

INTRODUCTION

Forests are important for many reasons. They provide wood products important to our economy and our daily lives. They are valuable as recreation areas where we can enjoy their natural beauty and as places where wildlife can make their homes. Forests provide oxygen for all animals, including humans, and help make and hold valuable topsoil in place.

We need to understand how forests work and what affects them so we can better understand what it takes to manage forest resources effectively.

THE ACTIVITIES

TIME REQUIRED

Cross Sections	20 minutes
Tree Growth	45 minutes
Tree Characteristics	30 to 45 minutes
Evidence of Change	30 minutes
Determine Site Index	30 minutes
Observe A Rotten Log or Stump	20 minutes
Communicate Through Sketching and Writing	30 minutes
Transfer the Process to Other Environments	20 minutes



COMBINING THE ACTIVITIES

The activities in this unit are displayed singly. Depending upon the time available, and the skill of the participants, you may choose to do only one activity or the entire series. For maximum learning, the activities should be experienced in the order listed in the unit, however, other suggestions are:

Suggestion 1

Title: Cross Sections/Tree Growth/Tree Characteristics Evidence of Change

Introduction: In these activities we will be looking at some factors that affect tree growth in the forest. First we'll examine tree growth rings.

Activity: Cross Sections

Transition Statement: We've identified some factors that affect tree growth in the forest. Now, let's look at a way to use that information.

Activity: Tree Characteristics

Transition Statement: What goes on in the environment has an effect on how trees grow. Next we will look for clues to events that have taken place in this environment.

Activity: Evidence of change

Summary: Now that we've seen some factors that affect tree growth, how could we use that information to grow healthier forests?

Suggestion 2

Title: Observe a Rotten Log or Stump/Communicate Through Sketching and Writing

Introduction: Data can be collected in many ways. It can be read, listened to, observed directly or determined by measurement. In this activity, we are going to gather data in yet a different way.

Activity: Observe a Rotten Log or Stump

Transition Statement: Just as there are many ways to gather information, there is also more than one way to record and interpret that data, as you will see when we begin the next activity.

Activity: Communicate Through Sketching and Writing

Summary: How could we use these sketches and writings? (By sharing the sketches and poems they could pass along their positive feelings about the forest environment to others.)

CURRICULUM RELATIONSHIPS

Social Studies

1. Read about tools foresters once used to measure trees and survey land. What tools and methods are used today? Have tools changed? How?
2. Calculate the total number of board feet of lumber harvested yearly in your area. What is the importance of timber management in your community? How much money is the total board footage worth? Extend these calculations and figures to your county and then your state.
3. Draw or locate forested areas in your state. Locate the wood manufacturing mills in your county and draw arrows from the forest where the mills get their logs to the mills. Find out how many board feet of logs the mills use daily. If each log truck has about 6000 board feet on it, how many trucks of logs does it take daily to supply the mills with



wood?

4. Read about forest seed orchards that produce seeds for reforesting harvested areas. How does forest genetics relate to human genetics?
5. Research early taxonomists like David Douglas. How did they contribute to plant identification and classification? Who developed the system of classification we use and has it changed? How?
6. Classify the economic importance of various tree species. How are population and industrial centers in the state affected by forest location? How important are forest resources to the state's economy? Which tree species are economically important?
7. Explore how trees are used in our environment. What kinds of trees are used in parks and along streets? What criteria are used for tree selection in these areas, around water lines and underground utility lines?
8. Discuss how trees affect people's feelings about where they live or take vacations. What role do trees play in helping people relax or stay healthy? Do trees affect our mental and physical health? How?
9. Determine historical events of a tree cross-section based on ring count. Relate the size of the tree to important past events in state and/or local history.

Science

1. Grow tree seedlings following directions from the U.S. Forest Service, State Forester or Nursery. Keep good records and graph results. Grow beans at the same time and compare the growth rates.
2. Identify and classify different tree species or associated stands of trees (forest types).
3. Identify and classify the physical requirements of major forest types in your state. Consider factors like: general soil types, amount of light needed, climate, shade tolerance, even-aged stands, other trees found in the community.
4. Experiment with seeds such as radish to determine the optimum spacing for maximum growth. Manipulate factors such as selection and thinning.
5. Obtain samples of different wood species. Experiment with strength and other physical properties. Determine its best use, then conduct research to verify or change your results.
6. Collect tree specimens and develop a classification key based on the major likenesses and differences of their leaf characteristics. Rework the key and provide an alternative way to classify the same leaves.
7. Make collections and classify them, devising a key. Keys can be made for rocks, soil, animal signs, skeletons, wood, bark, twigs--just about anything you classify.
8. Find a rotten log and explore it using ideas from A Rotten Log study.
9. Construct a model of a board foot.

