursery worker, etc.)
5. Ask students to draw or trace each other. Their life-sized figures should be traced or drawn on bulletin board or butcher paper. Then ask students to “dress” themselves in the clothing or uniform appropriate to their chosen forestry career.
6. Make posters representing forest-related jobs.

**Evidence of
Student
Understanding**

You can use the “Student Re-Teach” strategy to assess student learning. The strategy is done by having students teach newly learned concepts, skills, and processes to another student or group of students of the same or different grade level.

References/ Resources

- 📖 *So You Want to be a Forester....*, Society of American Foresters, 5400 Grosvenor Lane, Bethesda, MD 20814-2198.

- 📖 SAF website: <http://www.safnet.org/about/careers.htm>
Getting started in forestry and link to a list of accredited forestry schools in the U.S.

- 📖 Teachers may be interested in participating in a forest resource education workshop. Such workshops are offered by:
Wisconsin Forest Resources Education Alliance (WFREA);
6343 Highway 8 West, Rhineland, WI 54501. Call toll-free: 1-888-WFREA-64. Website: <http://www.wfrea.org>.

- 📖 *Trees for Tomorrow*, P.O. Box 609, Eagle River, WI 54521, phone: (800) 838-9472.

Consumer Choices and Consequences: Understanding the 3 R's (Reducing, Recycling, Reusing)

Standards Addressed

Environmental Education Standards:

- B. Knowledge of Environmental Processes and Systems:
B.4.8, B.4.9, and B.4.10.
- D. Daily Lives: D.4.1, D.4.2, and D.4.3.
- E. Personal and Civic Responsibility: E.4.1 and E.4.2.

Key Concepts/ Content

- ✳ To understand how students, as consumers and decisionmakers, impact the marketplace with their need for goods and services.
- ✳ To understand students needs may change over time and may impact both the environmental quality and the availability of natural resources.

Teacher Background

You may obtain information about recycling in Wisconsin using the information listed in the Resource and Reference section of this activity.

Before you begin this unit, it will be helpful if you ask the following environmental issues questions about various products:

- Do we need it?
- Is it renewable?
- Is it recyclable?
- Is it durable?
- How much energy was needed to make it?
- What is the total environmental impact?
- Did we look at all available options?
- Is precycling a consideration with this purchase?

(Precycling means reducing waste *before* you buy.)

Detailed background information can be gleaned from reviewing the video, *Circle of Life*.

Getting Ready

Option 1

Consider sharing the video listed above with your students. Then have students brainstorm and discuss ways that they can make a difference. The book, *50 Simple Things You Can Do To Save The Earth*, can be used to help guide the students' discussion.

Option 2

Ask the students to do research on paper recycling in Wisconsin.

Materials Needed

Option 1

✿ A variety of different types of packaging

Optional materials:

✿ *Circle of Life* video (see resource list).

✿ *50 Simple Things You Can Do To Save The Earth* (see resource list)

Option 2

✿ Garbage bags, one for each student

Procedures

Option 1

1. Ask students to bring examples from home to share:
 - Recycled material
 - Biodegradable material
 - Recyclable material
 - Renewable resource
2. Review key terms with students: renewable, durable, recyclable, precycling, biodegradable. After reviewing the key words, have students sort or categorize the materials that they have brought to share, using the categories listed above.
3. Ask the students questions about the various categories and then divide the students into groups, assigning each group a category. Ask the students to make observations about each category and present their observations about each category to the class.

4. Focus your final discussion on the products that did not fit into any category; what must be done with those products?

Option 2

1. Ask the students to begin collecting their own used paper. You may want them to do this for a couple weeks.
2. Give each a garbage bag to store the paper in.
3. Ask them to keep a journal or list explaining why the paper was thrown into the garbage bag.
4. You may even want to ask the students to decorate their own bag.
5. At the end of the collection time, ask the students to begin orally listing why they threw out their own paper.
6. Are there any patterns that exist in their throwing paper away?
7. Ask each student to journal about what each can do to “conserve” the use of paper.

Extension:

Direct students to plan an “ecological picnic” using a minimum of disposable items. Go on the picnic. Afterwards have students sort and recycle as much of the picnic garbage as possible. (This activity is adapted from *The California State Environmental Education Guide*. It reinforces the idea that students can make personal choices about their actions. In this case they will be making choices that will minimize the amount of waste generated by a class picnic. After the picnic students will collect the garbage that remains and recycle or compost what they can.)

**Evidence of
Student
Understanding**

Choose one of the following assessment tasks:

Option 1

Display different types of “packaging” on a front table. Have students sort the items using the following categories: 1) Made of recycled material; 2) Biodegradable; 3) Recyclable; 4) Renewable Resource. Students should explain their rationale or reasoning after sorting the items.

Ask each student to create a “Personal Code of Consumer Ethics.” The code should take into consideration daily consumer actions that are harmful to the environment and those that are beneficial. The students should consciously create the code based on actions they believe are beneficial, or at least not harmful, to elements of the environment. We will always have some impact. We can make choices about the kinds of impacts we make, their effectiveness, etc.

(Adapted from *Project Wild* “Enviro-Ethics” website: <http://www.dnr.state.wi.us/kidstuff.html>).

Option 2

Ask each student to self-evaluate his or her own need to conserve paper. Have them then develop a self-rating scale each will use to monitor their paper conservation. Ask each then to write about what they have learned about themselves from this project.

**References/
Resources**

📖 *Project Learning Tree: Environmental Education Activity Guide* (Pre K-8), Project Learning Tree, 111 19th Street NW, Washington, DC 20036.

📖 Video: *Circle of Life*, Temperate Forest Foundation, 14780 S.W. Osprey Drive, Suite 355, Beaverton, OR 97007.

📖 *50 Simple Things You Can Do to Save the Earth*
The Earthworks Group, Berkeley, CA, 1989.
(Ordering Information: Earthworks Press, Box 25,
1400 Shattuck Avenue, Berkley, CA 94709).

Forest Issues Project

Researching Local Environmental Forest Issues

Standards Addressed

Science Standards:

- A. Science Connections: A.4.1 and A.4.3.
- B. Nature of Science: B.4.1.
- C. Science Inquiry: C.4.2, C.4.3, C.4.5, C.4.6, C.4.7, and C.4.8.

English Language Arts Content Standards:

- B. Writing: B.4.1.
- F. Research and Inquiry: F.4.1.

Social Studies Content Standards:

- A. Geography: People, Places, and Environments: A.4.4, A.4.5, A.4.8, and A.4.9.

Environmental Education Content Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- C. Environmental Issue Investigation Skills: C.4.1, C.4.2, C.4.3, C.4.4, and C.4.5.

Key Concepts/Content

- 🌲 To use research skills.
- 🌲 To investigate local forest issues.
- 🌲 To analyze research findings.
- 🌲 To synthesize and present research findings.
- 🌲 To make connections between classroom learning and the outside world.

Getting Ready

Prepare student journal pages for each student. Also include student directions and grading rubric.

Send parent letter home.

Arrange for local community leaders to visit in order to help brainstorm local issues, provide information to students,

and provide names of people to interview and places to look for resources once students have selected their issue. These local experts can also help students brainstorm lists of questions to research. Such local experts can include university professors, city council members, local activists, local newspaper reporters, and concerned parents.

Teacher Background

Solving environmental problems and issues requires skills in environmental investigations. These skills, in turn, provide students with opportunities to apply and improve their capacity for systems thinking and their understanding of a sustainable world and society. Focusing on environmental issues offers students a means of integrating their knowledge of human and environmental systems and a way of finding personal relevance in that knowledge.

An excellent resource for students is the local DNR forester. A current list is available online at <http://www.dnr.state.wi.us/org/land/forestry/ftax/COUNTY.HTM> Students will work individually or in small groups to research a local forest issue. They will be using primary resources and interviewing local experts, neighbors, and community leaders. They will create a project to present what they have learned and what citizen action they have taken.

Materials Needed

- ✿ Parent Letter (see sample)
- ✿ Student research note books

Procedures

1. Introduce the project to students.
2. With local experts present (might include DNR representative), brainstorm possible forest issues. (Briefly discuss each issue to make sure students understand what it is.)

