

Field Enhancement 1: Unlocking a Forest's Past

NUTSHELL

In this lesson, students become forest detectives to uncover a forest's history. Using clues and data they collect at a forest site, students predict and make a drawing of what a forested area looked like in the past.

ENDURING UNDERSTANDINGS

- Ecosystems are continuously undergoing natural change. This natural change occurs through such processes as long-term evolution of organisms through relatively short-term processes such as succession, in which one plant community gradually supplants another.
- Ecosystems are dynamic and altered by natural or human disturbance. Disturbance plays an ongoing role in ecosystem structure and function.
- The lumber era shaped Wisconsin's economic, cultural, social, and environmental landscapes. Influences of this time period are still visible in Wisconsin today.

ESSENTIAL QUESTIONS

- What evidence should I look for in the forest to better understand its history?
- How can I use this evidence and observations I make to determine how the forest might have looked in the past?

OBJECTIVES

Upon completion of this lesson, students will be able to:

- Hypothesize about a forest's history by investigating clues.
- Describe how humans have influenced the history of a particular forest.
- Predict how a particular forest might have looked in the past.

SUBJECT AREAS

Act 31, Arts, Language Arts, Science, Social Studies

LESSON/ACTIVITY TIME

Total Lesson Time: 80 minutes

- Introduction.....5 minutes
- Activity 110 minutes
- Activity 215 minutes
- Activity 315 minutes
- Activity 415 minutes
- Conclusion.....20 minutes

TEACHING SITE

Any wooded area. Areas with interesting features or signs of past use like fences, rock piles, charred trees, stumps, etc. are ideal.

CLASSROOM LESSON CONNECTIONS


This lesson ties closely with **Lesson 1: American Indians and the Forest** and **Lesson 5: I Saw It on the News**.

STANDARDS CONNECTIONS

Standards for this lesson can be viewed online at the LEAF website (leafprogram.org).

MATERIALS LIST

For Each Student

- Copy of Student Pages  **1A-D, Unlocking the History of a Forest**
- Clipboard or other writing surface
- Pencil
- Crayons or markers (optional)

For the Teacher

- Google resources to support this lesson can be found at uwsp.edu/wcee/wcee/leaf/leaf-curriculum/k-12-forestry-lesson-guides
- Visit the teaching site in advance to decide the boundaries within which your students will work. Look for signs of the past you can point out to your students.
- Choose a spot in the surrounding area to take a short hike.

SAFETY PRECAUTIONS

Set up boundaries for your students to work within. Make sure you will be able to see all the students at all times. Children should walk, not run, at all times and be aware of rough terrain.

BACKGROUND INFORMATION

History of a Forest

Every forest contains clues that tell about its history. Wisconsin's landscape reflects the logging done during the 1850s to the 1920s. Some areas were replanted with rows of pines; others were left to reseed naturally. American Indian artifacts and old farm tools can sometimes be found in Wisconsin's forests. Clues like these give us information about the forest from long ago. Many other clues can be used to determine a forest's more recent history.

Looking at the area surrounding a forest can give us an idea of what happened in the recent past. Undisturbed habitat surrounding a forest may mean that people have not changed the land in an area; or it could mean that a long time has passed since there was a **disturbance**. In many areas of Wisconsin, farmland, shopping centers, and subdivisions are interspersed among forests. Introducing these elements into the landscape fragments what used to be contiguous stretches of forest. This leads to many changes. The composition of wildlife species present in the forest may change because some animals need large, continuous areas and other animals need openings. The effects on surrounding land can also include erosion of the soil, which in turn affects stream water quality. In addition, soil may be compacted or pollution and pesticides may enter the ecosystem. This can all affect the health of nearby forests. However, with a growing human population, there is a need for farmland, housing, and services, so we cannot consider them inherently bad.

Within the forest we can look for signs of people to determine what activities or events may have taken place there in the past. Rocks removed from fields and placed in piles, and barbed wire from old fences, might indicate that a forest used to be a farmer's field. An old foundation, an out-of-place tree, or a fence could indicate that a house and a yard existed there in the past. Glass bottles, broken plates, and old tools tell us that people lived and worked in the area. Trees growing in neat rows mean that people planted them either by hand or with machines. Fruit trees in a forest that seem out of place may indicate a house, farm, or orchard was once present.