Mathematics

1. Determine the height, diameter and board foot in a tree or telephone pole on your



- school yard. Determine the board feet in a standard cord of firewood.
2. Calculate the acres and percentages of state land in different forest types and make a bar graph to show the relationships, or use the computer to show the information using many graph forms.
 3. Graph local tree types to show growth rates and age of maturity.
 4. Develop math vocabulary such as diameter, radius and circumference.

Language Arts

1. Write descriptive paragraphs about any of the activities in which you participated in this unit.
2. Write instructions for ways to germinate a Douglas-fir or other kinds of seeds using the “stratification” process.
3. Write and illustrate a book about the life of a tree for a primary classroom.
4. Pick a tree topic and write and illustrate an informative brochure for students your age. Place in the school’s resource center.
5. Ask any forest management agency if they want some interpretive signs or brochures written. Work with agency personnel to develop the written material.
6. Write an article for the school newspaper about trees and their uses in your community.

Creative Arts

1. Use charcoal from a fire to sketch forest scenes. Spray with a fixative to save.
2. Make mosaics using materials found in the forest, i.e. bark, twigs, cones, needles, rocks, etc. Illustrate a concept or cycle learned in this unit, i.e. rotten log study.
3. Make rubbings of different tree barks, cross-sections, leaves, and needles. Label and create an informative display for a school display case or create a book.
4. Construct models of forests in which you display different methods of forest management such as thinning, selective cutting, clearcutting, etc.
5. Create wreaths of forest materials such as cones, twigs, branches, and grasses.
6. Explore music, poetry, and songs about trees. Create a dance or illustrate the writings.



CROSS SECTIONS

CONCEPT	Cause/Effect, Interaction, Gradient
PRINCIPLE	Reading tree rings can be as fascinating as reading books. A tree cross-section can help us understand more about the environment in which the tree grew thereby helping students understand more about the environment in which they grow. Accurate observations are the first step to interpreting the environment. Observations, are key in this activity.
OBJECTIVE	<ul style="list-style-type: none">• The student will be able to list at least four observations when reading a tree cross-section.• The student will be able to define and distinguish between an inference and an observation.• The student will be able to name at least three factors that can affect tree growth.
PREPARATION	Collect cross sections of trees 4" to 6" in diameter that show a variety of growth patterns and influences (wide and narrow annual ring spacing) such as fire, insects, diseases, damage from construction, or weather changes.
MATERIALS NEEDED	<ul style="list-style-type: none">• Cross sections of trees (one for every one to two people)• Easel paper or chalk board for recording responses• Activity Sheet A: <u>Looking at Cross-Sections</u> (for each participant)
PROCESSES USED	<ul style="list-style-type: none">• Observe• Hypothesize• Infer• Communicate
TIME	20 minutes for the activity, discussion time as needed.



DOING THE ACTIVITY (indoors, outdoors)

A. Set Stage

Reading tree rings can be as fascinating as reading a book. A tree records in its growth rings information about the environment in which it lives. In this activity, we will be making observations using tree cross-sections to help us find out more about life and growth in a forest.

B. Procedure

1. Students will look at the tree cross-sections and discuss with other students some of their observations about their cross-section.
2. Distribute cross-sections, one to every one or two students.
3. After about five minutes, hand each student Activity A sheet, and ask them to use the top space on the sheet to record some of their observations about the cross-sections. They may work with another student after they've observed their

ACTIVITY A: Looking at Cross Sections 5-10 min.
individual/group

Write down some things you notice about your cross section.

INFERRING TREE GROWTH RING PATTERNS

Work by yourself or with a partner

Select 3 observations about the cross sections from the group list. List possible reasons for these observations. List ways you could set up an investigation to find out more about your observations and inferences.

Observations (What you noticed)	Inferences (Possible reasons for this)	Investigations (How we could find out)
1.		
2.		
3.		

