

Lesson One



The Science of Forests and Trees



CONCEPTS

1. Forests contain many components in addition to trees.
2. There are five major structural layers in a forest.
3. A tree species is a group of individual trees that have the same characteristics.
4. Trees can be identified by their physical characteristics.

OBJECTIVES

- Students will be able to:
1. Define a forest in their own words.
 2. Name and describe the five layers of a forest.
 3. Explain the difference between an individual tree and a tree species

TEACHING SITE

Indoor or outdoor classroom; optional wooded area (school forest) with a variety of tree species.

MATERIALS

Large easel paper or butcher paper; pictures of a forested area, Forest Layer Worksheet, and Four Common Wisconsin Trees Handout.

LESSON TIME

One 50-minute class period

NUTSHELL

As a class, students will create a diagram illustrating the components that make up a *forest*. Students will learn about the five layers in a forest by examining diagrams and discuss the differences between individuals and species.

TEACHER PREPARATION

Read background information, gather materials, and copy the **Forest Layer Worksheet** and **Four Common Wisconsin Tree Handout** for each student.

VOCABULARY

- ✿ **Leaf litter** – This first layer of a forest is found on the forest floor and is comprised of dead and decaying matter.
- ✿ **Forb Layer** – The second layer of a forest; it contains herbaceous plants (non-woody) like ferns, wildflowers, and grasses.
- ✿ **Shrub Layer** – This layer is home to plants with woody stems that are not trees, such as raspberries and poison ivy.
- ✿ **Understory** – This layer is comprised of immature trees and smaller shade-tolerant trees. These trees are waiting for a break in the canopy so that they can take advantage of the space and sunlight created when a mature tree dies or is harvested.
- ✿ **Canopy** – The tallest layer of a forest. It consists of mature trees that partially or completely block out the sunlight with their foliage.
- ✿ **Individual** – a single tree.
- ✿ **Species** – a population of individuals with similar characteristics that usually only interbreed among themselves. Species groups are usually given a scientific, Latin name (for example: *Acer* = Maple, *Quercus* = Oak, *Pinus* = Pine).

BACKGROUND INFORMATION

A Forest Defined

There are many ways to define a forest. Some people think of forests as places to go for rest and solitude. Many people see forests as a wealth of resources to be harvested. Still others see forests as an important habitat for plants and animals. A **forest** is often defined by whatever special interest a person may have. Here are several technical definitions of a forest:

- 1) A **forest** is a land-based ecosystem characterized by the complex interactions between soil, water, air, plant, and animal components and the dominance of woody plants.
- 2) A **forest** is an area of land covered primarily by trees, and includes soil, water, and wildlife.

- 3) A **forest** is at least one acre in size and has at least 10% tree cover.
- 4) **Forestland** is land covered by at least 10% live trees or land formerly having such cover and not currently developed for non-forest use.
- 5) **Timberland** is forestland capable of producing 20 cubic feet/ acre/year of industrial wood and not withdrawn from timber utilization.
- 6) **Reserved timberland** is private or public timberland withdrawn – or deferred by law – from timber production or utilization.

The first activity in this lesson will allow students the opportunity to create their own definitions of a forest.

Forest Layers

There are five major structural layers in a forest. The **leaf litter**, or humus, on the forest floor is comprised of dead and decaying plant matter. This layer provides food to some animals, shelter to others, and replenishes the nutrients in the soil.

The **forb** layer contains herbaceous plants (non-woody stems) like ferns, wildflowers, and vines. This layer is also an important food source for animals. The species that make up the forb layer can be used to indicate how much sunlight or moisture an area receives.

The third layer of a forest is the **shrub** layer. This layer is home to plants with woody stems and some tree saplings. Examples include raspberry, sumac, and elderberry bushes along with sugar maple and hemlock saplings. The shrub layer is an important source of food and habitat for many animals, especially birds.

The next layer is the **understory**. It is comprised mostly of immature trees and smaller, shade-tolerant trees. These trees are

waiting for a break in the canopy so that they can take advantage of the space and sunlight created when a mature tree dies or is harvested.

The final layer of the forest is the **canopy**. This layer is made up of mature trees that partially or completely block out the sunlight with their foliage. Both the understory and canopy trees are habitat to innumerable animals as well as valuable economic resources. The vertical distribution of these layers is known as the **structure** of a forest. The structural characteristics of a forest create microclimates, determine habitat suitability for many forest animals, and distinguish many different forest types.