3. Allow students a few minutes to form groups (if they desire) and select an issue. You may choose to limit one group to each issue.
4. Allow students time to use experts to brainstorm questions and interview them. The experts can also help students identify others to contact.
5. Share the grading process with students. Use the provided rubric, adapt it to your needs, or create your own with students' input.
6. Set deadlines with students.
7. Allow students time during school to collaborate, call for interviews, and work on their projects. This will also allow the teacher the chance to check progress of each group.
8. Schedule presentations at least a week ahead of time.
9. Students present their research and projects at scheduled time.

**References/
Resources**

For information on trends affecting the midwest see North Central Research Station's website at:

<http://www.ncfes.umn.edu>

Look for the August/September 1999 NC NEWS article *Here Comes The Neighborhood*.

Sample Parent Letter

Dear Parents/Guardians,

Solving environmental problems and issues requires skills in environmental investigations. These skills, in turn, provide students with opportunities to apply and improve their capacity for systems thinking and their understanding of a sustainable world and society. Focusing on environmental issues offers students a means of integrating their knowledge of human and environmental systems and a way of finding personal relevance in that knowledge.

As a cumulative assessment of our forestry unit and our environmental studies, students will be involved in a forest-related local issues research project. Students will be working as individuals or in small groups, using primary resources such as newspapers and interviews, to research a local issue. To help them get started, local experts will be invited into the classroom. These experts will help list local issues, provide students with initial information, provide them with names of others to interview, and help students develop questions to ask. If you wish to be on the panel of local experts, please let me know. We would love to have you! Please look in your child's learning log for additional details.

Thank you for your continued support and partnership in your child's education!

Sample Forestry Issues

(The examples are to serve as a place to start. It is best to create a locally relevant list for students to choose from.)

Examples:

- Watershed health.
- Pressure on private landowners to sell their forestland to developers.
- How many deer are too many?
- Can we do more paper recycling?
- The forests are changing, is that okay?
- Is wilderness important?
- Can the Endangered Species Act be successful?
- Controlling exotic and invasive insects, plants and diseases

- Should prescribe fire be used in Wisconsin?
- How does a product become green certified?
- Is the forest big enough for everyone's recreational needs?
- Are forest products compatible with other forest uses?
- Can Wisconsin tourism survive without a healthy forest?
- What's going on in your town?

**Student Forestry
Issues Research
Project
Procedures I
Must Follow**

1. Choose a forestry issue that you find interesting. Remember the list generated in class; it was to help you get started with the project.
2. Follow this research process:
 - a. Presearch - choose topics and organize thoughts; narrow topic*
 - b. Search - figure out sources and pull materials together*
 - c. Research - use the sources and take notes in your own words to explain what you're finding
 - d. Organize - put notes, etc., together in an order that makes sense; do more research or make changes if necessary
 - e. Evaluate - evaluate your work and the final product; improve where you can

* The questions on the following page may be helpful.

**Questions I
Might Ask About
My Project**

What is the issue that I've selected?
What do I already know about this issue?
What do I want to know about this issue?
What is the history of the issue? (What caused the problem and what has been done so far?)
What are some of the problems related to the issue I selected?
Why do I think these are problems?
Is there more than one side to this issue? (Do people disagree about what is important? Why?)
Who might I interview to discover facts and opinions about the issue that I chose?
What are some questions that I can ask these individuals?
What other sources can I use to find facts and opinions about the issue that I chose?
Where can I access these sources of information?
Are there related subjects/topics that I can look into to get information about the issue that I chose?
Are there any national or global connections to the issue that I chose?
What would I like to see happen about this issue?
Why would I like this to happen?
What do I think would need to happen in order for this to occur?
What can I do to help this to happen?
What effect do I think this issue will have on the future?

Learning Log

You MUST keep a learning log during your research of the issue you chose and your development of the product!

What to Include in Your Learning Log

1. Date every entry made. Make an entry every day you learned something that may be useful in creating your project. This includes notes, thoughts, observations, etc. Your entries must be legible!!!
2. Notes using the following format:

Source/Page	Notes	Reactions
-------------	-------	-----------

Source/Page

Bibliographic information:

Book

Author. Title (underlined). place of publication, publisher, copyright date, pages information came from.

Example: Shippen, Katherine B. A Bridle for Pegasus. New York: Viking Press, 1951, pp. 28-42.

Magazine

Author. "Title of Article" (in quotation marks). Name of Magazine (underlined), volume: number, pages article found on.

Example: Lewis, C. "Navy Unveils Low-Cost Sounding Rocket." Aviation World, 69:6, pp. 49-51+, November 3, 1958.

Newspaper

Author (if given). "Title of Article" (in quotation marks). Name of Newspaper (underlined). town/city paper is from, date paper was published, pages article found on.

Example: Doe, John. "Who am I Really?" Sometown Journal. Sometown, WI, January 1, 1994, section B, pp. 2-3.

Person

Last name, First name. "What person was interviewed about." Where the interview took place, date of interview.
Example: Michalak, Ruth. "Life in the 1940's." Stanley, WI, November 14, 1993.

Encyclopedia

Author (if given). "Title of Article" (in quotation marks). Name of Encyclopedia (underlined). Edition (year published), Volume, pages used.

Example: Piccard, Don. "Balloon." The World Book Encyclopedia. 1964, vol. 2, pp. 39-44.

* If the source you find doesn't have helpful information about the issue you chose, do not include it in your bibliography!

Notes

Write down the information you believe is important in answering questions about the issue you chose. Notes should not be copied from the source unless it is a direct quote that the author will be given credit for writing or saying. It might be helpful to label each note as to which question it could answer.

Reactions

Explain how you feel about the information you put in your notes.

Why do you feel the information is important to the issue you chose?

What other questions do you have after finding this information?

Other comments or thoughts about the issue you chose that this information made you think about.

Ideas this information gave you that you might want to include in your product.

**Other Things
to Include**

3. Describe exciting things you learned or did that relate to the issue you chose.
4. Describe difficulties you are having. What changes might you need to make?
5. Additional comments/ideas you may have.

**Important
Things the
Teacher Should
Know About
the Project**

- * Students must obtain permission from the teacher to work in pairs or small groups. Each member of the group should do his/her own Learning Log!
- * Students should make at least 3 entries in their Learning Logs each week.

**Possible products for your students to show knowledge of
the issue they chose**

1. song
2. play
3. story
4. painting/drawing
5. sculpture
6. cartoon strip
7. videotape
8. letter to the editor
9. invention
10. report
11. game
12. model
13. a lesson designed and taught to the class
14. other (must be approved)

* Be sure to tell the students you reserve the right to ask questions and expect answers about the choices they make in creating any of the above. For example: Why did you choose the colors that you used in your painting?

Grading Checklist for Forestry Issues Research Project

Criterion	Minimum	Average	Good	Wow!	Comments
Process: Statement of purpose and research questions clearly explain the purpose of your research done and provides a good start for the research. Notes are neat and complete. (Show source, page number if available, and reaction) Learning Log entries show that several resources were used to gain knowledge on the topic, facts, and opinions (local resource people such as the DNR, city council members, newspaper articles, interview with local business people, etc.). Each note in Learning Log has a logical and thoughtful reaction.					
Group worked well together throughout the process.					
Project: Project shows preparation and thought throughout the time given. Product reflects the knowledge learned during the research process.					
Product: Student shows preparation for presentation. Student shows effort to contribute to the presentation of the product and information learned. Student shows good speaking skills. Student able to answer questions about the issue chosen and the project.					

Additional Comments:

Date	Source/Page	Notes	Reactions

Other:

ABC's of Forestry

Standards Addressed

Environmental Education Standards:

- A. Questioning and Analysis: A.4.1, A.4.2, A.4.3, and A.4.4.
- C. Issue Investigation Skills: C.1.1.

Key Concepts/Content

✳ To summarize the students' knowledge of forestry in the state of Wisconsin.

Teacher Background

This activity can be used at the end of several days or weeks of research and instruction on the topic of forestry. This project would best be used as a cumulative or final activity for this unit. It would work well as a way to summarize all the information learned into one student-generated document. You will need to decide if you want individual student books or a class book developed during this project.

Getting Ready

Students should look at simple ABC books (the author Jerry Pallotta has done many of these types of books; information is found in the reference section of this activity) and discuss their setup/styles.

Safety Issues

There are no safety issues associated with this lesson plan.