Tree Rings Information:

The current year's growth is the ring next to the cambium layer just inside the bark. The rapid spring growth is lighter colored than the growth made in the summer, so a light-and-dark colored ring makes one year's growth. It is easier to see and count the summer wood (dark rings) to determine the age of the tree when it was cut.

These rings are easily counted on the stumps of cut trees.



This tree was 42 year old when it was cut.
The dark rings are summer wood and the light rings are spring wood. One light and one dark ring makes one year's growth.



cross-section. (5-10 minutes)

4. Direct students to read the Tree Rings Information at the bottom of the sheet when they finish with the assignment. They may do this individually or with another student.
5. Mid-Activity Discussion: Begin by asking:
 - A. What did you notice about the cross-section? List responses for participants to see. Make sure you point out that these are participants' observations. May need to define observation.
 - B. Point to two or three items from the list that deal with growth characteristics and rings, such as varying growth ring width, center, etc. What are some possible reasons for these growth patterns being present in the cross-sections? Point out that these reasons are inferences that we infer from our observations.
6. Ask students to extend their observations and inferences, then speculate about how they would find out whether their observations and inferences were true or not. To do this, complete the middle section of Activity A.

C. Retrieve Data:

1. Ensure that all students have read the last section of Activity A.
2. Conduct a discussion. Have each student or student group report on their observations.
3. Ask: What observations did you select to think more about? Generally, what can growth rings tell us about a group of trees? (competition, climate, temperature). What do you notice about the ring pattern?

CLOSURE Students share with each other or with the group what they have learned about the conditions which affect tree growth?

TRANSITION We've identified some factors that affect tree growth in a forest. In the next activity (Tree Growth) we will explore ways to use that information.



TREE GROWTH

- CONCEPT** Cause - Effect, Interaction about some of the factors foresters use.
- PRINCIPLE** In this activity, participants learn a way to manage a forest stand for maximum growth potential. By studying core borings from living trees, they learn it is possible to study trees and improve growing conditions without destroying the trees.
- OBJECTIVE**
- The student will be able to identify and discuss factors that affect a pre-selected stand of trees.
 - The student will be able to design an investigation to find reasons for similarities and differences in tree growth patterns.
- PREPARATION** Select a timber stand for study. Tag four to five trees, number them and record the diameter of each tree. Select trees that show effects of environmental conditions: injury, over-crowding, lack of sunlight, etc. Bore each tree ahead of time. Number the cores to correspond with the tree numbers. Tape the tree cores to cardboard with transparent tape or place in plastic straws to keep the cores intact. If you plan to do this activity again, on this site, place the cores in liquid resin. They will keep indefinitely. In any event, keep the numbered cores, and permanently mark the trees to eliminate the necessity of reborings.
- Prepare an enlarged matrix of the chart in step 2 of this activity. Cover the matrix with a sheet of plastic and record data with a grease pencil. This way, you can use the chart again.
- You can also do this activity using stumps that grew under a variety of competitive influences if you can find enough different examples in a relatively close relationship.
- MATERIALS NEEDED**
- Increment borer
 - Tags for trees
 - Hand lenses
 - Large chart of activity matrix
 - Activity Sheet B: Interpret Data About Tree Growth (for each participant)
- PROCESSES USED**
- Observe
 - Interpret data
 - Hypothesize
 - Communicate
 - Infer
 - Measure
 - Use numbers
- TIME** 45 minutes
- DOING THE ACTIVITY** (indoors, then outdoors on site)



A. Set Stage

In this activity, we will demonstrate a method for estimating how the environment influences tree growth.

B. Procedure

1. Show a sample of a tree core. Then use an increment borer to demonstrate how a core is taken. Answer any questions that arise.
2. Hand out core samples, hand lenses and Activity Sheet B. Use all the prepared cores so there will be good choices available when students get to #3 on the Activity Sheet.
3. Review information about cores if you feel you need to. Then

15 min.
groups

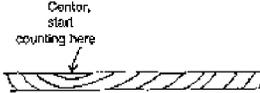
ACTIVITY B: Interpret Data About Tree Growth

1. Observe the tree core your group has been given and record the following information:

Tree no.	Number of dark rings from center to bark (approx. age)	Remarks about the pattern of rings

2. When your group has the above information, one person from the group should record this information on the blackboard or easel board. Chart to be like ACTIVITY C, part 2.