Forest Composition

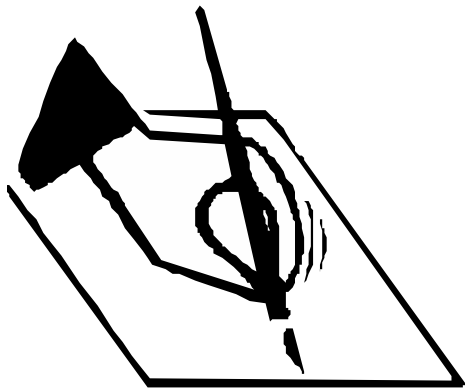
The **composition** of a forest refers to the mix of plant species (trees, shrubs, and forbs) present in a forested area at a specific point in time. A forest's tree composition refers only to the tree species present. Forested areas throughout Wisconsin have many different compositions. Forests can have a composition of one tree species such as a jack pine in a jack pine barren, or they can be made up of ten or twenty different tree species.

The number of species within a given forested area reflects species **richness**. The abundance of these species reflects the forests **evenness**. A forest may have a species richness of 30 different tree species, but 90% of those trees might be aspen trees. This would leave 29 tree species making up only 10% of the forest area, resulting in a low value for species evenness. If each of the 30 tree species made up about 3% of the forest composition, however, the evenness value would be very high because the abundance of each of the trees would be almost the same. The evenness of a forest together with the richness is known as the **diversity** of a forested area.

ACTIVITIES

1. What do *you* think a forest is? (5 minutes)

Before delving into the WI Forestree Unit, you will want to have a measure of what your students' current knowledge about forests is. Ask them the question "What is a forest?" Do not discuss this out loud, but have them write down their own definition of a forest in their log book. At the end of the Forestree Unit, you will ask students to write their definition of a forest again and compare their new definition with the one they wrote in the beginning. This method will serve as one measure of the information your students have learned over the course of the unit.



2. Concept Mapping (10 minutes)

To continue assessing your students' knowledge of forestry concepts, you will create a concept map pertaining to forests with the entire class. Begin by writing the word *forest* in the middle of a large easel pad or piece of butcher paper. Ask students "What do you think of when you hear the word forest?" A variety of answers will emerge from this question (trees, deer, timber, paper, leaves, raccoons, birds, beauty, mountain biking, hiking, hardwood, evergreen, etc.). These answers may fall under many different concepts, including: forest makeup, forest types, organisms found in forests and/or values of a forest.

As you add each idea or word to the paper, try to group words based on concepts such as those above. Connect ideas that fall under a concept together, but make sure they all lead back to the word *forest* in the middle (refer to the example concept map for ideas on what words should be included). Encourage students to think of things that may not be immediately obvious, perhaps building on ideas that other students have had. When students' ideas are exhausted, tell them that "When working with forests, there are many issues that need to be considered, both environmentally and economically." During this Wisconsin Forestree Unit, they will become detectives searching for ways that the forest environment and forest economy can maintain a balance. They will start first, though, with the most evident part of a forest...the tree. If possible, leave the concept map in an easily viewed space on the wall for reference throughout the Forestree Unit.

3. Layers of a Forest (20 minutes)

In this activity, students will be introduced to the **structure** of a typical forest. A good way to discuss this concept to students is to relate a forest to a house. Tell them to think of a typical two-story house. What would the lowest layer in the house be? *The basement!* What's in the basement? *Pipes, storage, etc.* What about the next level? *Kitchen, dining room, living room, etc.* The next? *Bedrooms, a study, etc.* What's at the top of the house? *The attic, and then the roof.* Well, a forest has layers just like a house does, only the layers are called different things.

Discuss these layers with your students. Ask, "What's at the bottom of a forest?" *Dead leaves,*



soil, etc. The dead leaves are called **leaf litter** – this is the first layer of a forest. This layer has a variety of insects, microorganisms and bacteria present. What do you think they do? *They break down leaves and replenish nutrients in the soil.*

Moving up, what's the next thing you would find? *Small plants, ferns, flowers, etc.* This layer of non-woody plants is called the **forb layer**. What is the forb layer useful for? *Important food source for animals, habitat.* Another use for the forb layer is to tell us what kind of forest we are in. How do you think it does this? Think about the rooms in your house. How do you tell what to call each room? *By the furniture and appliances you find in that room – you can tell your kitchen from the bathroom from the bedroom.* You can tell the type of forest that you are in by the trees and plants that grow there. Trees grow on land that has all of the tree's requirements available for them to use. What are some of these requirements? *Sunlight, nutrients, space, moisture.* The tree species that are found in a forest depend on the availability of the sunlight, nutrients, space, and moisture within that forest. By knowing what amounts of these factors are available, scientists can tell what kind of forest they are in. The types of forbs present can give scientists a good estimation of the availability of sunlight, moisture, and nutrients and help them to determine the type of forest that they are in.

