

# **Understanding the Forest and Its Uses**

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## **Why Harvest?**

Trees provide essential wood products that are used in our homes, our communication, and for a myriad of other uses. They can be converted to useful products with far less consumption of energy than can potential substitute materials, and unlike substitute materials, trees and the wood they produce will grow back.

Forest management largely replicates what happens in nature, while making use of trees that would normally die through plant competition. As a forest grows, trees compete for soil nutrients, growing space, and sunlight. Over time, some trees in the forest grow faster and taller than their neighbors, and some of these go on to develop into mature stems. Those that are less vigorous and slower growing become overtopped and shaded by their more vigorous neighbors and most typically die - the result of a "natural thinning" by nature. Forest management removes many of the competing stems, leaving remaining trees to grow to larger sizes faster than if harvesting were not practiced. When mature trees are harvested, and the forest re-established to begin the cycle again.

## **Competition and Forest Harvesting**

**Grade Level:** K-3  
**Subjects:** Science, writing  
**Concepts:** Effects of competition

**Material needed:** Felt board or cardboard, scissors, tape, glue, and construction paper

**Time needed:** 45 minutes

### **F.R.E.E. supporting materials:**

- "Education in Nature" leaf and stencil kit (Georgia Pacific)

### **Learner Objectives:**

After completing this lesson, students should be able to:

- describe what competition in a forest is.
- understand how harvesting affects competition within a forest stand.
- understand that proper forest management and harvesting can replicate natural cycles in a forest.

### **Preparation:**

Prepare a large section of felt board or cardboard by drawing or marking an area to represent the "forest." This area should be large enough so that most students will be able to fit his/her tree in to the forest, but small enough so that all trees will not fit easily.

### **Doing the activity:**

Using the leaf and stencil kit, have each student trace and cut out a tree on felt or cardboard, depending on which material you used in the preparation section. Then, have each student place his or her tree in the "forest" at the front of the room. Because all of the student's trees will not be able to fit into the forest, some trees will be touching each other, on top of one another, or overtopping shorter trees. This demonstrates a crowded forest. Discuss with students what happens in a crowded forest.

Would there be enough sunlight getting to all trees?

Would there be enough space for each tree to grow?

Would the larger trees block the sunlight for the smaller trees?

Make sure students understand the negative effects of competition in a crowded forest. Help them understand that crowded forests do not provide enough sunlight, space, or nutrients for all trees. As a result, many trees lose vigor over time and eventually die as more vigorous neighbors compete more effectively for the essentials of health and life.

Next, have students "harvest" some of the trees to lessen competition. This simply involves removing some of the crowded trees to give all trees enough space and sunlight to grow. Students should experiment with how many trees to harvest. Discuss the

remaining trees and the extra space, sunlight, and nutrients they will receive after harvesting.

Now have students label each harvested tree as one of the uses identified in "Uses of the Forest." Students might use these harvested trees to make a home, paper, a fence, or a power pole. For example, a student could write the word "lumber" on one of the harvested trees and "paper" on another. This reminds students that each tree has value and that harvesting provides for their needs.

**Evaluating results:**

Ask students to list the negative effects of a crowded forest. Have students describe why harvesting could benefit the trees in a forest. Do students understand that harvested trees have value and are used to satisfy their daily needs?

**Extra activities:**

- 1) Create this scenario: Citizens of the students' community are angry because of harvesting going on in a nearby forest. Have students write a letter to these citizens describing the positive benefits of periodic harvesting on the forest.
- 2) Have students make a list of everything they have used today (or this week) that is made from wood or wood fiber. (Check the Kid's Corner section of the F.R.E.E. website for a partial list of products).

## **Why Teach Succession?**

An understanding of forest succession is essential to forestry and the way forests work. Succession characterizes the cycle every forest undergoes as it ages and matures. Forests are dynamic and therefore always changing in form and content. Many believe that a forest, if left unmanaged, will remain perfectly intact as seen today. However, no forest ever maintains the same species characteristics, density, and associated wildlife populations over time. Therefore, students should understand why and how and forest changes over time.