Materials Needed

- ✳ Sample ABC books
- ✳ Books on forestry
- ✳ Internet sites on forestry

Procedures

1. Students should look at ABC books and discuss their setup/styles.
2. As a class, brainstorm lists of words and/or phrases that relate to the topic of forestry and that begin with the same letter. Create a list like this for a few of the letters of the alphabet (i.e., A = animals, B = butterflies, C = clearcutting, etc.).
3. Ask each individual student to make a list of words and/or phrases to use for his/her book that relate to forestry. These words and phrases can be found by looking back at information presented and projects done during the forestry unit. Additional research can be done and information obtained through internet sites.
4. For individual books: Explain to the student that each is going to make a big book about the theme forest. Each student is to decide on how to put together his or her big book and then how to publish/display the book. Also suggest they might want to consider a special audience for the book, such as another student or a younger sibling.
5. For a class book: For each word, an explanation and illustration(s) should be developed and included in the page layout for the book. Ask each student to select a page to complete for the book. (You may need to adjust this list depending on the size of your class.)
6. Compile all 26 pages together into the form of a book and create cover pages. You may want to use some of the handmade paper made in the activity called "Handmade Paper." Laminating or covering in plastic sheets would make a sturdy cover. A descriptive page about each student author should also be included.
7. For both individual and class books: The books or book may be read to the class or other classes, and the finished product(s) could even be placed in the school library for the remainder of the school year.


Extension:

Have students find a book about trees in the school library or the local public library. Students can share with the class the book they find. Read a book about trees to the class such as *The Tremendous Tree Book* by Barabara Brenner and May Garelick, 1979, Boyds Mills Press, Inc.

Evidence of Student Understanding

Before this project, the teacher and students should develop a grading rubric that clearly states what the finished book must include. The student and teacher can then use this rubric in a project post-conference to determine the grade earned. Some of the requirements for this project might be using words that relate to forestry, a well-written sentence for each letter, well-done illustrations, etc.

References/ Resources

 Jerry Pallotta is the author of many different ABC books on topics ranging from ocean life to extinct plants and animals. To find examples, go to [Amazon.com](https://www.amazon.com) on the internet and type in the author's name and do an author search.

Forest Fact and Fiction

Writing about the forest community

Standards Addressed

Environmental Education Content Standards:

- A. Questioning and Analysis: A.4.4.
- B. Knowledge of Environmental Processes and Systems: B.4.1, B.4.4, B.4.5, B.4.6, B.4.10, and B.4.12.
- D. Decision and Action Skills: D.4.2, D.4.3, and D.4.5.

Science Content Standards:

- A. Science Connections: A.4.5.
- C. Science Inquiry: C.4.6.
- E. Earth and Space Science: E.4.6 and E.4.8.
- F. Life and Environmental Science: F.4.1, F.4.3, and F.4.4.
- H. Science in Social and Personal Perspectives: H.4.2.

English Language Arts Content Standards:

- B. Writing: B.4.1, B.4.2, and B.4.3.
- D. Language: D.4.1.
- F. Research and Inquiry: F.4.1.

Math Performance Standards (optional):

- A. Mathematical Process: A.4.2.
- E. Statistics and Probability: E.4.1.

Social Studies Content Standards:

- A. Geography: People, Places, and Environments: A.4.1, A.4.2, and A.4.4.
- C. Political Science and Citizenship: C.4.1.

Key Concepts/Content

- 🌲 To relate unifying themes in a forest community such as interaction, constancy, change, evolution, energy, and form and function through observation.
- 🌲 To know what makes a forest a forest.
- 🌲 To know where forests are located in Wisconsin (optional: in the U.S. and the world).
- 🌲 To understand essential elements for plant and animal survival in a forest.

- 🌲 To develop a better understanding of predator/prey relationships and food chains within the forest community.
- 🌲 To write about the life cycle of a tree.
- 🌲 To see seasonal changes that occur in temperate deciduous and coniferous forests found in Wisconsin.
- 🌲 To know about plant and animal adaptations that are tailored for life in the forest.
- 🌲 To see how trees and forests are useful to the animals that live in the forest as well as to people.
- 🌲 To know why forests need to be conserved and what people, especially children, can do to help care for forests.

Teacher Background

Wisconsin's history is rich in forestry. From the early lumbering days to today's tourism, the natural beauty of Wisconsin's forests is evident. The forest provides many natural resources. It is important that students have a basic understanding of this important Wisconsin resource.

Before this activity, teachers should lead students through learning experiences that introduce and reinforce the key concepts. Students should also have practice writing paragraphs.

Students will be creating a book that expresses their knowledge about Wisconsin forests. They will create a big picture view of the forest and its many values. You may wish to assign this project as an individual, pair, or small group project. The completed books can be placed in the school library for other students to check out.

Getting Ready

- Prepare parent letter, student project description, and grading tool. Copy for each student.
- Copy graphic organizer for each student.
- Arrange with library/media specialist for student books to be circulated in the school library.
- Call local decorating stores to acquire old wallpaper sample books.

Safety Issues



- ◆ Arrange for parent help if choosing option 2—publishing.
- ◆ Students should not be allowed to use the utility knife to cut wallpaper.

- ✿ Parent Letter (see sample)
- ✿ Student description of project, including grading checklist (see sample)
- ✿ Access to resources used during forestry unit
- ✿ Access to final copy paper, crayons/markers/colored pencils
- ✿ Publishing materials:

Option 1

Plastic bindings
Binding machine
Envelopes cut in half for library card
Library check out cards
Plastic sheets or cardstock for book cover

Option 2

Cardboard or tag board for book cover (cereal boxes work well, but must be larger than the final copy paper)
Book tape and masking tape
Stapler
Glue
Scissors
Safety utility knife
Wallpaper or wrapping paper
Envelopes cut in half for library card
Library check out cards

Procedures

1. Introduce the project to students. Use the Forest Book Guidelines or create a class description of what a good forest book would include. Sharing an example or two of prior student work can help clarify the project and provide a model. Send home the parent letter the day the project is introduced.

2. Establish a timeline for completion. Students should have due dates for the plan, rough draft, self-editing, peer-editing, adult editing, and final copy completion.
3. Share the grading process with students. Use the provided rubric, adapt it to your needs, or create your own with students' input.
4. Have students plan their stories using a graphic organizer (see sample for one option). Check each student plan to make sure requirements are included.
5. Allow students class time to work on their books. They will be eager to share them with you and each other as they go. Use computer resources, if they are available, to create the final copy (or even rough draft!), showing students how to make page breaks and leave space for their illustrations.
6. Edit. Students should be given a copy of the grading rubric or checklist as they self-edit and peer-edit. The teacher, adult assistants, or parents can do adult editing.
7. Final copy and illustrations. Students may type or neatly write by hand the final copy. While doing this, they should determine placement of illustrations and page breaks. Student-created illustrations should be encouraged over clip-art. Illustrations can be made using any art medium, but remember, other students will handle books. (Adding a dedication page at the front and an "About the Author" page at the end is a fun way to personalize each book.)
8. Publish the book. Choose either option 1 or 2. Both create nice books.

Option 1	Option 2
<ul style="list-style-type: none"> • Students design cover and title page, making sure to include title and author. • Assemble completed pages in order and number them. Put cover and end page in place. (Plastic transparency sheets may also be used to protect the cover.) • Bind with binding machine. • Glue half an envelope with opening toward the top in the back of the book. • Fill out proper information on the library card and insert it into the envelope. 	<ul style="list-style-type: none"> • Students design title page, making sure to include title and author. • Assemble completed pages in order and number them. Put title page and end page in place. • Staple pages near the left edge in 3-4 places. • Cut cardboard to desired size and shape. Fold to create a center. • Tape stapled pages to the center of the cardboard. • Adults should help students cut wallpaper or wrapping paper to the right size to cover the outside of the cardboard. • Glue wallpaper or wrapping paper to the cardboard. Fold edges to the inside and tape to secure. • Glue blank paper on the inside front and back to cover the wallpaper/wrapping paper edges and tape. • Students should design the cover, making sure to write (Sharpie markers work best) the title and author on the front. • Glue half an envelope with opening toward the top in the back of the book. • Fill out proper information on the library card and insert it into the envelope. • Allow to dry.

- 9. Assess student books using the predetermined rubric. (Do not write on the final book copy because it will be placed in the school library.)
- 10. Place student books in the school library for about a month, providing an audience for student work. (If students have younger reading buddies, they may enjoy sharing their books first!)

Evidence of Student Understanding

Teachers may wish to document each stage of the writing process upon completion for each student.