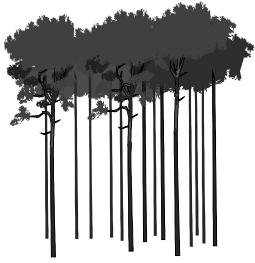
The next layer up is the shrub layer. Can you think of some plants that would be included in this layer? *Blueberries, raspberries, sumac, tree saplings (sugar maple, hemlock).* The shrub layer provides more food for animals, as well as important shelter to lots of animals, especially birds.

What's in the next layer? *Small trees, young trees.* These trees don't get a lot of something they need to survive – what is it? *Sunlight.* This layer is called the **understory**, and the trees in this layer can survive with only small amounts of sunlight. They are shade-tolerant. Does anyone know what the word tolerant means? One way to explain tolerance is to ask students if they have ever tried to watch TV or read with a little brother or sister making a lot of noise...how did they handle it? If they got mad and couldn't read or watch TV, they didn't tolerate the noise very well – they couldn't handle it. If they could still concentrate on what they were doing, then they were tolerant – they could deal with the distraction. Well, the trees in the understory can tolerate a lack of sunlight. Many of them are just waiting for a larger tree to die and fall down, then they will shoot up into the sunlight, and become larger themselves.

Does anyone know what the last layer is called? *The canopy.* This layer is made up of mature trees. These trees are the tallest in a forest, and get the majority of the sunlight. They also receive the strongest winds and rain. What do you think this layer is used for? *Timber, shelter, habitat for a few animals (generally birds), photosynthesis (light capture) for the tree.* When you put all the layers together, you have the **structure** of a forest, just like putting all of the rooms of the house together would create the structure of the house.

After discussing these concepts and terms with your students, divide them into groups of three. Give each group a copy of the **Forest Layers Worksheet**. A picture of the forest layers is on the worksheet, with five blanks corresponding with each layer. Students need to fill out the blanks on the worksheet with the correct name for each layer. Give students a few minutes to complete this task, then bring them all back together. Discuss with students what their answers were and why they put them in a particular order. Then discuss the correct answers with the entire group, making sure that everyone understands the concepts and terms outlined above.

Option: If you have access to a forested area, you can do this same activity outside in the forest. Conduct your discussion outside, pointing out different layers to students and asking them to brainstorm what they think the uses for a particular layer are. Then bring them back inside to complete the worksheet.



4. **Species vs. Individuals** (5 minutes)

As preparation for the rest of the unit, students will need to understand the difference between individual organisms and different species. Ask students what a species is. How is a species different from an individual? *A species is made of many individuals that have the same characteristics.* One white pine tree is an individual, but all white pine trees are in the same species.



Knowing the kinds of trees that are in a forest is important when you are trying to determine the forest **composition**. What do you think I mean when I say forest composition? *All of the different species of trees in a forest make up the forest composition.* Direct your students to look back at the Layers of a Forest worksheet. Next to each layer is a box with a number of different kinds of trees and plants listed. Explain to your students that these are trees and plants that are usually found in that layer of forest. Ask if your students are familiar with any of these types of trees.

5. **Forest Visualization** (10 minutes)

Hand out the **Common Wisconsin Trees Sheet**. This will give additional information including tree silhouettes and leaf shapes. Tell the class that the individual pictures of the trees on the worksheet represent 4 different types of trees species found in Wisconsin. Have the class read over the tree descriptions and look at the pictures. Have the students close their eyes and envision a forest made up of those 4 tree species. Describe each separate tree using information from the worksheet. Use the information to help the students form a mental picture of the trees and the forest. Have them make the canopy trees (white pine and red maple) large and dominant and the younger trees (white oak and aspen) small and overtopped. Tell them the season to place the forest in and give them an animal (deer, porcupine, chipmunk, etc.) to place in the scene. Use elements like landscape and weather to solidify the forest in their mind. Once the students have the picture in their mind, ask them to visualize each of the 4 separate trees that they have put in their forest. Which is the biggest? Which is the smallest? Can you see the structure of the forest? Recite these trees that they have placed in the forest scene and tell the class that these 4 trees make up the **tree composition** and help to create the structure of their imaginary forest.