DRAWING OF TREE CORE



Record the following information about tree cores (the diameter information.)

Tree No.	Number of rings from center to bark (approx. age)	Diameter of tree trunk (Cir. " 3)	
1			
2			
3			
4			
5			
6			

ACTIVITY B: Interpret Data About Tree Growth (continued)

3. Set up an investigation to find out reasons for some of the differences in the data.
 - a. Select 2-3 trees from the list that show differences in growth rates.
 - b. Which trees did you select? (Indicate by number)
 - c. Why did you select those trees?
4. Go with your group to the site of the trees you selected for investigation and do (Part 4). Collect and Record Data. Record your observations:
 - a. Interpret Data. Record possible interpretations of the above data:
 - b. Summarize your investigation. Write your group's summary below. Include:

what you were trying to find out

what data you collected about it

what interpretations you made

what other data you would collect about your investigation



instruct students to use the next 5 minutes to complete #1 on the activity sheet. **TEACHER NOTE:** Monitor group work and adjust time to complete the activity. Add 2 to 3 minutes if groups seem to need it.

4. Students record the information on their tree core in the chart in Point #2, columns 1 and 3. Facilitator asks "What further information does this data provide?" Conduct a short (2-3 minute) discussion.
5. While the groups are working, teacher/facilitator records tree diameters on the large chart prepared ahead of time. Chart is the same one found in Point #2 of the activity sheet and asks students to record pertinent information on their activity sheet.
6. Transition: The cores you have been examining were removed from premarked trees on site. In a few minutes, we'll go find them and conduct further investigations.
7. Students should read part 3 on Activity B, gather all materials needed outside and follow the instructions. Teacher/facilitator: You may want to ask students which trees they chose and why.
8. Groups go outside to where trees are tagged and numbered and finish parts 3 and 4.

C. Retrieve Data

Each group provides a two to three minute summary of their findings. Ask questions that will help groups compare their information. Record or highlight information you think might help in the comparison.

CLOSURE From our investigations, what are some factors that you think are affecting the growth of this forest?

TRANSITION What goes on in the environment has an effect on tree growth. In the next activity you will examine a forest environment looking specifically at how individual trees grow.

TREE CHARACTERISTICS



CONCEPT	Cause/Effect, Interaction, Replication
PRINCIPLES	You've heard the old cliché, "Can't see the forest for the trees." In this activity, participants will look at trees in a forested stand and examine specific characteristics. Managers may examine a stand for timber production or maybe for wildlife management objectives.
OBJECTIVE	<ul style="list-style-type: none"> • The student will be able to analyze the growth characteristics of a group of young trees. • The student will be able to select trees with the desirable characteristics for timber production. • The student will be able to select trees with desirable characteristics for some kinds of wildlife.
PREPARATION	Select a young forest stand, 20 - 60 years old. Many times the same stand can be used for collecting and interpreting data about tree growth.
MATERIALS NEEDED	<ul style="list-style-type: none"> • Selected tree stand • Activity Sheet C: <u>Look at Tree Characteristics</u> (for each participant) • Tags to mark trees • Plastic tagging of different colors
PROCESSES USED	<ul style="list-style-type: none"> • Observe • Predict • Hypothesize • Infer • Communicate
TIME	30 to 45 minutes
<u>DOING THE ACTIVITY</u>	(outdoors)



A. Set Stage

1. In the next 45 minutes, we will be investigating the factors affecting tree growth. There is a fixed amount of moisture and nutrients in the soil for plant use. Theoretically, all of this is used by plants for food manufacture and growth. For example, if there were 1,000 trees on one acre, they would use all the available moisture and nutrients and grow at a certain rate. If we evenly cut or thinned 900 trees out of the stand, the remaining 100 trees could have a potential of growing ten times faster than each of the original 1,000 trees. That might be important depending on the objectives for that group (or stand) of trees.
2. Not all trees in a forest are the same. The land manager, in selecting the trees in areas being managed, looks for certain characteristics in a tree to decide which trees have the best quality and the fastest growth.
3. What are some tree characteristics that are important to look for when identifying which have the greatest economic potential?

B. Procedure

1. Hand out Activity sheet C.

NOTE :

Have students get in groups of 3 or 4.
Provide each small group with different colored flagging.