Sample Rubric:

4	<ul style="list-style-type: none"> ▪ Student included all required concepts. These were clearly explained with examples. ▪ Student included several concepts about forests not required. These were clearly explained with examples. ▪ Student carefully followed each step in the writing process on time. ▪ Story sequence is logical (it has a plot and makes sense). ▪ Story shows thoughtful use of grammar and punctuation. (Sentences are complete and express clear thoughts.) ▪ Story shows thoughtful use of paragraphing. (Main idea and supporting details are obvious.) ▪ Final copy is neatly done with thoughtful illustrations. Final copy shows exceptional effort. ▪ Student used class time wisely.
3	<ul style="list-style-type: none"> ▪ Student included all required concepts. These were clearly explained with examples. ▪ Student included one or two concepts about forests not required. These were clearly explained with examples. ▪ Student carefully followed each step in the writing process on time.

	<ul style="list-style-type: none"> ▪ Story shows thoughtful use of paragraphing. (Main idea and supporting details are obvious.) A few errors may be present. ▪ Final copy is neatly done with thoughtful illustrations. ▪ Student used class time wisely.
2	<ul style="list-style-type: none"> ▪ Student included most required concepts. These were explained with examples. ▪ Student followed most steps in the writing process, or didn't complete them on time. ▪ Story sequence is logical (it has a plot and makes sense). ▪ Story shows attempt at thoughtful use of grammar and punctuation. (Sentences are complete and express clear thoughts.) Several errors may be present. ▪ Story shows attempt at thoughtful use of paragraphing. (Main idea and supporting details are obvious.) Several errors may be present. ▪ Final copy is done with illustrations. Lack of effort and thoughtfulness may be evident. ▪ Student did not use class time wisely.
1	<ul style="list-style-type: none"> ▪ Student included few required concepts with explanations and examples. ▪ Student followed few steps in the writing process, or didn't complete them on time. ▪ Story sequence lacks logic. ▪ Story shows little attempt at thoughtful use of grammar and punctuation. Several errors may be present. ▪ Story shows little attempt at thoughtful use of paragraphing. (Main idea and supporting details are not obvious.) Several errors may be present. ▪ Final copy is done with illustrations. Lack of effort and thoughtfulness may be evident. ▪ Student did not use class time wisely.

Comments:

Sample Checklist

Description of Expectation	Points Received
<p>Inclusion of required concepts, explained with examples (5 points each):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Examples of interaction, constancy, change, evolution, energy, and form and function in a forest community. <input type="checkbox"/> What makes a forest a forest? <input type="checkbox"/> Where are forests located in Wisconsin? <input type="checkbox"/> What do plants and animals need for survival in a forest? <input type="checkbox"/> Predator/prey relationships and food chains within the forest community. <input type="checkbox"/> Life cycle of the tree. <input type="checkbox"/> Seasonal changes that occur in the forests found in Wisconsin. <input type="checkbox"/> Examples of plant and animal adaptations, and an explanation of why each adaptation helps the plant or animal to survive in the forest. <input type="checkbox"/> Ways that trees and forests are useful to the animals that live in the forest as well as to people. <input type="checkbox"/> Why forests need to be cared for and what people, especially kids, can do to help care for forests. <input type="checkbox"/> Ways that people manage the forests to provide for wildlife and for the recreation and economic needs of people. <p>Inclusion of non-required concepts, explained with examples (5 points each):</p>	
Timely completion of each step in the writing process (5 points)	
Thoughtful use of grammar and punctuation (5 points)	
Thoughtful use of paragraphing (5 points)	
Story sequence is logical and makes sense (5 points)	
Final copy is neatly done with thoughtful illustrations (5 points)	
Wise use of class time (5 points)	
Point Total	
Grade for Forest Book	

Comments:

Sample Parent Letter

Dear Parents/Guardians,

As an assessment of student learning, fourth grade students will be writing forest books. The books will reflect the forest concepts we have been learning. Some of these include:

- ✓ Examples of interaction, constancy, change, evolution, energy, and form and function in a forest community.
- ✓ What makes a forest a forest?
- ✓ Where are forests located in Wisconsin?
- ✓ What do plants and animals need for survival in a forest?
- ✓ Predator/prey relationships and food chains within the forest community.
- ✓ Life cycle of the tree.
- ✓ Seasonal changes that occur in the forests found in Wisconsin.
- ✓ Examples of plant and animal adaptations, and an explanation of why each adaptation helps the plant or animal to survive in the forest.
- ✓ Ways that trees and forests are useful to the animals that live in the forest as well as to people.
- ✓ Why forests need to be protected and what people, especially kids can do to help protect forests and reverse the damage people have done.
- ✓ Ways that people manage the forests to provide for wildlife and for the recreation and economic needs of people.

Each student will plan out his/her book and write it following the writing process. Once the rough draft is complete, students will self-edit, then share their work with a peer. Approximately 5 hours of class time will be made available for writing. Parents may be asked to aid students with the adult edit phase of the writing process. During this phase, parents may help students with grammar and punctuation, encourage them to improve content and paragraphing, and talk out their thoughts to make them more complete. Do not feel that everything must be perfect. The final copy must still reflect the true work of the child.

Rough drafts are tentatively due (_____). Final copies with illustrations are tentatively due (_____).

Students will be publishing each book using cardboard and wrapping or wallpaper. Students will need to bring a large cereal box or 2 pieces of cardboard slightly larger than a regular 8-1/2 x 11 inch piece of paper. They should also bring in wallpaper or wrapping paper to cover the books. Volunteers to help with the publishing process on the 25th (from approximately 12:30 to 2:00) would be greatly appreciated!

After the books are published and graded (for both science content and writing skills), they will be placed in the school library for other students in the building to check out.

Thank you for your continued support.

Sample Student Guidelines for Forest Book

Forest Book Guidelines

1. Your book must include the following concepts of life in Wisconsin's temperate deciduous forests:
 - ✓ Examples of interaction, constancy, change, evolution, energy, and form and function in a forest community.
 - ✓ What makes a forest a forest?
 - ✓ Where are forests located in Wisconsin?
 - ✓ What do plants and animals need for survival in a forest?
 - ✓ Predator/prey relationships and food chains within the forest community.
 - ✓ Life cycle of the tree.
 - ✓ Seasonal changes that occur in the forests found in Wisconsin.
 - ✓ Examples of plant and animal adaptations, and an explanation of **why** each adaptation helps the plant or animal to survive in the forest. (For example: a woodpecker's beak allows it to "drill" holes in the bark of a tree to get to the bugs underneath to eat.)
 - ✓ Ways that trees and forests are useful to the animals that live in the forest as well as to people.
 - ✓ Why forests need to be conserved and what people, especially kids, can do to help care for forests.
 - ✓ Ways that people manage the forests to provide for wildlife and for the recreation and economic needs of people.
2. The book does not have to read like a report. The above requirements can be covered in a story too. For example, you could tell the story of a day in the life of a grub. However, you need to explain what each concept means and give at least one example found in the forest.
3. Your final copy may be either typed or neatly handwritten. Length depends upon your story.
4. Your sentences should be complete with correct punctuation. Your paragraphs should have a clear main idea and supporting details.
5. Your final copy must have illustrations and will be bound into book form in class.

6. You may also choose to include other ideas you learned about the forest such as:
 - ✓ Layers of the forest
 - ✓ Family life of animals, birds, or insects
 - ✓ Unique plants or animals that are found only in the forest
 - ✓ People in Wisconsin who have been important to the history of forests and forestry
7. Have fun and do your best work!

References/ Resources

- 📖 Ranger Rick's *NatureScope: Trees are Terrific*
 - Great resource for activities with reproducible pages for teaching about trees in the community. This resource also has good background information for teachers.

Websites:

- 📖 Missouri Botanical Gardens *What's It Like Where You Live?*
<http://www.mobot.org/MBGnet/>
 - Written at a 4-6 grade level. Includes graphs, maps, and charts to research and compare biomes. Each biome page also has relevant links to other web sites. Includes temperate deciduous forests, tundra, taiga, grasslands, rain forests, deserts, oceans, and freshwater environments.
<http://www.mobot.org/MBGnet/store.htm>
 - (Online ordering of supplemental *What's it Like Where You Live?* curriculum. The curriculum includes excellent videos, a multimedia animal reference CD, teacher's guide, and reproducible pages.)
- 📖 *ABC World Reference: Wide World of Animals*
 - (Online ordering information) <http://www.learningcompanyschool.com/school/products/abcwwa.htm>.