Succession is most influenced by species characteristics, including the reaction of young trees to direct sun and to disturbances of both natural and human origin. Because of differences in sunlight requirements, typically shade-loving species will take over shade-intolerant species ("sun" trees). That is to say, a forest filled with shade-intolerant trees will succeed to shade-loving species. A forest consisting of only shade-loving trees will not change in composition until a disturbance occurs, such as a windstorm, fire, insect infestation, ice storm, or forest harvest. For sun-loving trees to return to an area, adequate sunlight must reach the ground. This can happen in two main ways:

1. Shade tolerant trees can be harvested so as to allow direct sunlight to reach the forest floor. Openings created should be at least as wide as twice the height of surrounding trees.
2. A fire or some other type of disturbance kills a number of trees, flooding the forest floor with sunlight.

Each stage of succession supports different tree species. Knowing which species occur in these stages is important as it dictates what species are available to satisfy human and animal needs. Therefore, providing students with a basic understanding of succession is essential to education about forests.

## What is Succession?

**Grade Level:** 3-5  
**Subjects:** Science  
**Concepts:** Cycles, stages, and causes of succession

**Material needed:** Color overheads

**Time needed:** 30 minutes

### **F.R.E.E. supporting materials:**

- "Treetop" Ch. 5 (Minnesota Extension Service)
- "Trees + Me = Forestry" Ch. 4 (Minnesota Extension Service)

### **Learner Objectives:**

After completing this lesson, students should be able to:

- understand the cycles of succession.
- understand events that lead to various stages of succession.
- describe the difference between shade tolerant (shade-loving) and shade intolerant (sun-loving) species.
- describe the characteristics of a climax forest.

### **Preparation:**

Prepare color overheads of:

- Trees + Me = Forestry, p.26
- Treetop, p. 28.

Write these key words on the chalkboard or overhead:

"shade-tolerant" or "shade-loving", "shade-intolerant" or "sun-loving", "pioneers", "disturbance", "climax", and "succession."

### **Introduction:** (Adapted from "Trees + Me = Forestry, Chapter 4)

Tell the students you are going to read them a story, the succession story. Tell them to listen for the key words on the board as you read the story. After the story they will be asked to define the key words and discuss how they relate to succession.

"When you remove trees from a forest, you take away the shade on the ground. In this new forest, **sun-loving** or **shade intolerant** trees can grow because they can survive in warm, dry soils and have the ability to quickly develop roots that seek-out moisture. They also grow fast so that grasses and shrubs do not grow over them. Aspen, paper birch, and jack pine are some common **sun-loving** or **shade-intolerant** trees and are also known as **pioneers**. Pioneer species typically have a relatively short lifespan - often about the same as people. Pioneer species also often form thin crowns that create light shading of the forest floor as they grow larger. But as soon as the pioneer species begin to shade the forest floor they create a bit of a problem for themselves. As they shade the area beneath them, the young trees that emerge from their seeds cannot survive.

Different kinds of trees that grow well in the light shade now grow better and faster. These other species are called light-shade trees or intermediate-tolerance trees. Some light-shade trees include red maple, oaks, green ash, white pine, and balsam fir, and spruce. These are the kinds of trees that soon cover the forest floor underneath the light shade of the **pioneers**. When the short-lived pioneer species near the end of their life cycle they begin to lose vigor and their crowns begin to thin. Eventually the sun-loving trees die. This sets the stage for rapid growth of the light shade trees that soon take over the forest canopy. These trees form thicker crowns than the sun-loving trees and create dense shade beneath their branches. Eventually, just as happened with the pioneers, the light shade trees block the sunlight to the forest floor and their young can no longer survive either. Now other types of trees, the **shade-loving** or **shade-tolerant** trees start to grow in the deeply shaded forest floor. Some common shade-loving trees include sugar maple, basswood, and northern white cedar. As the light shade trees begin to age and lose vigor, the deep shade-loving trees begin to grow more rapidly, eventually overtopping the light-shade trees and taking over the forest canopy. Once the deep shade-loving trees take over a forest, they will remain in control until the next **disturbance** such as a tornado, violent windstorm, fire, insect attack, or logging operation. This is because their young can thrive in the deep shade of the forest floor. This type of forest is called a **climax** forest because this is the final stage a forest reaches in the process of succession.