CONCLUSION

Forests can be defined by the structure and composition that they have. Many forests contain different trees and combinations of trees and have different structural characteristics. These differences from forest to forest influence the different types of animals that live there and the forestry practices that are used. There are many factors that help to create the structure and composition of a forest. Ask the class to brainstorm the reasons why forests differ in the trees that they contain and the structure that they have. Tell them that they will learn more about these influences in the next class.

STUDENT LOG BOOK

Throughout the lesson students should have their log book accessible. They should write the name of the lesson (The Science of Forests and Trees) and the date. They should write down vocabulary along with definitions. The log book should also be used for students to take notes in during class and to answer the Log Book question that accompanies each lesson (on their own time). For this lesson, have students describe how the layers of a forest are similar to the levels of a house.

SEEDS TO GROW (*This extension lesson will be covered with your students if they participate in the Wisconsin Forestree Field Experience at the Central Wisconsin Environmental Station*)

Identifying Tree Species

This extension activity will allow students to identify more of the common trees found in Wisconsin. An important part of forestry is being able to identify what tree species are present in an area. Knowing tree types and their characteristics helps foresters determine which trees to manage for a particular reason. A good tool used to identify trees is the dichotomous key.

Explain to students what a dichotomous key is and show them the tree key included. At each step there are two descriptions of a particular characteristic. The user chooses the description that best matches the tree they are trying to identify. Each step narrows down the choices until the tree is identified. To help students become acquainted with dichotomous keys, use the example key provided to let them key out each other. The key uses the characteristics of the students to separate the class into groups, just as a dichotomous key for trees uses the tree characteristics to separate the forest into different tree species.

You will need to explain some of the vocabulary used with dichotomous keys (included in a separate vocabulary list). You can then use the tree key provided to identify several species of trees. You can also use field guides to identify trees based on the same characteristics. Use leaves and branches that are brought in to the classroom. If you do use real samples or go outside to identify real trees, make sure that all of the samples are included on the key you are using.

WEB LINKS

Wisconsin Department of Natural Resources—www.dnr.wi.state.us

American Forest Foundation (Project Learning Tree—www.affoundation.org)

Wisconsin Forestry Resources Education Association—www.wfrea.org

Michigan State University—www.forestry.msu.edu/uptreeid

REFERENCES

Addis, James et al. 1995. Wisconsin's Biodiversity as a Management Issue. Wisconsin Department of Natural Resources.

Bates, John. 1995. Trailside Botany: 101 favorite tree, shrubs, and wildflowers of the Upper Midwest. Pfeifer-Hamilton Publishers. Duluth, MN.

Kimmins, Hamish. 1997. Balancing Act: Environmental Issues in Forestry. UBC Press, Vancouver.