- An excellent CD Rom to research animals in biomes. Go on detailed explorations of more than 700 species of animals. Students observe animals in their natural habitats, gather remarkable facts about animal characteristics, and discover threats to their survival. Featuring text, photos, sound clips, full-screen videos, interactive taxonomy trees, time-lapse exhibits of changes in the animal world, and more.

 *GORP (Great Outdoor Recreation Pages) National Forests and Grasslands*

http://www.gorp.com/gorp/resource/US_National_Forest/main.htm

- Descriptions of national forests, including activities, tours, trails, wildlife areas, etc.

 *New Forests Project*

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

- The New Forests Project (NFP) is a people-to-people, direct-action program established in 1982 in an effort to initiate reforestation and reduce deforestation in “developing countries.” This site includes information about this project as well as educational resources for teachers about forests. For example: Tree Species of the Month.

 *School Nature Area Project*

<http://www.stolaf.edu/other/snap/> (homepage)

<http://www.stolaf.edu/other/snap/cyberseasons.html> (Cyberseasons)

- CyberSeasons is a project of the School Nature Area Project (SNAP) of St. Olaf College. SNAP works as a partner with Minnesota schools and communities, using local nature areas to further environmental education and benefit the environment through grants, training, and resource support. CyberSeasons and SNAP’s website are open to all those interested in environmental education and using their schoolyards as a meaningful part of the school experience.
- You can collect and submit data from your class as well as access data from other schools all school year

with Following Fall, Snow, and Did Spring Snap?
There are also resources, activity ideas, and galleries
of student work.

 *The Environment Web Directory K-12 Links*


<http://www.webdirectory.com/Education/K-12/>

- List of K-12 environmental web resources and school projects.

 *National Wildlife Federation Homepage*

<http://www.nwf.org/nwf/index.html>

- Access information about NWF resources. Do a search of the site and get background information and selected activities from NatureScope and other NWF publications.

 *Nature Net, The Environmental Learning Network, Links to south-central Wisconsin outdoor environmental education sites.*

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

 *Wisconsin Department of Natural Resources*

<http://www.dnr.state.wi.us/>

 *EEK! Wisconsin Department of Natural Resources site for kids*

<http://www.dnr.state.wi.us/org/caer/ce/EEK/>

 *EE Link (Environmental Education Link)*


<http://eelink.net/>

- Online access to EE publications, resources, and links.

 *Global Schoolhouse*

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

- Collection of projects and resources for teachers and students.

 *DuPage Environmental Awareness Center's Listing of Books for Children*

<http://www.terasys.com/deac/form.htm>

- Do a title, author, keyword, grade level, or publisher search on this data base.

📖 *Children's Literature Web Guide*

<http://www.acs.ucalgary.ca/~dkbrown/index.html>

- The Children's Literature Web Guide is an attempt to gather together and categorize the growing number of Internet resources related to books for children and young adults. Searchable data base.

Other Resources:

📖 *EE News: Environmental Education in Wisconsin*, published by the Wisconsin Department of Natural Resources, UE-Extension, the Wisconsin Association for Environmental Education, Inc., the Wisconsin Center for Environmental Education, and the Wisconsin Department of Public Instruction.

- Excellent resource for Wisconsin specific environmental education information, including biographies of important environmental contributors in Wisconsin history, lesson plans, resources, and upcoming workshops.
- To subscribe for 1 year, send your name, address, and a check for \$5.00 to EE News, DNR, CE/6, P.O. Box 7921, Madison, WI 53707.

📖 *Down to Earth: The Wisconsin Environmental Science Activity Notebook, A Teacher's Guide*, Today's Educational Products for Tomorrow's Earth by Dave Thorson, 1994. (Route 1, Box 135A, Gordon, WI 54838)

📖 Sayre, April Pulley. *Temperate Deciduous Forest*. Twenty-first Century Books New York 1994. ISBN 0-8050-2828-5

📖 Cooper, Ann. *In the Forest*. Denver Natural History Press: Denver, CO 1996. ISBN 0-916278-71-9

Appendix

Elementary Science Safety Contract

Safety issues are essential in a science teaching setting and must be discussed in all situations. At the beginning of each year, teachers outline proper procedures for handling supplies and equipment with students and establish expectations for safe conduct in the science classroom. To insure that all parties are aware of these expectations, students and parents sign a safety contract. A sample safety contract for elementary students follows. It can be adapted to specific situations.

I will:

- ✦ Follow all directions given by the teacher
- ✦ Wear safety goggles whenever the teacher directs
- ✦ Conduct myself in a responsible manner at all times when doing science both in the classroom and in an outdoor setting, i.e., field trips
- ✦ Handle animals respectfully
- ✦ Always wash my hand after handling chemicals, animals, plants, or soils
- ✦ Immediately report any injury or spill to the teacher
- ✦ Use proper techniques and be careful with equipment and sharp instruments

We have read and we understand these safety procedures, and this student agrees to follow all of them.

Student Signature

Date

Parent/Guardian Signature

Date

Please indicate if this student has any allergies or other medical problems the teacher should be aware of which could put the student or others at risk in the science activities.

Allergies:

Contact lenses:

Other:

protected forestland yields little, if any, overland water runoff. Only when soils are fully saturated with water, slowing movement to the ground water table, will any significant overland flow occur from the forest. Of course, this is of most concern where the land is steep. Moreover, water draining off land in row crops or from developed areas into the forest can create serious problems. This is due to the large, concentrated volumes of water which usually enter the forest at just a few points. Gullying and loss of productive growing sites are the result.

Strangely enough, there is water movement even within frozen soils, though in limited amounts. Since frost depths in protected Wisconsin forestland are quite shallow, of the permeable type and generally insulated by snow, frozen soils yield minimal runoff.

The water that moves into the soil is available for tree growth and to replenish the ground water table of the region. It is this ground water that we tap with our wells and which supplies springs and streams. The water provided by the green sponge is clear and pure, quite different from that water which flows off cropland and city streets!

Now that we understand what the green sponge does, how do we best protect this valuable contribution? By protecting and keeping intact that precious litter layer and the soil which it protects. Keep livestock and discriminate burning out of the forest, avoid draining runoff from cropland and developed areas into the forest, and utilize proper logging techniques when removing forest products. For further explanation of how to accomplish these goals, see your local forester.

By Arden Meyer
Oscar La Croix
Wayne A. Kuntzsch
Madison, Wis.