Each stage of forest growth has a dramatic affect on the animals that live in the forest. Entirely different kinds of animals live in a pioneer forest than in a climax forest.

**Doing the activity:**

Using the color overheads developed in the preparation section, the class should discuss which picture happened first, second, third, and so on. Be sure to discuss why the pictures occurred in this order and what may have caused the change to take place. Introduce the word "**succession**" as the change in the forest composition that takes place over time. Succession is the term used to describe the gradual change in the overhead pictures.

Next discuss the key words on the chalkboard. Have students write down what they think the words mean and then discuss answers as a class. How does the word relate to succession and changes in the forest? These key words and concepts will be further discussed in following lessons.

**Evaluating results:**

Do the students understand how succession changes a forest? Do they understand what causes succession? Can the student describe the succession cycle? Do students know the difference between shade-tolerance and shade-intolerance?

## **Forest Disturbances**

**Grade Level:** 1-5  
**Subjects:** Science  
**Concepts:** Human and natural disturbances affect a forest and its composition, forest dynamics

### **Material needed:**

**Time needed:** 30 minutes

### **F.R.E.E. supporting materials:**

- "The Two Sides of Fire" (Temperate Forest Foundation)
- "Trees + Me = Forestry" Ch. 4 (Minnesota Extension Service)

### **Learner Objectives:**

After completing this lesson, students should be able to:

- understand how human disturbances affect a forest.
- understand how natural disturbances affect a forest.
- understand that forests are dynamic and always changing.

### **Preparation:**

Make two columns on a chalkboard or dry erase board. Label the columns "Human Disturbance" and "Natural Disturbance"

### **Doing the Activity:**

Many events shape the forest and the trees that grow within it. Events that change the forest are called forest **disturbances**. Ask the class what the word "disturb" means. The content of the forest is constantly changing. This gradual change of the type of plants in a forest is called **succession**. Ask the class to recall what succession is and how it influences the forest.

Have each student come to the board and list a disturbance in either the "natural" or "human" disturbance column.

Examples of human disturbances may include: compacted soil on hiking or recreational vehicle trails, housing developments, new roads, clearing of land for agriculture, logging, and air pollution.

Examples of natural disturbances may include: fire, tornado, hurricane, severe thunderstorm, ice storm, volcano, disease, insect infestation, flood, and activity of a beaver colony.

Discuss how each disturbance affects the forest. Choose one of the disturbances and ask students to take out a sheet of paper and list the positive and/or negative effects of the disturbance.

Discuss possible positive effects. (Does it open up the forest floor for re-establishment of pioneer species or a species representing an earlier stage of succession? Might the change result in new species of plants that might attract birds or larger populations of some kinds of animals, or new species of animals that might attract other animals that feed on them?)

Discuss possible negative effects. (Does the disturbance stunt growth or cause long-term damage to the forest?)

Stress the importance the disturbance has on changing the composition of the forest and creating opportunities for new growth). Discuss how disturbances of the past have changed the forest into what we see today.

**Evaluating the results:**

Can students list natural and human disturbances? Do students understand that forests are dynamic and always changing due to disturbances? Can students describe positive and negative effects of forest disturbances? Can students apply their knowledge to real life situations (see Extra Class Activities below).

**Extra class activities:**

Have students find a picture in magazine/book/newspaper showing some type of disturbance in a forest. Have students present the picture to the class and explain how the disturbance is changing the forest.

Sometimes forest managers let forest fires burn instead of immediately putting them out. Ask students to brainstorm about why a forest manager might want to choose this management approach.

## **The Succession Play**

**Grade Level:** 1 -4

**Subjects:** Theater

**Concepts:** Stages and cycles of succession

**Materials needed:** construction paper

**Time needed:** 30 minutes

### **F.R.E.E. supporting materials:**

- "Treetop" Ch. 5 (Minnesota Extension Service)
- "Trees + Me = Forestry" Ch. 4 (Minnesota Extension Service)

### **Learner objectives:**

After completing this activity, students should be able to:

- act out the cycle of succession
- integrate past knowledge of disturbance and succession to explain the dynamic nature of a forest

### **Preparation:**

Make copies of the "Shade Tolerance" list on p. 28 of "Trees + Me = Forestry

Make copies of "Kids Cards!" in the back of "Treetop".