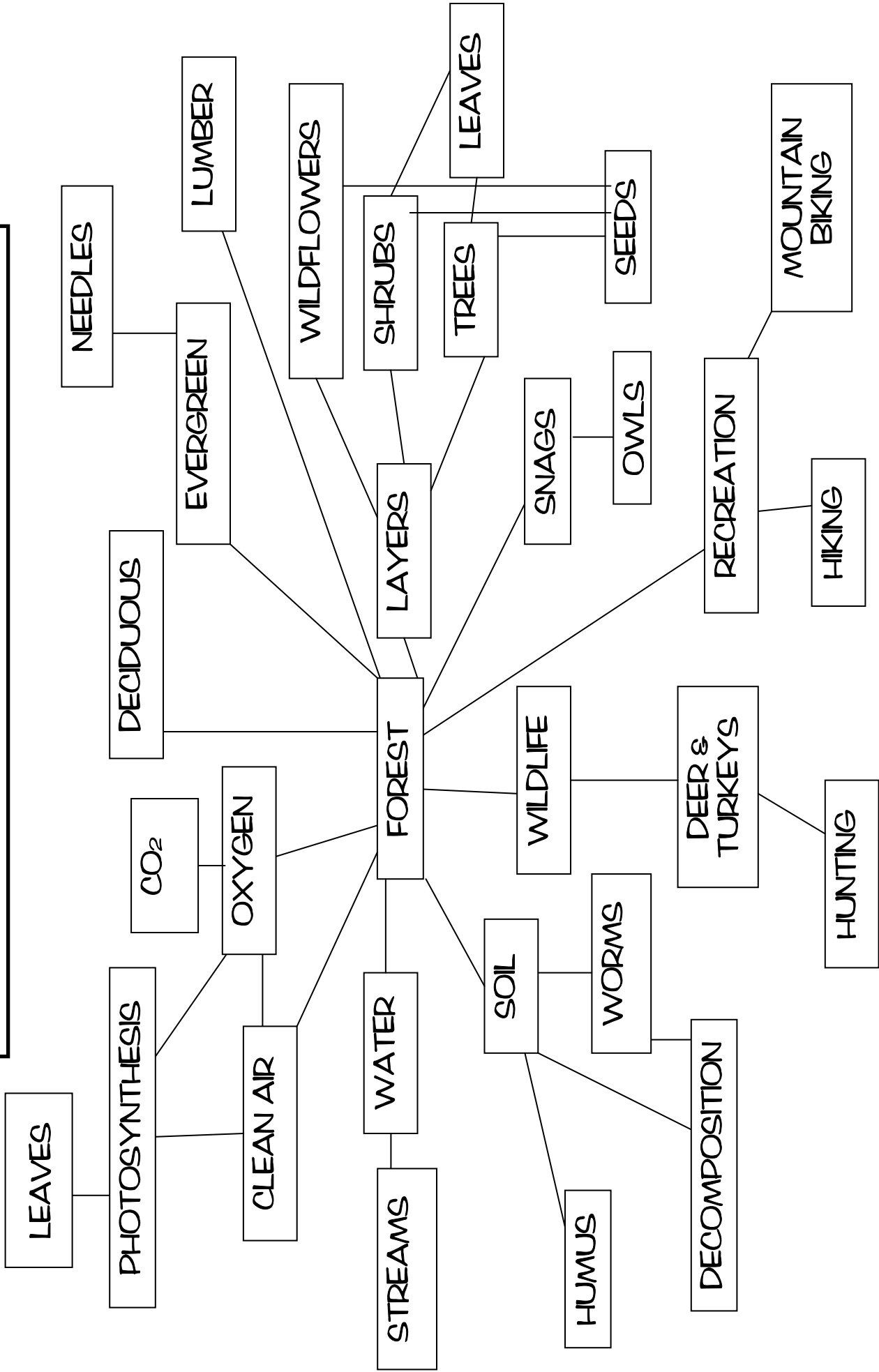
Perry, David A. 1994. Forest Ecosystems. John Hopkins University Press. London.

Petrides, George A. 1958. Peterson Field Guide: Trees and Shrubs of Eastern North America. Houghton Mifflin Co., Boston.

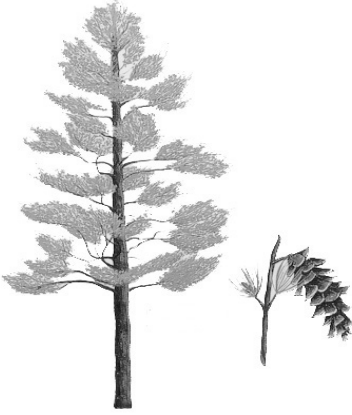



Platt, Rutherford. 1987. 1001 Questions Answered About Trees. Dover Publications Inc. New York.

Wisconsin Department of Natural Resources Bureau of Forestry. 1990. Forest Trees of Wisconsin and How to Know Them.

WHEN YOU HEAR THE WORD FOREST,
WHAT DO YOU THINK OF?








Four Common Tree Species in Wisconsin

<p>White Pine</p>		<ul style="list-style-type: none"> ✦ Found in the canopy ✦ Can live up to 400 years ✦ Used to be the major lumber tree in WI ✦ Can reach up to 150 ft. in height ✦ Usually the dominant tree in mature forests
<p>Red Maple</p>		<ul style="list-style-type: none"> ✦ Found in the canopy ✦ Turns a brilliant red in the fall ✦ Very tolerant of different environmental conditions ✦ Important food source for wildlife ✦ Increasing importance as a lumber tree
<p>White Oak</p>		<ul style="list-style-type: none"> ✦ Usually found in the understory ✦ Best all-around multipurpose hardwood tree in America ✦ Can live up to 600 years ✦ Found in the southern 2/3 of WI ✦ Root system and canopy have a very large spread
<p>Big-Tooth Aspen</p>		<ul style="list-style-type: none"> ✦ A pioneer tree found in younger forests ✦ Needs full sunlight to grow ✦ Can create very thick stands called "dog-hair" stands ✦ Lives up to 80 years ✦ Reaches 80 feet in height ✦ Valuable as pulpwood ✦ Important food source for wildlife

LAYERS OF A FOREST

FOREST COMPOSITION

	<p>Red Pine White Pine Sugar Maple Eastern Hemlock</p>
	<p>Paper Birch Black Cherry White Ash Red Maple</p>
	<p>Raspberry Elderberry Poison Ivy</p>
	<p>Snow Trillium Bracken Fern Pink Lady Slipper</p>
	<p>Leaves, twigs, nuts, needles, and other decomposed plant material</p>