**"And into the forest I go, to lose
my mind and find my soul."**

★ John Muir ★

Ageing a Tree

Determining the age of trees tells us how long the trees have been growing in the forest. There are several ways to age trees. Pine trees add one row of branches every year. We can get a rough estimate of how old a pine tree is by counting the rows of branches. This sounds simple; however, in practice, it can be difficult to see the rows through the foliage.

Another method is to count the rings on a cross-section of a tree trunk. This can only be done if the tree has been cut down or by taking a core sample with an increment borer. Trees add one ring of growth every year. In the spring, the wood grows faster than in the summer, so rings often appear to have one dark layer, and one light layer or one thick layer and one thin layer. These two layers together make up one ring. To determine the age of a tree that has been cut, start just inside the bark layer. Count each ring until you reach the center. The number of rings you count equals the number of years that tree was alive.

A third way to estimate the age of tree is to use a growth factor calculation. This factor is species specific. Different tree species grow at different rates. Based on species characteristics, a growth factor has been assigned. When this number is multiplied by the tree diameter, an approximate age can be determined. This method provides a relative estimate. The growth factor was determined for trees growing in a natural forest setting. In an urban or landscaped setting, trees receive extra care, such as fertilizer, watering, pruning, etc., and they have less competition so they tend to grow faster and with wider growth rings. Below are instructions for measuring the diameter of a tree and a chart containing the growth factors.

1. Measure the circumference of the tree.
2. Divide the circumference by 3.14 to get the diameter.
3. Multiply the diameter by the species growth factor to determine the approximate age.

To Measure Tree Diameter Using a Diameter Tape

1. The standard height for diameter measurements is 4.5 feet above ground level.
2. Wrap a diameter tape (a specially calibrated forester's tool) or measuring tape around the tree. Make sure the tape is tight against tree and not twisted. For larger trees, this may require two people.
3. Record the measurement. **NOTE:** On some measuring tapes "0" is not at the very end of the tape.
4. If you are not using a diameter tape, divide the measured circumference by pi (3.14) to get the diameter.

Growth Factors

American Elm	4
Aspen	2
Basswood	3
Black Cherry	5
Black Oak	4
Black Walnut	4.5
Cottonwood	2
Green Ash	4
Ironwood.....	7
Red Maple	4.5
Red Oak	4
Red Pine.....	5.5
River Birch.....	3.5
Shagbark Hickory	7.5
Silver Maple.....	3
Sugar Maple	5
White Ash	5
White Birch	5
White Oak.....	5
White Pine	5

Diameter (in inches) x Growth Factor = Approximate Tree Age

Growth Factors Adapted from the International Society of Arboriculture

Even-aged Vs. Uneven-aged

Some forests contain trees that are all the same age or very close to the same age. These are considered **even-aged** stands. They are likely to be plantations or natural stands of species like aspen or jack pine that colonize an area shortly after disturbance. With time and lack of disturbance, the aspen and jack pine forests will become **uneven-aged** as different tree species enter the ecosystem. Determining if a forest is even-aged or uneven-aged can tell us something about its history. A plantation may have once been a farmer's field. Or perhaps it was an area affected by a disturbance like fire or harvesting.

Disturbance

A **disturbance** is an event that interrupts the growth of a forest. Disturbances can take place on a large scale, like when a storm or a forest fire damages large areas. Disturbances can also take place on a small scale, like when a single tree gets struck by lightning. By looking carefully at clues in the forest, we can determine if a disturbance has taken place in the past. It is also possible to estimate how much time has passed since the disturbance took place. Dead trees and stumps decay slowly over time. By carefully observing how much they have decayed, we can estimate how much time has passed since the tree died.

VOCABULARY TERMS

Archaeological Resources Protection Act of 1979 (ARPA): The United States Congress created the Archaeological Resources Protection Act (ARPA) to protect important places and objects (artifacts) on public lands. The law says that people may not dig for or collect archaeological resources from public or Indian lands.

Disturbance: An event that interrupts the growth of a forest (e.g., fire, harvest, wind, flood).

Even-aged: A group of trees that are all nearly the same age.

Leave No Trace: Seven principles that, when followed, minimize the impact humans and their actions have on plants, animals, ecosystems and other humans.