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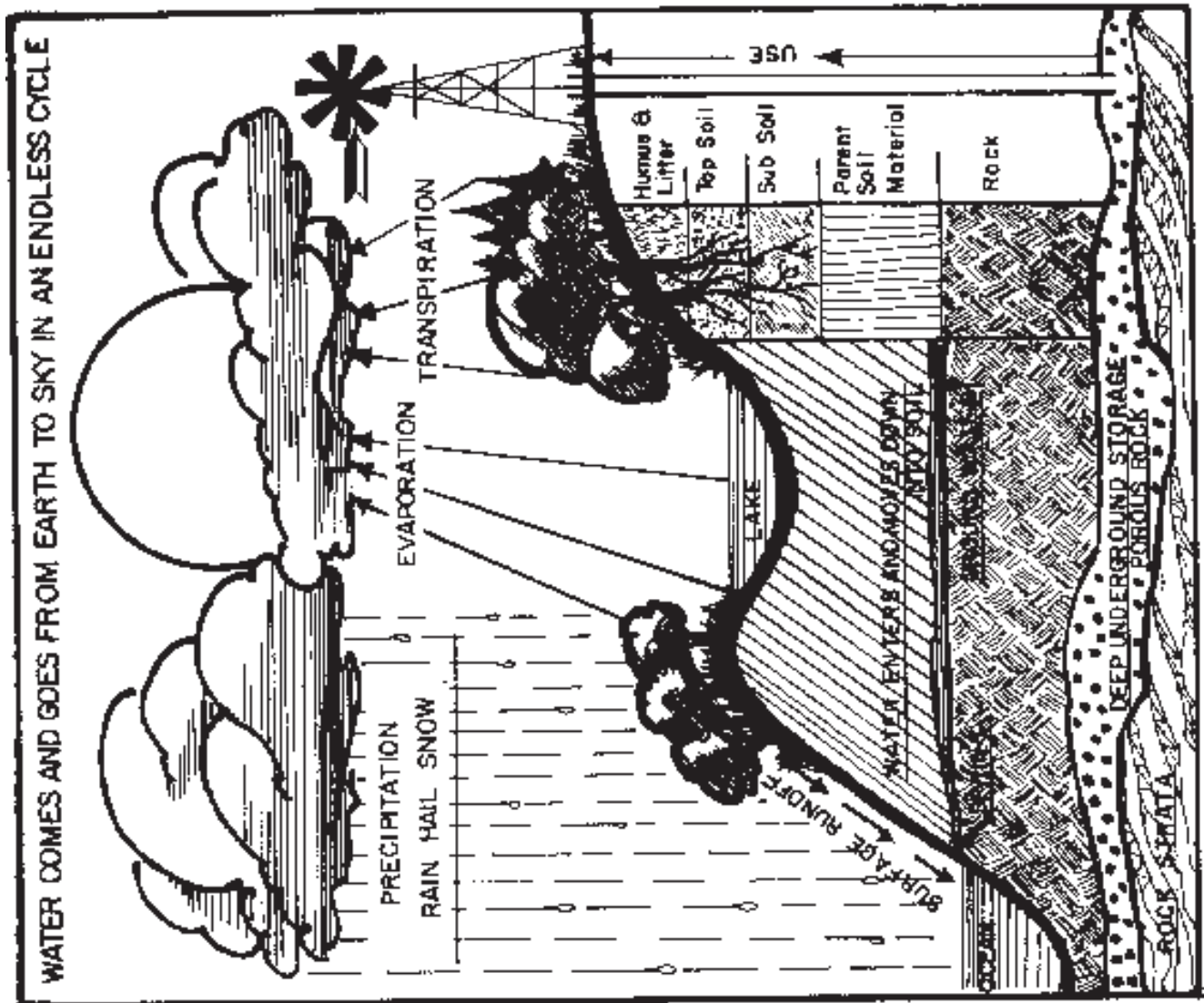
FOREST AND WATER - THE GREEN SPONGE

A forest like a sponge, you say? How can that be? Well, here's the story

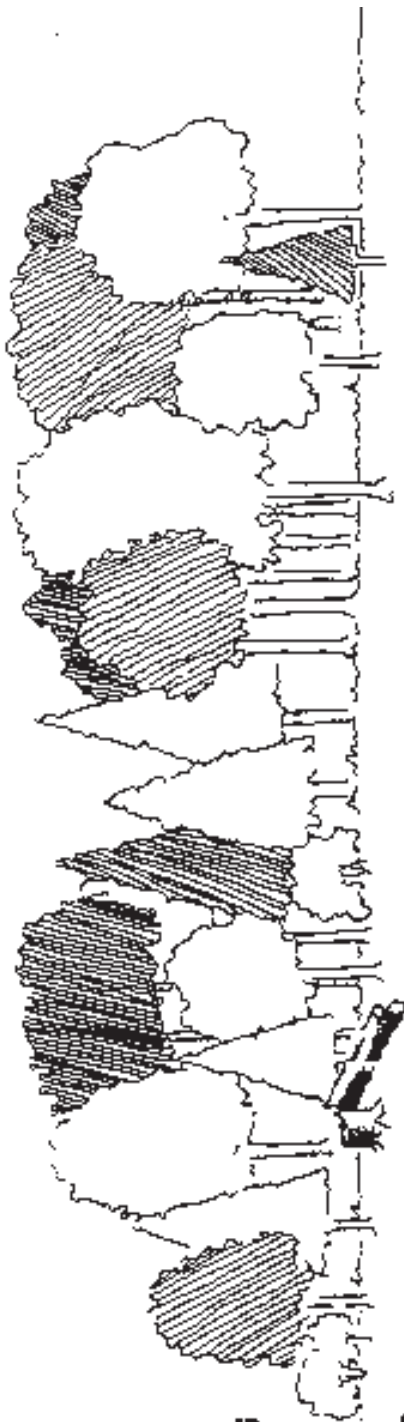
A forest is more than trees; it's all of the vegetation growing there, (and the animal life) plus the soil which produces them. The story of the sponge involves the soil and the vegetation supports, but most particularly soil and trees. Trees use a lot of water through transpiration and evaporation. Water from the soil is absorbed by the roots, moves up the stem and into the air through openings in the leaves (transpiration). That's why the forest gives you that cooling or air conditioning effect. Rainfall is intercepted by leaves, limbs and trunk and some is evaporated into the air before it can reach the ground. What about the large amount of water (including snowmelt) that does reach the ground? It moves into the soil, just as the water that you might sprinkle on a sponge! So it's the forest soil that acts as the reservoir for the water. That's, as long as it's managed properly.

A natural forest soil is deep and porous, that is, filled with air spaces and protected by a litter and humus layer. This litter layer protects the soil surface from the force of the raindrops, allowing water to move into the soil (infiltration). Undisturbed forest soil can absorb rainfall rates up to 50 inches per hour! 8 to 12 inches being common in Wisconsin. Cultivated lands are a fraction of that! Any action that destroys or removes the litter layer reduces this beneficial action. Infiltration is further reduced when the soil is compacted. Compaction reduces the pore space in the soil thereby reducing the amount of water that can move into and through it. Destruction of the litter layer and compaction will both result in livestock grazing; fire is detrimental in terms of litter layer loss.

Cutting trees has little effect on runoff as the litter layer remains intact. Careful removal of the logs on a well designed road system will minimize the amount of area disturbed. Proper drainage and seeding together with typically rapid re-vegetation, returns the area to normal in 1-2 years after logging.



Trees, Forests and Quality Water



The Nation's forests are a rich resource of aesthetic quality, wildlife habitats, and wood products. Forested areas also produce some of the nation's best quality water.

■ Forest land contributes to clean water in several ways.

Well managed forests protect the soil and allow precipitation to soak into the ground reducing erosion and replenishing the water table.

Healthy forests protect against soil erosion and are efficient at retaining nutrients. Sediment, nitrogen, and phosphorus concentrations are low in streams draining lands with fully stocked and vigorous trees.

Streamside trees help stabilize streambanks, provide shade to cool streams for fish, and provide woody debris which is necessary in many areas for fish habitat and stable stream beds and banks.

■ Many factors affect water quality on forested watersheds.

Some impairments are natural in origin because water quality is influenced by vegetation, soils, and geology. Even without human influences some waters are acidic, low in oxygen, or high in sediment.

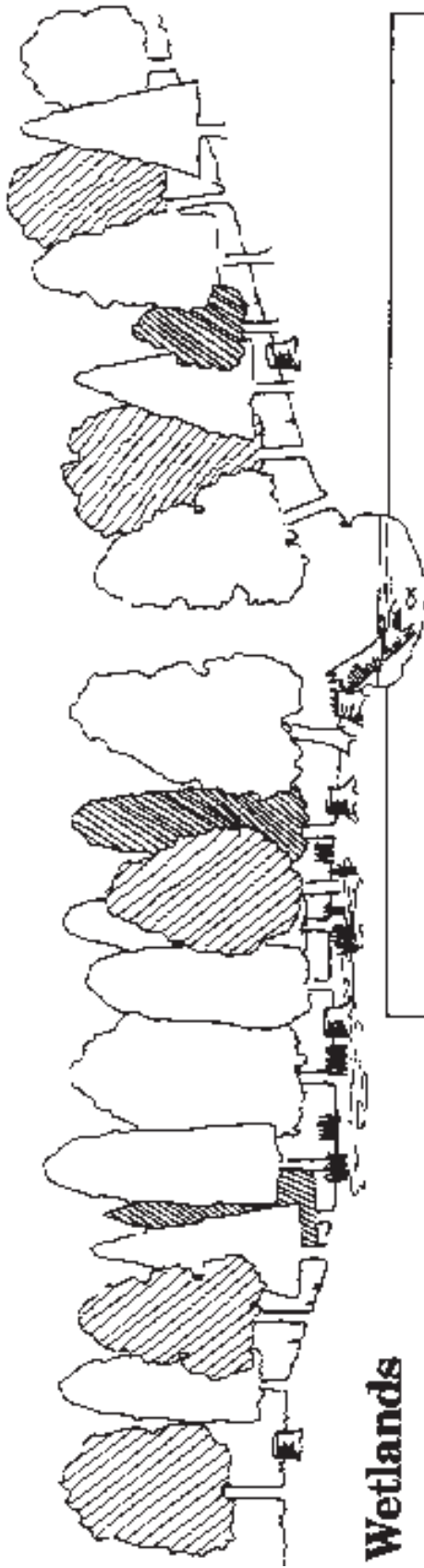
The impacts of human activities are often more apparent. Improper grazing, mining, highway construction, or forestry can change water quality on forested watersheds. Some of the impacts of these changes can last for decades.