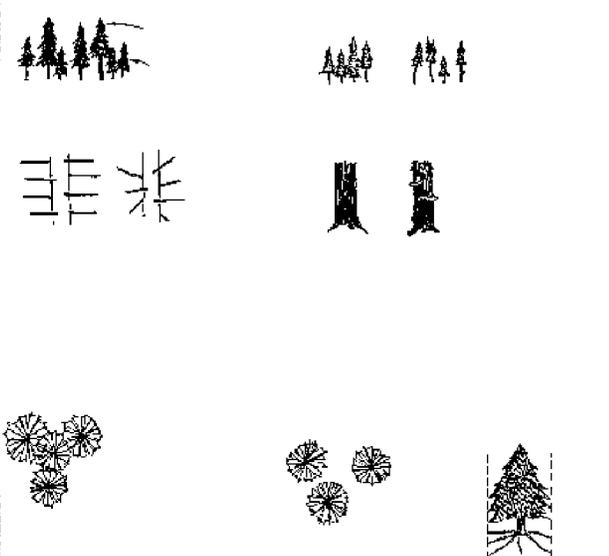
2. Working in your small groups, spend 20 minutes doing the activity and filling out the activity sheet.

C. Retrieve Data

ACTIVITY C: Look at Tree Characteristics 20 min. groups

Using the characteristics below, look at the trees in a timber stand and mark at least five trees that you think are the best formed and fastest growing, and that should be left standing.

Some Characteristics to look for in Evaluating Trees in a Coniferous Forest:



Tree Selection

The trees I selected to keep had the following characteristics:

The trees I selected to remove had the following characteristics:



1. Have each group identify selected trees and give reasons for selections.
2. Ask about other factors that could have influenced tree selection.
3. Ask what were the most/least common reasons used for selecting trees.
4. Ask how criteria and selection would have been different if the trees were being managed for other objectives such as wildlife or scenic quality.

CLOSURE

Discuss activity by asking:

1. From our investigations, what have we found out about tree characteristics?
2. How do different management objectives affect which trees are left and which are taken?
3. What have we found out about managing tree stands?

NOTE:

If you have students who are in an urban environment, you might ask:

- a. How could you use this knowledge to develop a planting plan for your yard or school?
- b. What city environmental factors would you want to consider?

TRANSITION

You have looked at individual tree cross-sections, then at individual trees and how they grow. Now you will look at a forested site to see if you can determine how this environment came to exist.



EVIDENCE OF CHANGE

CONCEPT	Cause/Effect, Change, System
PRINCIPLE	Using knowledge gained and observation powers, participants examine an unfamiliar site to see if they can discern part of its history. The skills used and learned in this activity will transfer to the examination of any new site.
OBJECTIVE	<ul style="list-style-type: none">• The student will be able to identify at least three evidences of change in the environment.• The student will be able to describe the cause and effect relationships of the changes they identify.
PREPARATION	Locate a forest environment in which some evidence of changes can be observed. This could be the same site used for the <u>Tree Growth Rate</u> and <u>Tree Characteristics</u> activities. Prepare an easel paper chart of the activity <u>Recording Evidence of Change</u> .
MATERIAL NEEDED	<ul style="list-style-type: none">• Selected forest site• Activity Sheet D: <u>Record Evidence of Change</u> (for each participant)• Flip-chart sized Activity Sheet D
PROCESSES USED	<ul style="list-style-type: none">• Observe• Communicate• Infer• Hypothesize
TIME	30 minutes
<u>DOING THE ACTIVITY</u>	(outdoors)



change. Record your findings on the activity sheet and transfer your results on the large chart.

C. Retrieve Data

1. Have groups share their results. Determine if any of the information enables the group to put the events into a time sequence. If it does, ask the students and record the information on another easel sheet. Ask:
2. What does this information tell us about the area's past?
3. What natural influences have caused the most changes here?
4. What human influences have caused the most change?
5. What other information would be useful in creating the area's past?

CLOSURE

Discuss activity by asking:

1. What can we say about change in a forest?
2. In what other environments could we create past histories?

TRANSITION

The preceding activities have helped demonstrate the complexity of a forest community. The next activity will help you look at a site and determine its potential for growing trees.