Native American Graves Protection and Reparation Act (NAGPRA): The Native American Graves Protection and Reparation Act (NAGPRA) is a law that protects Indigenous burial sites and objects that were found on Native land or on land owned by the U.S. government. If remains that have already been removed can be proven to belong to a specific Native nation or tribe, they must be returned.

Uneven-aged: A group of trees of different ages.

"A woodland in full color is awesome as a forest fire, in magnitude at least, but a single tree is like a dancing tongue of flame to warm the heart."

★ Hal Borland ★

PROCEDURE



Introduction

1. Ask your students if they have ever been wandering through the woods or even in their backyard and come across something that piqued their interest. Maybe it was an old bottle or a group of dead trees. Clues like these can tell us something about what happened in an area in the past. Today you will become forest detectives. You will use a key to unlock the history of a forest. Your goal is to decide what the forest looked like in the past and what it might have been used for. We will begin by looking at the area that surrounds the forest. Then we will go into the forest to look for more clues. As a detective, what special skills will you need to use? (*Thinking skills, looking skills, listening skills, and possibly others.*) You will need to look, listen, and think carefully in order to uncover this forest's past.
2. Share the *Unlocking the History of a Forest Educator* Google slideshow with students to help them understand what they will be looking for in the forest. In addition, be sure to explain what ARPA, NAGPRA and Leave No Trace are and tell them that the expectations are that everyone in the class will follow the ARPA and NAGPRA acts and abide by the Leave No Trace principles.
 - In 1979, the United States Congress created the **Archaeological Resources Protection Act (ARPA)** to protect important places and objects (**artifacts**) on public lands. The goal of the law is to protect public lands and Indian lands from being damaged and having artifacts stolen from them. The law says that people may not dig for or collect archaeological resources including pottery, baskets, bottles, coins, arrowheads, tools, structures, pit houses, rock art, graves, and human skeletons. The **Native American Graves Protection and Reparation Act (NAGPRA)** is a similar law




that protects Indigenous burial sites and objects that were found on Native land or on land owned by the U.S. government. It says that Native remains and artifacts are cultural property of Native nations and tribes and are not objects to be studied. Remains belong left in place or with Native nations and tribes. If remains or objects that have already been removed are proven to belong to a specific Native nation or tribe, the remains or objects must be returned.

- **Leave No Trace** is a set of seven principals that are meant to minimize the impact humans and their actions have on plants, animals, ecosystems, and other humans. They should be applied anywhere, at any time you are taking place in educational, recreational, or other activities outdoors. The seven principles are:
 1. Plan ahead and prepare
 2. Travel and camp on durable surfaces
 3. Dispose of waste properly
 4. Leave what you find
 5. No fires allowed
 6. Respect wildlife
 7. Be considerate of other visitors

Activity 1

Give each student a copy of Student Pages  **1A-D, Unlocking the History of a Forest.** Take your students on a short walk in an area surrounding the forest where they will be working. During the walk, remind your students that they are forest detectives. They need to remain quiet and look carefully at their surroundings. Toward the end of your hike, stop and ask your students to look at the three pictures at the top of Student Page  **1A, Unlocking the History of a Forest.** Have each student circle the picture that looks most like the area they just walked through. Discuss how looking at the surrounding area helps us. (*It gives us clues about what happened here in the past.*)


Activity 2

1. Take your students to the forested area they will be investigating. Show your students the boundaries they will work within.
 2. Tell your students they will be working in pairs to find clues about the forest's past. Explain that Student Page  **1A, Unlocking the History of a Forest** will help them know what to look for. It will also tell them what the clues might say about the forest's past. Each student should sketch pictures and jot down notes about their discoveries on their own student page.
 3. Tell them their first assignment as a forest detective is to look for signs of people. The list on Student Page  **1A, Unlocking the History of a Forest** will help them get started. Ask the groups to walk around inside the boundaries and look for signs of people. When they find one, they should sketch a picture of it in the space provided.
 4. Once the groups have completed their sketches, gather them together. Ask your students to list a few of the signs they found. Then ask your students what these signs tell us about the activities of humans in this forest in the past. *(Answers will vary depending on the signs found. See student page for more information.)*
2. Give students time to age several other trees within the boundaries. Students may need assistance in tree identification, measuring, and math on Student Page  **1B, Unlocking the History of a Forest**. Ask your students to use the chart on the student page to record their findings. Once your students have had time to work, ask them to share information about the oldest tree they found.
 3. Tell students that some forests are mostly even-aged and some are uneven-aged. Ask what "even" means. *(Things are all the same or equal.)* Ask what "uneven" means. *(Things are not equal or the same.)* Ask students what they think it means for a forest to be even-aged. *(All the trees are approximately the same age.)* Tell students that often forests do not contain trees of all the same age. Ask how a forest might grow with trees of all the same age. *(All the trees might have been planted at the same time.)* Have students determine if their forest is mostly even-aged or uneven-aged and circle it on their student page.