### **Doing the activity:**

Divide the class into three groups. One will be the sun-loving (shade-intolerant) trees, one the light-shade (intermediate) trees and the other, the deep shade-loving (shade-tolerant) trees.

Have each child choose a tree from the shade tolerance tree list. Students can use the "Kids Cards" to find out more about their tree and to draw pictures to represent the tree they have chosen. In the picture students should also include the shade tolerance level of their trees. For example, a student who chooses a shade-intolerant tree might also draw a sunflower on his or her paper, while a shade-tolerant tree student may draw a cloud. Encourage creativity in representing the shade tolerance of the species.

Next tell the students they are going to be in a play, the play of succession. The picture they drew will be their "costume."

Act out the play beginning with the sun-loving trees through the intermediate trees to the deep shade-loving trees. Remind students of key words discussed in past lessons. For variety, you can act as a disturbance (wind, fire, etc.) that periodically "interrupts" the play and starts the succession cycle over again.

### **Evaluating the results:**

Can students explain the stages and cycle of succession? Do students understand the order of succession and why it occurs in this matter?

## **Paper Patrol**

**Grade Level:** 3-5

**Subjects:** Math, writing, art

**Concepts:** Wood products are recyclable, paper has many uses

**Materials needed:** Several boxes, art supplies (for extra activity), scale

**Time needed:** ongoing through several weeks

### **F.R.E.E. supporting materials:**

- Earth Answers: "Is Using Paper Killing Trees?," "How is Paper Recycled?," "How Much Paper Can Be Made from a Tree?," "Why Recycle?," "Are We Running Out of Trees?" (TAPPI)
- Paper Recycling Post (T APPI)
- Paper Making Activity (Project Learning Tree)

### **Learner Objectives:**

After completing this lesson, students should be able to:

- understand how paper is made and recycled
- work in groups and share group responsibilities
- start a recycling initiative in their classroom
- understand the impact paper production has on the wood resource

### **Preparation:**

The Earth Answers "Paper Recycling" poster should be displayed in the classroom. Make overheads of the U.S. Paper Recovery Rate and the Paper Recovery Rate vs. Landfilling from Earth Answers "Why Recycle?" Also make an overhead from "How Much Paper Can Be Made From a Tree".

### **Doing the activity:**

Show students the paper recovery rate overheads and discuss the improvements in paper recycling. Make sure students understand that their efforts to recycle will contribute to the increased paper recycling efficiency.

As a class, brainstorm on the paper products which students use every day. These will include obvious things such as paper, notebooks, books, and less obvious items such as toilet tissue and Kleenex. Stress how important paper products are to students' lives. Now show students the overhead regarding how much paper products can be made from a cord of wood. Explain that a cord of wood is a stack of wood 4' high, 8' long, and 4' wide. Using the Earth Answers "How is Paper Recycled?" and the "Paper Recycling" poster, explain the paper production process. The process is complicated and while details are not important, a general understanding of the process beneficial.

Next split students into four working groups. Tell students they are going to do a paper project and that each group will be responsible for a different aspect of the project. Groups should be encouraged to collaborate and share ideas or information throughout the project. Delegate group responsibilities as follows:

Group 1: This group should calculate the amount of paper (in lbs.) used in the classroom. This can be done on a daily, weekly, or monthly basis, depending on the amount of detail desired. The group should also calculate the amount of paper that is used a second time in class before being recycled. Students should be able to see this number increase with increased efficiency.

Group 2: Responsible for getting used paper into two boxes: "paper written on one side" and "paper written on both sides". The group should also keep track of the amount of paper in each box (for Group 1 ). The group should make sure paper is not mixed in with other classroom trash.

Group 3: Responsible for thinking of and implementing new uses for the "paper written on one side". An example could be using the paper for in-class exercises or quizzes. Encourage students to be creative in new uses of this paper.

Group 4: Responsible for the "paper written on both sides". This group will decide if this paper can be used again or should be recycled. If it can be used again, the group should collaborate with Group 3 on possible classroom uses.