DETERMINE SITE INDEX



CONCEPT	Change, Evolution
PRINCIPLE	Site index is based on the relationships of the total height to the age of the dominant or tallest trees in the forest stand. The site is rated for growth of different tree species.
OBJECTIVE	<ul style="list-style-type: none"> • The student will be able to conduct an investigation to determine growth rate differences in a given stand of trees. • The student will be able to determine the timber site index or growth potential of a piece of land.
PREPARATION	<p>Locate a dominant tree so that total height can easily be measured using the method on the activity sheet. It may be possible to use one of the dominant trees from <u>Tree Characteristics</u>.</p> <p>Bore the tree. Tape the core to a card so the rings can be counted.</p> <p>Measure and mark a 100' or 200' distance so participants can determine their length of step.</p>
MATERIALS NEEDED	<ul style="list-style-type: none"> • 100' tape • Increment borer • Tree identification key • Local site index tables • Activity Sheet E: <u>Determine Site Index</u> (for each participant) • Stakes, such as green garden stakes for measurement
PROCESSES USED	<ul style="list-style-type: none"> • Observe • Measure • Use numbers • Interpret data
TIME	30 minutes

NOTE TO TEACHER: Although more sophisticated measuring techniques exist to measure the height of trees, this technique makes the mathematical principle visible and uses equipment that is readily available.



DOING THE ACTIVITY (outdoors)

A. Set the Stage

Determine this site's potential for tree growth. Site index is an important measurement in determining the productivity of a certain area or site for growing trees. **Site index** is based on the relationships of the total height to the age of the dominant or tallest trees in the forest stand. The site for growing trees is rated from excellent to poor and can be different for different tree species.

B. Procedure

1. Hand out the Activity sheet E.

20 min.
groupe

ACTIVITY E: Determine the Site Index of an Area

Work by yourself.

A. Determine the length of your step.
Count the number of normal steps you walk in 200' and record below.

no. steps in 200'	length of step
56-73	3'
74-97	2.5'
98-113	2'
114-over	1.5'

No. of steps walked _____
Length of step is _____
(use chart to determine)

B. Determine the height of the tree.

- Hold your arm in front of you and parallel to the ground. Measure the distance from your hand to your eye. Cut a stick this length.
- Now hold the stick upright to form a right triangle with your arm.
- Facing the tree you wish to measure, walk backward away from the tree on level ground, until the top of the tree can be sighted across the upper end of the stick. Make sure your hand is in line with the base of the tree.
- You are now the same distance from the tree as the height of the tree. Count the number of steps it takes to return to the base of the tree.

C. Determine the age of the tree.
Count the number of dark rings from the center of the tree core to the bark, and record in box at right.

Tree species and/or tree no.	Number of dark rings from center to bark (approx. age)

D. Site Classification. Record the tree species, tree height, and age below. Using the following table, determine the site and classification.
Tree Species: _____; Ht. _____ ft.; Age _____ yrs;
Site: _____; Index: _____

E. Ground Plant Index.
Identification of ground plants can be used as a rule of thumb for determining site index. Using the chart below, compare the site index determined above.

	Site II	Site III	Site IV	Site V
Open fern	XXX	X		
Chick	XXX	X		
Dandelion (fractured leaves)	XXX	X		
Timothy	XXX			
Seal	X	X	XXX	XXXX
Orange & black	X	X	XXX	XXXX
Flax	X	X		X
Open spray	X	X		
Plantain	X	X		
Spent	X	X		
Lythrum	X	X		
Knockout	X	X		
Yarrow	X	X		

X, Bark = 25%
XX, Between 25 & 50% of ground covered by one species
XXX, Between 50 & 75%
XXXX, Over 75%



2. Site index is determined using these 3 pieces of information:
 - a. The length of your step, which you can find out using the 200' course over there.
 - b. The tree height, using that tagged tree.
 - c. Tree age, using this increment borer.

By making these measurements and using the activity sheet, you can determine site index.

Another way to find site index is to inventory the ground cover. Ecologists have determined that there is a relationship.

3. Take 20 minutes and work in small groups.

C. Retrieve Data

Discuss findings and compare results. Look at differences in results.

Ask:

1. How did index derived from measurement compare to the index derived from ground cover?
2. What are some ways that site index could be used?
3. What other information would be important in determining future uses of this area?