Vocabulary for the Dichotomous Keys

- ✿ **Dichotomous key:** a tool for identifying tree species by the process of elimination using leaf, twig, fruit, or bark characteristics.
- ✿ **Alternate branching:** a branching pattern where side branches, leaves and leaf scars do not grow directly across from each other.
- ✿ **Broad-leafed:** Trees that have flat leaves as opposed to trees with needles. These trees usually lose their leaves in the fall.
- ✿ **Bundles:** Trees in the pine family have groups of needles held together at the base by a small papery wrap called a fascicle. White pines have five needles wrapped together, while other pine trees have only two. Larches appear to have needles in bundles, but they are really just clusters of needles.
- ✿ **Compound leaf:** A single leaf with numerous leaflets. A leaf actually begins where the leaf stem attaches to the twig.
- ✿ **Conifer:** An evergreen tree that bears cones.
- ✿ **Deciduous:** Trees that lose their leaves in the fall and bear flowers in the spring. These trees are also called broad-leafed.
- ✿ **Evergreen:** A tree that retains its leaves or needles throughout the winter. Also called conifers.
- ✿ **Leaf scar:** The mark left on a twig after the leaf drops off in the fall. The bundle scars are the points where the leaf vessels, which carry water and nutrients, passed into the twig.
- ✿ **Leaf stem:** This is usually a small stem that attaches the leaf to the twig. They can be round, flat, or square.
- ✿ **Leaflets:** These smaller parts of leaves often resemble leaves themselves, and join together along the leaf stem. The leaf starts where the woody twig ends.
- ✿ **Lobes:** These are like fingers on a leaf that make the leaf an irregular shape. Think of an oak leaf as an example. The spaces between the lobes are called sinuses.
- ✿ **Margins:** This is the edge of the leaf. The edge can be toothed or smooth, lobed or entire.
- ✿ **Opposite branching:** A branching pattern where side branches, leaves, and leaf scars grow from the stem directly across from each other. Maples and ashes have this characteristic.
- ✿ **Scaly:** Evergreen needles that are flat and overlapping, like fish scales, are called scaly. Northern white cedars have scaly needles.
- ✿ **Simple leaves:** The leaf stem is the same as the mid-rib for that leaf.
- ✿ **Sinuses:** The spaces in between lobes on a leaf.
- ✿ **Toothed margins:** The edges, or margins, of some leaves appear to have teeth. Single-toothed means that all the teeth are about the same size. Double-toothed means that between each tooth there is a smaller tooth. Serrated means that the leaf margin looks like a saw blade.
- ✿ **Whorled:** the leaves originate at the same point on a branch and form a circular pattern around the branch or twig.

Dichotomous Key to Identify Students

- | | |
|--|--|
| <p>1. Female...2
Male...17</p> <p>2. Brown hair...3
Not brown hair...6</p> <p>3. Brown eyes...4
Not brown eyes...9</p> <p>4. Earlobes attached...5
Earlobes unattached...11</p> <p>5. Freckles...student is _____
No freckles...student is _____</p> <p>6. Brown eyes...7
Not brown eyes...12</p> <p>7. Earlobes attached...8
Earlobes unattached...14</p> <p>8. Freckles...student is _____
No freckles...student is _____</p> <p>9. Earlobes attached...10
Earlobes unattached...15</p> <p>10. Freckles...student is _____
No freckles...student is _____</p> <p>11. Freckles...student is _____
No freckles...student is _____</p> <p>12. Earlobes attached...13
Earlobes unattached...16</p> <p>13. Freckles...student is _____
No freckles...student is _____</p> <p>14. Freckles...student is _____
No freckles...student is _____</p> <p>15. Freckles...student is _____
No freckles...student is _____</p> <p>16. Freckles...student is _____
No freckles...student is _____</p> | <p>17. Brown hair...18
Not brown hair...21</p> <p>18. Brown eyes...19
Not brown eyes...24</p> <p>19. Earlobes attached...20
Earlobes unattached...26</p> <p>20. Freckles...student is _____
No freckles...student is _____</p> <p>21. Brown eyes...22
Not brown eyes...27</p> <p>22. Earlobes attached...23
Earlobes unattached...29</p> <p>23. Freckles...student is _____
No freckles...student is _____</p> <p>24. Earlobes attached...25
Earlobes unattached...30</p> <p>25. Freckles...student is _____
No freckles...student is _____</p> <p>26. Freckles...student is _____
No freckles...student is _____</p> <p>27. Earlobes attached...28
Earlobes unattached...31</p> <p>28. Freckles...student is _____
No freckles...student is _____</p> <p>29. Freckles...student is _____
No freckles...student is _____</p> <p>30. Freckles...student is _____
No freckles...student is _____</p> <p>31. Freckles...student is _____
No freckles...student is _____</p> |
|--|--|