■ Forestry activities are compatible with water quality goals.

Harvesting trees is an activity which occurs on about 2% of the nation's forest land each year. Good planning, harvesting, and reforestation practices can protect water quality during forestry activities.

Foresters support the use of what are called **best management practices** to control pollution during harvesting and reforestation activities. Many State forestry organizations conduct surveys to determine the use and effectiveness of these practices. The results show good compliance by landowners and forest managers.

Permanent land clearing or deforestation should not be confused with forest management activities.



Wetlands and Streamside or Riparian Forests

Forests that grow on wetlands and floodplains near streams and ponds are especially important to water quality. Approximately 50 million acres of forested wetlands remain in the lower 48 States.

For more information:

Wisconsin Department
of Natural Resources
Bureau of Forestry
P.O. Box 7921
Madison, WI 53707

These forested areas retain and transform pollutants.

Nitrogen is retained in plants or released as a gas through a natural process called denitrification.

Sediment and attached nutrients such as phosphorus are trapped and retained in the soil or plants.

Forested wetlands and floodplains should be recognized for their value:

Value for habitat

Streamside forests provide large woody debris for fish and riparian corridors for wildlife.

Value for flood control

Woody stems slow the velocity of flood water.

Value for water quality

Riparian forest buffers are effective in reducing ground water pollutants, trapping surface water pollutants, and lowering water temperature.

Value for timber

Wetlands and floodplains are important sources of high quality wood.

What You Can Do

- ▲ Manage your land to control pollution.
- ▲ Increase the proportion of forest land, especially near streams.
- ▲ Retain trees in land development projects.

Educator’s Fact Sheet #1: “A History of Papermaking”

The ability to express thoughts through written communication has been at the center of civilization for centuries. Writing has enabled humans to learn, keep records, make transactions, spread news, and communicate with each other. Most of our important records are on paper—items like birth certificates, report cards, and marriage licenses. Although writing has been around for a long time, paper hasn’t. In fact, putting thoughts down in written form wasn’t always easy or practical.

Earliest Writing Surfaces

Early people discovered that they could make simple drawings on the walls of caves, which was a great place for recording thoughts, but wasn’t portable. Imagine spending hours scratching a message into a heavy clay tablet and then having to transport it. That’s exactly what the Sumerians did around 4000 B.C. Although this form of written communication was now portable, it still wasn’t practical because of its weight. For centuries, people tried to discover better surfaces on which to record their thoughts. Almost everything imaginable was tried. Wood, stone, ceramics, cloth, bark, metal, silk, bamboo, and tree leaves were all used as a writing surface at one time or another.

The word “paper” is derived from the word “papyrus,” which was a plant found in Egypt along the lower Nile River. About 5,000 years ago, Egyptians created “sheets” of papyrus by harvesting, peeling and slicing the plant into strips. The strips were then layered, pounded together and smoothed to make a flat, uniform sheet.

No major changes in writing materials were to come for about 3,000 years. The person credited with inventing paper is a Chinese man named Ts’ai Lun. He took the inner bark of a mulberry tree and bamboo fibers, mixed them with water, and pounded them with a wooden tool. He then poured this mixture onto a flat piece of coarsely woven cloth and let the water drain through, leaving only the fibers on the cloth. Once dry, Ts’ai Lun discovered that he had created a quality writing surface that was relatively easy to make and lightweight. This knowledge of papermaking was used in China before word was passed along to Korea, Samarkand, Baghdad, and Damascus.

By the 10th century, Arabs were substituting linen fibers for wood and bamboo, creating a finer sheet of paper. Although paper was of fairly high quality now, the only way to reproduce written work was by hand, a painstaking process.

By the 12th century, papermaking reached Europe. In 1450, Johannes Gutenberg, a German, invented the printing press. Books and other important documents could now be reproduced quickly. This method of printing in large quantities led to a rapid increase in the demand for paper.

Paper in Early America

Papermaking is one of the oldest American industries. Only 19 years after the Pilgrims came to America, a printing press was set up in Cambridge, Massachusetts. At that time, paper was still being shipped from England and Europe.

In 1690, William Rittenhouse built a paper mill near Germantown, Pennsylvania, the only one in the New World until 1710. By 1775, there were fewer than 20 paper mills in the colonies. As the population in America grew, so did the need for more paper.

Early on, papermakers realized that they needed to locate their mills near populated areas that could provide a reliable supply of old rags, which were their main raw material. They also realized that they needed to be near a large supply of fresh water, both for turning the mill machinery and for washing the rag fibers.

In 1789, a Frenchman named Nicholas-Louis Robert invented a prototype of a machine on which paper was formed on a continuous sheet of wire cloth. But it was two prosperous London brothers, Henry and Sealy Fourdrinier, who developed the first practical version of this paper machine in 1804. Many modern paper machines are now referred to as “fourdrinier” machines.

By 1810, there were 185 paper mills in the United States. As existing mills expanded and new mills began production, rags became scarce. American papermakers began experimenting with alternative raw materials, such as tree bark, sugar cane waste, straw, and cornstalks.

Development and Growth in Wisconsin

In 1848, a paper mill was established in Milwaukee, producing paper for the Milwaukee Sentinel & Gazette. The paper was made from rags, with production climbing to 90 reams a week, “enough to supply the entire press of the state.” Three months later, President Polk signed legislation enabling Wisconsin to become a state.

Financial troubles, dam washouts, and difficulties obtaining an adequate supply of rags prevented the industry from becoming firmly established in southern Wisconsin. Although the Milwaukee area declined as a papermaking center, it is today a regional and national center for printing and paper converting.

A plentiful supply of fresh water is necessary for good papermaking, so it was natural for the industry to begin developing further north along the banks of some of the state’s major rivers, including the Fox, Wisconsin, Chippewa, Menominee, Peshtigo, Eau Claire, Flambeau and others. Much of the industry took over old lumber mill and flour mill sites and established new waterpower sites.

The first paper mill in the Fox River Valley was started in Appleton in 1853 to produce a coarse grain rag paper and straw wrapping paper. This mill burned in 1859, but was immediately rebuilt and made about four tons of wrapper and manila daily.

Between 1850 and 1875 paper mills were started at Waterford, Beloit, Sparta and Fond du Lac. An 1870 edition of the Winnebago Country Press detailed the manufacturing process of a local mill. It said the mill turned out 3,000 pounds of paper a day with rags from as far away as Milwaukee and Chicago.

The Fox River was fairly well established as the papermaking center of Wisconsin by 1872. Natural advantages had much to do with this. Lake Winnebago, at the upper end of the Fox, drains down to Green Bay about 35 miles away. During its travel, the water drops a total of 170 feet, with dams spaced all along the length of the river to provide many sites for power.

If there is any one year significant to the paper industry in Wisconsin, it is 1872. This year was the beginning of huge industry growth in the founding of paper mills. It was this year that Colonel H. A. Frambach, a Civil War veteran, brought the Keller groundwood process to the Fox River Valley, enabling papermaking from wood pulp. The process was invented in Germany in 1844 when Friedrich Keller experimented by pressing wood sticks against a grindstone and adding water to create small fibers suitable for making paper. This mechanical process is still used today to produce groundwood pulp.

In 1873, Colonel Frambach co-founded a mill in Kaukauna—the first mill to install a machine for grinding pulpwood logs. Soon after, other pioneers in wood pulp manufacturing were producing paper from poplar trees. The paper industry, particularly after introduction of the groundwood process, found that Wisconsin offered all that it needed to be successful—abundance of pure water, raw materials, power, skilled labor, and ready access to good markets.

The Civil War stimulated a greater demand for newspapers; it was followed by an era of invention and industrial growth. When wood was beginning to outgrow its original single purpose as lumber, and wood pulp was becoming widely used for papermaking, many of the lumber companies moved away, leaving millions of acres of cut forests. The paper industry eventually played a large role in reforesting Wisconsin.

In 1888, the first paper mill was built on the Wisconsin River. Central Wisconsin would soon become another intensive area for papermaking.