Activity 3

1. For their next assignment, your students will age several of the trees in the forest. If possible, demonstrate how to age a tree in different ways.
 - a. A pine tree by counting the rows of branches.
 - b. A stump by counting the rings.
 - c. Any live tree by measuring the diameter and multiplying by a growth factor.

Activity 4

Now it is time to look for disturbances in the forest. Explain that a disturbance is an event that interrupts the growth of a forest. For example, forest fires, storms, and disease all interrupt the growth of a forest. Ask the groups to walk around and look for the clues that are listed on Student Page  **1C, Unlocking the History of a Forest**. When they find a clue, they should put a check beside it. Afterwards, help them analyze whether or not the clues indicate a particular disturbance took place.

UNLOCKING THE HISTORY OF A FOREST - A

Circle the picture that looks most like the area SURROUNDING your forest.



Look for examples that show people were in your forest long ago. Here are some ideas:

- Rock piles** might mean that the forest used to be a farmer's field. Farmers pull rocks out of the dirt to make plowing easier. They pile the rocks up on the edge of the field.
- Glass bottles, broken plates, old tools** mean that people used to live and work here.
- An **old foundation** means a house or building used to stand here. People build foundations out of stone or concrete. You might be able to see where walls or a fireplace were.
- An **old fence** made of wood or stone might mean that there used to be a farm or animals on the land.
- An **out-of-place tree** might mean that someone planted it there for a specific reason. Maybe this was someone's yard and they wanted a tree for shade. Or maybe they planted an apple tree for its fruit.
- Trees growing in neat rows** mean that people planted them either by hand or with machinery. People plant trees in rows to make them easier to care for.
- Barbed wire** might mean that a farmer used to keep horses or cows on this land.
- Other signs** may exist as well. What other signs do you see? What might these signs tell you about the forest's past?

Sketches and Notes About Items from People in the PAST

UNLOCKING THE HISTORY OF A FOREST - B

Look for examples that show people were in your forest recently. Here are some ideas:

- | | |
|--|--|
| <input type="checkbox"/> Telephone/electric poles bring services to your school and the surrounding area.
<input type="checkbox"/> Signs might tell people about what is in the forest, or might be used by people walking or driving nearby.
<input type="checkbox"/> Litter means someone was careless. You can help by picking it up and throwing it away. | <input type="checkbox"/> A bench gives people a place to sit.
<input type="checkbox"/> Birdhouses mean someone was caring for the wildlife in the area.
<input type="checkbox"/> Trails mean that people hike here.
<input type="checkbox"/> Other signs may exist as well. What other signs do you see? What might these signs tell you about the forest's past? |
|--|--|

Sketches and Notes About Items from People in the PRESENT

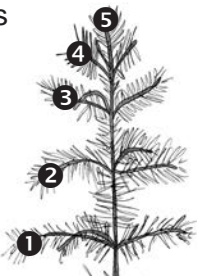
Figure Out the Age of Several Trees in Your Forest. Write Your Answers Below.

Kind of Tree: _____ Age: _____

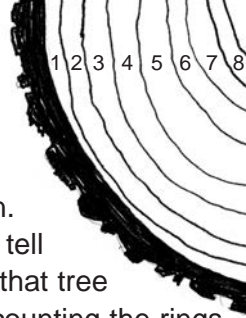
Kind of Tree: _____ Age: _____

Kind of Tree: _____ Age: _____

1. Pine trees grow one row of branches each year. You can tell how old a pine tree is by counting rows.




2. Try to find a stump where a tree was cut down. You can tell how old that tree was by counting the rings.




3. Have your teacher help you measure a tree and use math to figure out the age.

4. Your forest is mostly:



Even-aged



Uneven-aged

NOTE: If most of the trees are the same age and height, it could mean they were all planted at the same time, like when a farmer no longer used the land for crops.