Dichotomous Keys for Common Wisconsin Trees

Begin here:

Tree has needles...use Coniferous Tree Key

Tree has broad leaves...use Deciduous Tree Key

Coniferous Tree Key

1. Needles in bundles or groups (2)
1. Needles single or flattened and scaly (5)
 2. Needles in clusters...**Tamarack**...Larix laricina
 2. Needles 2-5 per bundle (3)
3. Five needles per bundle...**White Pine**...Pinus strobus
3. Needles in pairs (4)
 4. Needles 3-4 inches long...**Red Pine**...Pinus resinosa
 4. Needles under 2 inches, bark dark gray...**Jack Pine**...Pinus banksiana
5. Needles square, round or scaly (6)
5. Needles flat (8)
 6. Needles scaly and flattened...**Northern White Cedar**...Thuja occidentalis
 6. Needles square or round (7)
7. Needles 1/3 - 3/4 inch long, twig hairless...**White Spruce**...Picea glauca
7. Needles 1/4 - 3/4 inch long, new twigs have hair, grows in wet areas...**Black Spruce**...Picea mariana
 8. Needles 1/2 inch long with short stem...**Eastern Hemlock**...Tsuga canadensis
 8. Needles 3/4 - 1 and 1/4 inches long, no stem...**Balsam Fir**...Abies balsamea

Deciduous Tree Key

1. Opposite branching (2)
1. Alternate branching (5)
 2. Compound leaves (3)
 2. Simple leaves (4)
3. 9-11 leaflets, leaflets do not have stems...**Black Ash**...Fraxinus nigra
3. 5-9 leaflets, leaflets have stems, smile-shaped leaf scar...**White Ash**...Fraxinus americana
 4. Leaf margins smooth, 5 lobes...**Sugar Maple**...Acer saccharum
 4. Leaf margins notched, 3-5 lobes...**Red Maple**...Acer rubrum
5. Compound leaves (6)
5. Simple leaves (8)
 6. Leaflets over 2 inches long, 5-7 hairless leaflets, egg-shaped nut...**Shagbark Hickory**...Carya ovata
 6. Leaflets over 2 inches long, 7-17 slightly hairy (below) leaflets, leaf 12-36 inches long...**Black Walnut**...Juglans nigra
7. Leaves lobed, smooth or toothed margins (8)
7. Leaves not lobed (9)
 8. Pointed lobes, leaves hairless, sinuses no closer than 1/2 inch to mid-vein...**Red Oak**...Quercus rubra
 8. Rounded lobes, even lobes, and sinuses, leaves hairless...**White Oak**...Quercus alba
9. Leaves toothed, papery bark (10)
9. Leaves toothed, bark not papery (11)

- 10. Leaves single-toothed, white peeling bark...**White Birch**...Betula papyrifera
- 10. Leaves double-toothed, yellow or bronzed bark...**Yellow Birch**...Betula alleghaniensis
- 11. Leaf stems flat (12)
- 11. Leaf stems round (13)
 - 12. Leaves have small, fine teeth < 1/16 inch, bark usually white...**Trembling Aspen**...Populus tremuloides
 - 12. Leaves have large teeth, bark usually white...**Big-Toothed Aspen**...Populus grandidentata
 - 12. Leaf is triangular-shaped with course teeth...**Cottonwood**...Populus deltoides
- 13. Leaves long and narrow (14)
- 13. Leaves almost as wide as long...**Basswood**...Tilia americana
 - 14. 5-6 inches long, hairy leaves, fringe along rib on bottom of leaf, bark very dark...**Black Cherry**...Prunus serotina
 - 14. 3-5 inch long leaves, smooth gray bark...**American Beech**...Fagus grandifolia

The vocabulary definitions and the dichotomous keys for the tree identification are adapted from a tree identification website created by Bill Cook, extension forester at Michigan State University.

Forest Visualization

Lesson 1, activity 5

Read this description after reviewing the "Four Common Tree Species in Wisconsin" handout with students. Help them to visualize a forest of white pine, red maple, white oak, and quaking aspen.