Groups could present weekly reports of their progress and ideas. For an added challenge, this could include graphs to model efficiency in classroom paper use. Groups should be rotated periodically so that students have the opportunity to be in each group. Also each group should keep a journal regarding their group calculations/ideas/information for the next rotation of students to utilize.

For an art lesson, Groups 3 and 4 could collaborate on making "recycled" art using paper already used once in class. Students could make "recycled" cards, gifts or collages. Even a papermaking exercise could be done using classroom paper (Project Learning Tree's Paper Making Activity). Again, encourage creativity.

**Evaluation:**

Are students actively participating in and contributing to the group? Are students creative and innovative in uses for partially used paper? Do students have a generally understanding of the paper process? Can students list paper products they use everyday?

**Extra Activities :**

Students could start a "Paper Recycling Campaign" by presenting their paper recycling project to other classrooms and encouraging others to start their own projects.

## **Uses of the Forest**

**Grade level:** K-3

**Subjects:** Art, writing

**Concepts:** The forest has many uses.

**Materials needed:** Copies of the "Make Your Own Forest" activity sheets, large sheets of construction paper, glue, scissors, and tape

**Time needed:** 1.5 hours

### **F.R.E.E. supporting materials:**

- Treetop "Make Your Own Forest" insert (MN Extension Service)
- "What has a tree done for you lately?" poster (Indiana Hardwood Lumberman's Association)
- "Sharing the Forest -A Natural Fact" video (MN Forest Industries)
- "Education in Nature" leaf and stencil kit (Georgia Pacific)
- "The Idaho Forest: A Miracle at Work" poster (Idaho Forest Products Commission)

### **Learner objectives:**

After completing this lesson, students should be able to: visually "create" a forest

- describe varied uses of the forest
- apply forest uses to the student's daily life

### **Preparation:**

Have students view the "Sharing the Forest" video shortly before the activity. Have students look at the "What has a tree done for you lately?" and "The Idaho Forest: A Miracle at Work" posters. Make copies of the "Make Your Own Forest" materials.

### **Doing the activity:**

Using the "Make Your Own Forest" material have students "create" their own forest on a large piece of construction paper. Encourage students to use different types and sizes of plants. In addition, students may use the leaf and stencil kits to make their own trees. Next, start a class-wide or small group brainstorming activity on the uses of forests. List the uses on the chalkboard as the class brainstorms. Encourage students to think of a broad range of uses such as:

- recreational uses (tree-forts, swings, places to hunt)
- building uses (homes, schools, offices, etc.)
- everyday life uses (pencils, notebooks, desks, and even vanilla ice cream and toothpaste )

Once the class has listed many uses then students should include these uses into their forest pictures. Either by drawings or words, forest uses should be included in student's pictures. Pictures should be hung around the classroom to remind students of their forest and its uses.

**Evaluating results:**

Ask students to list some ways they use the forest in their everyday lives. Do the students understand the forest has many uses? Did students actively participate in the brainstorming activity?

**Extra activities:**

As an extra activity, students could use another piece of construction paper to create a pie chart or graph to illustrate what percentage of the forest they would use for the uses identified in the brainstorming activity.

Another extra activity might involve writing and creative expression. Have students write a poem about the forest and the uses identified in the brainstorming activity.

## **Life Without Wood**

**Grade Level:** 1-5

**Subjects:** Writing

**Concepts:** Necessity of wood products for everyday life

**Materials needed:** No special materials are needed

**Time needed:** 30 minutes

**F.R.E.E. supporting materials:** None

### **Learner objectives:**

After completing this lesson, students should be able to:

- understand the importance of wood products in their everyday lives

### **Preparation:**

No special preparation is needed.

### **Doing the activity:**

Begin by reviewing with students the various products they use every day which come from wood.

Next, have students write a creative essay entitled "Life Without Wood". Encourage students to describe the difference between things they use on an everyday basis. For example, books might have to be made with plastic pages, or cabinets, furniture or entire houses might have to be made of metal, concrete, or plastic, or students would have to brush their teeth with something other than toothpaste. Also have students think of items that would not exist if there were no wood. These may include camp fires, log homes, newspapers, or novels. Students could read essays aloud.

### **Evaluating results:**

Do students understand how important wood is in their lives? Do students understand the large number of products they use which come from wood?