UNLOCKING THE HISTORY OF A FOREST - C

Look for evidence of disturbances. A disturbance is an event that interrupts the growth of a forest. Did any of these disturbances happen in your forest in the past? Use the following checklist to help you decide.

FIRE - LOOK FOR:

- Tree trunks or branches with charred areas and black markings
- Bare patches of the ground that might be black

ELECTRICAL STORM - LOOK FOR:

- A single charred tree
- A tree with a long narrow split and bark missing from top to bottom

ICE STORM - LOOK FOR:

- Large branches broken off
- Small trees completely broken off

WINDSTORM - LOOK FOR:

- Whole branches with leaves still on them laying on the ground
- Trees with broken branches
- Trees snapped off at the trunk
- Trees tipped with their roots torn from the ground

FLOOD - LOOK FOR:

- Water lines on the trunks of the trees
- Dead trees in low areas

HARVEST - LOOK FOR:

- Stumps that have been cut by a saw
- Piles of sawdust
- Branches and the tops of trees lying on the ground
- Logging roads
- Colored flagging
- Stumps marked with paint

DISEASE - LOOK FOR:

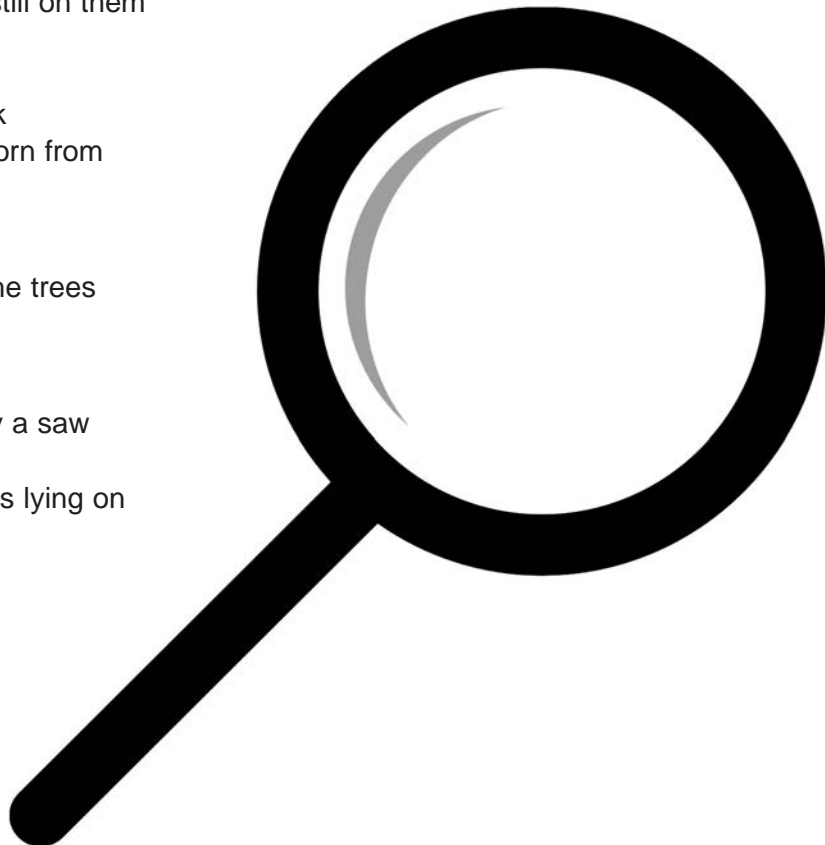
- Black spots on leaves
- Molds or mushrooms
- Large tumor-like growths on tree trunks

INSECTS - LOOK FOR:

- Small holes in the tree trunks
- Small holes in the leaves
- Small piles of chewed bark or wood

ANIMALS - LOOK FOR:

- Trees with many buds eaten off
- Trees with the bark chewed on or rubbed off
- Holes in the trunk



UNLOCKING THE HISTORY OF A FOREST - D

Now that you have looked at several clues, what do you think this area of forest might have looked like in the past? Draw a picture based on what you have discovered.

Sketches and Notes About This Forest from LONG AGO