You are standing on a small hill inside a forest. High above you are the tops of the giant white pine trees reaching 100 feet into the air. They are many of these white pines in the forest and they have thick, rough bark and trunks so large you can't touch the tips of your fingers together as you reach around the trunk. Dry, brown needles are scattered along the path where you are standing and long pinecones with sticky sap on them are scattered everywhere.

Also in the canopy are large red maple trees. You remember times when you threw their helicopter-like seeds into the air and watched them spin to the ground. These seeds are an important food source for wildlife, which you can't see but can hear. The 'caw-caw' of a crow, the screechy cry of a blue jay, and rustling in the dry leaves on the ground from a squirrel running from tree to tree looking for food are sounds around you. Seeing the red maples and hearing the rustle of leaves makes you think of the forest in the fall when all the maple leaves have turned to a brilliant shade of red.

The sun is shining, creating spots of light on the forest floor where it is not blocked by branches and leaves. Summer is near so all the trees are full with leaves rustling and needles whistling in the breeze. The white pines and red maples are not the only trees you can see as you look toward the sky. You can also find the leaves of a white oak with their rounded, finger-like tips. These trees can live up to 600 years but in this forest the oak are still young and haven't reached the canopy yet. They fill the understory and add to the variety found in the litter layer when their acorns drop. These brown, shiny nuts with rough little caps are a favorite to the gray squirrels running on the forest floor.

Near the edge of the forest where you first entered is another kind of tree. The triangular leaves with toothed edges fluttering back and forth in the wind help to identify this tree as a quaking aspen. Its bark is smooth and gray and its leaves are a bright shiny green on the top. The quaking aspen needs a lot of light to grow, which is why it is on the edge of the forest, not deep inside where it would be shaded by other trees. The aspen are young pioneer species that only reach 80

feet in height when mature. These aspen are small in size compared to the towering white pines in the heart of the forest.

Together all of these trees are part of a balanced community. Over time the larger trees will die and create openings in the forest for younger saplings to sprout and reach the canopy. The cycle of the forest will continue.

Now visualize each of the four trees in the forest separately. *White pine, red maple, white oak, quaking aspen.* Which is the biggest? *White pine.* Which is the smallest? *Quaking aspen.* Can you see the structure of the forest? *The four trees-white pine, red maple, white oak, and quaking aspen make up the tree composition and help to create the structure of this forest.*

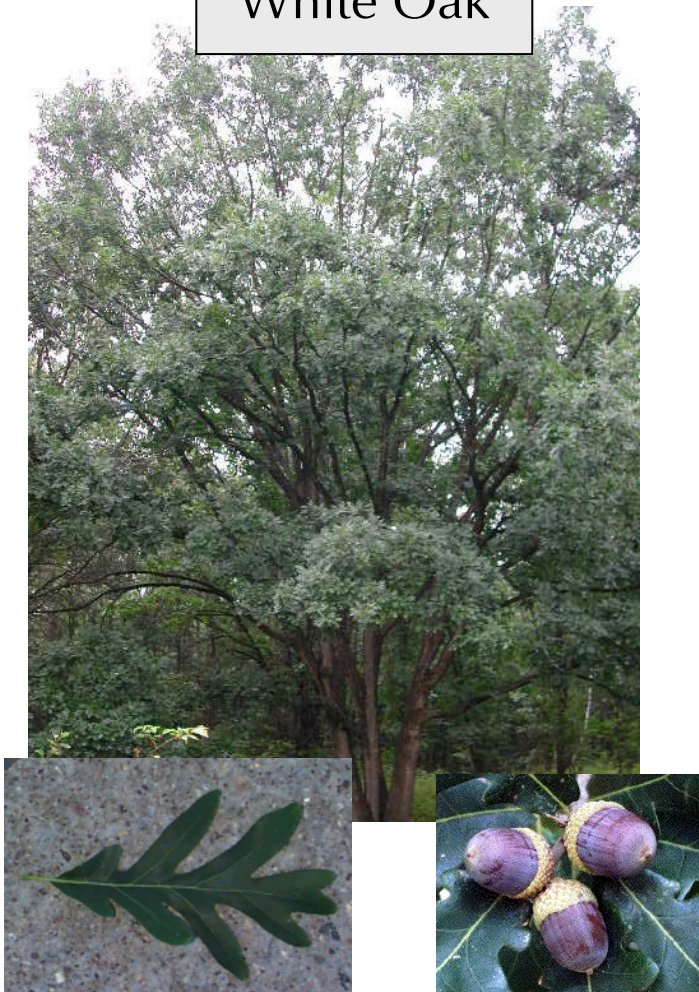
White Pine



Red Maple



White Oak



Quaking Aspen