Throughout its history, the Wisconsin paper industry has used recycled materials. When the first mill began in 1848, recycled cotton rags were the sole source of fiber. The use of recycled white wastepaper as a source of fiber was first reported in Wisconsin in 1873. Cotton fibers were the bulk of this recycling, although wood fibers from imported papers were probably included.

Recycling mills in Wisconsin had an annual capacity of 180,000 tons by 1925. By 1950 capacity had increased to nearly 300,000 tons. In the late 1970's, capacity was approaching one million tons. Today, Wisconsin's recycling mills turn 2.5 million tons of wastepaper into new, useful products annually.

The Wisconsin paper industry has proved to be one of the state's most stable economic contributors. Technological advances, an ability to adapt, and quality management have carried the industry through periods of economic challenges and business transitions.

Educator’s Fact Sheet #2: “How Pulp and Paper Is Made”

The process of making paper has not changed—at least, fundamentally—since its discovery. But with almost two centuries of improvements and refinements, modern papermaking is a fascinating, high tech industry. Here’s a “primer” on the industrial papermaking process.

Raw Materials

Trees and recycled wastepaper are the primary raw materials used in paper manufacturing (some paper grades rely on cotton or other fibrous material). But, examining these raw materials more closely, you’ll see that papermakers really use “cellulose.” It comes from three main sources: logs harvested in the forest, recycled waste paper, and sawdust and chips recycled from sawmills making lumber. Papermakers can use hardwood and softwood trees. Hardwoods, or deciduous trees which shed their leaves in the fall, commonly used in Wisconsin include aspen, maple and birch. Softwoods are the coniferous, or evergreen, trees such as pine (red, white, Jack), spruce and tamarack.

Woodpulp Preparation

When raw logs arrive at the mill, machines strip off their bark, reduce the wood to chips, and ready it for the paper manufacturing process by turning it into pulp, or a mixture of wood fiber and water. The wood can be reduced to a fibrous state by mechanical means (chopping or grinding), “cooking” the wood chips in pressurized containers, or combinations of both. The preparatory process removes lignin which is the “glue” that makes trees rigid and able to grow tall. Some paper companies choose not to own pulp mills. Instead, they purchase “market pulp” from other producers that has been demoinsturized for ease in shipping and handling.

Preparing Recycled Wastepaper

From its early years, the paper industry has recovered discarded products—first rags, then recycled wastepaper—and used them as a raw material. Recycled wastepaper also needs preparation before it is ready for the paper machine. For example, paper grades need to be sorted and inspected to assure the right types are used for the grade of paper to be produced. All non-paper substances—such as dirt, debris, staples, paper clips, tape and adhesives (called “stickies”)—are removed to avoid contaminating the pulp and new paper products.

Some companies can use virtually all recycled fiber as a raw material, others can incorporate some—the percentage depends largely on the physical attributes, or characteristics, needed in the new products being manufactured.

It is important to remember that wood fibers cannot be recycled endlessly. Generally, they can be reused only about five to seven times before they become unusable for further papermaking. That means new wood fiber will always be needed in paper manufacturing. However, the U.S. and Wisconsin paper industries are committed to even greater recycling achievements. In 1989 for example, papermakers announced a voluntary goal to recover and reuse 40 percent of all available wastepaper in the nation by 1995. By 1993, the goal had already been surpassed, prompting the industry to set a new goal to recover 50 percent of all the paper used in the nation by the end of the century. Today, Wisconsin's paper industry is a national leader in the utilization of recycled wastepaper, turning more than 2.5 million tons into new, useful products annually. The volume recycled by Wisconsin paper companies has more than doubled since 1980.

Final Pulp Preparation

The pulp passes through cleaners and screens and may be whitened if needed for the grade of paper being manufactured. Additives like dyes, pigments, sizing or resins are sometimes added to provide the paper or paperboard (thicker paper used for boxes and containers) with the appropriate finish or physical characteristics for its intended end use.

Paper Manufacturing

Now the pulp is ready for the paper machine. Here it is more than 99% water and less than 1% fiber. The slurry is sprayed from the headbox onto a moving, continuous loop of fine, wire screen. After the water in the pulp slurry drains through the screen, a damp mat of wood fibers bonds together forming a new sheet, or web, of paper. Then the web moves to the press section, being carried by a moving felt. There the paper is compressed and more water is squeezed out. Next it moves to a long series of dryers, or steam-heated cylinders, that evaporate more water. The paper machine typically is 150 inches to 300 inches wide and 100 yards long, or as long as a football field. When it arrives at the end of the machine, the new paper generally has a moisture content of just 4% to 6%.

Finishing and Converting

Some paper grades are coated, particularly if they are going to be used in printing and publishing. The coating process can occur on the paper machine or be done on a separate machine. New paper also can be directed through a vertical column of steel rollers—or calendar stack—to further smooth its surface. Paper coming off the paper machine is wound into a jumbo roll weighing many tons. Depending on the eventual use of the paper it may next be cut, slit, and rewound into many smaller rolls, or cut into sheets. The final step needed to transform new paper into retail products is called “converting.” It may be done by the paper manufacturer or it may be accomplished by other facilities.

Educator's Fact Sheet #3: "Wisconsin's Paper Industry Today"

Centuries of invention and innovation have evolved paper from a basic writing surface to a commodity that we would have much difficulty living without. Paper manufacturing is big business worldwide, including Wisconsin, the nation's leading papermaking state. As you might expect, the economic benefits to Wisconsin are impressive.

Paper Production Tops 5 Million Tons

Paper facilities in the Badger State produce about five million tons of paper annually. Wisconsin has been the nation's leading paper manufacturing state for more than 30 years; presently the output here is more than one million tons greater than in Alabama, the nation's second leading papermaker. More than one million tons of paperboard products, primarily used in a wide array of protective packaging, also are produced here annually. The value of shipments from Wisconsin's paper companies tops \$12.4 billion annually, while the combined shipments of paper and other forest products is valued at nearly \$16.8 billion.

Employment for More Than 52,000

More than 52,000 people are employed as papermakers in jobs noted for good wages and stability. Pulp and paper manufacturing accounts for about one in every 11 Wisconsin manufacturing jobs.

The industry's workforce earns more than \$2.2 billion annually; and their average wage is nearly 30% greater than those in all other manufacturing employment and more than 70% higher than the average weekly wage for all employment in Wisconsin.

Paper manufacturing supports jobs for more than 125,000 others—persons employed outside of papermaking as clerks, bankers, teachers, lawyers, truckers, carpenters, doctors, electricians, butchers and bakers—all of the many retail, wholesale, service, transportation, government and related jobs that comprise the economic fabric of society. Moreover, economists measure a \$3.8 billion impact on Wisconsin's economy as paper industry wages are spent on goods and services, rent and mortgages, income and property taxes, saved and invested.

Papermaking is the key component of Wisconsin's forest products industry which includes loggers and manufacturers of lumber, furniture and other wood products. With 99,000 employees, the forest products industry, including paper manufacturing, is the leading employer in 14 counties and second or third largest in another 24 counties. And, many of the state's 1,800 forest products firms are based in rural communities, helping assure viable economies statewide.

Thousands more jobs are closely linked to papermaking “upstream and downstream” — such as suppliers to the industry or its customers.

Many Jobs Linked to Papermaking

About 6,000 persons are employed by companies that design and manufacture paper-making machines and related equipment. They produce more than \$830 million in goods annually for use in Wisconsin, the United States and around the world.

Installations of new papermaking equipment, plant expansions and facility upgrades generate employment for several thousand more construction and skilled trade workers annually.

Wisconsin’s paper industry purchases more than \$6.1 billion in goods and services annually.

Convenient access to quality Wisconsin-made paper is a big reason why there’s a vigorous, growing printing industry here. More than 53,000 printers earn nearly \$1.4 billion in annual wages. Those economic benefits are shared across the state as about half of all printing and publishing positions are in Milwaukee and southeast Wisconsin.

A Positive Future Through Capital Investments

The outlook for the industry and its beneficial impact on the Wisconsin economy is positive. Although papermaking is a very competitive business sector, companies here are investing enormous amounts of capital in manufacturing and environmental protection equipment and facilities.

For example, more than \$720 million was invested by Wisconsin papermakers during a recent three-year period in capital projects to help assure they continue to be world-class competitors with a bright future in Wisconsin.