CLOSURE

We have looked at the complexity of the forest ecosystems and the growth of trees. In the next activity we will complete our look at the life cycles of the tree and forest.

TRANSITION

Now we will observe the impact and importance of the life-death cycle in a forested community.



OBSERVE A ROTTEN LOG OR STUMP

CONCEPT	Cycle, Organism
PRINCIPLE	A rotten log or stump is often called a “nurse” log because it acts as a nursery for young forest plants. Many concepts can be learned while studying the stump. In this activity, the concept of a cycle is explored.
OBJECTIVE	<ul style="list-style-type: none">• The student will be able to observe the living and non-living things on the log and record their effects.• The student will be able to draw a simple cycle that is taking place on the log and explain what they have drawn.• The student will be able to demonstrate understanding of the importance of rotten logs by not tearing it apart as they explore it.
PREPARATION	Locate a rotting log or stump on which the effects of living and non-living things can be observed. If possible, locate more than one so that small groups can work on each log.
MATERIALS NEEDED	<ul style="list-style-type: none">• Hand lenses, one for each participant• Activity Sheet F: <u>Analyze a Rotten Stump</u> (for each participant)
PROCESSES USED	<ul style="list-style-type: none">• Observe• Infer• Communicate• Interpret data
TIME	20 minutes



3. Spend 20 minutes working by yourself.

NOTE TO TEACHER: You may have to help your group differentiate between living, non-living, and once living. Once living goes in living; non-living are soil, rocks, air, water, sunlight.

C. Retrieve Data

1. Groups should share observations. Help them to compare and contrast their findings. Then ask for volunteers to share their diagrams or cycles. If appropriate, comment on how people defined and illustrated cycle differently. Ask:
2. What cycles did you identify?
3. What roles do these cycles play in this environment?
4. What caused the log or stump to die?
5. Don't forget the possibility of social or economic cycles. Discuss the events that may have created the stump or log.

CLOSURE

Choose a closure idea you like, or make up your own. If many cycles are similar, have those groups draw one cycle, combining the elements. Ask the group to illustrate the life cycle of a tree's birth and death making sure to illustrate several of the forest influences they have studied. If cycles are different, ask the group to combine all the elements into one cycle.

TRANSITION

There are many ways to record data. The next activity emphasizes one more way to observe and record your observations.



COMMUNICATE THROUGH SKETCHING AND WRITING

CONCEPT Perception, Change

PRINCIPLE People need to value all observation methods. Some observe better with measure and instrument in hand. Others “feel” their environment, and write music, poetry, or create images to share. This activity is an opportunity to learn about a specific environment in another way.

OBJECTIVE

- The student will be able to explore and use colors from nature in a simple drawing of the site or elements of the site.
- The student will write about the forest’s processes of change using a form of poetry.

PREPARATION Locate the log or stump to be used in this activity. More than one is helpful, so participants can spread out.

The subject of the sketch depends upon the environment. It can be anything that is significant about the area...rotten log, stump, or snag, an old homestead, a fence or barn, a city building, transmission tower or freeway.

MATERIALS NEEDED

- Sketching paper, such as white or manila construction paper
- Pieces of charcoal from a fireplace or campfire, (not commercial)
- Natural drawing materials such as rotten wood, leaves, flower petals, wet clay or soil

PROCESSES USED

- Observe
- Communicate

TIME 30 minutes

NOTE: See appendix for forms of poetry.



DOING THE ACTIVITY (outdoors)

A. Set the Stage

We observe and organize our environment in different ways. Some people are most comfortable when measuring and recording in scientific ways. Others feel their environment and are more comfortable expressing themselves through the arts. Today, we are going to record some impressions through the use of sketching and poetry.

B. Procedure

1. Hand out paper and charcoal (use charcoal from a fire, if possible).
2. Tell them they have 15 minutes to find a comfortable place where they can see a log or stump.

NOTE: You may want to provide the group with leaves, rotten wood, flowers, etc. which might provide color. Just be careful not to disrupt the site.

3. When most people have finished their sketch ask them to please take out a pencil or pen and find a place on their sketch (across the bottom, or down the side) to write some things according to your directions. Repeat the instructions each time.
 - a. Write down two descriptive words about the scene, log or stump.
 - b. Write three action words about the scene, log, or stump--words that describe processes or changes taking place or things happening to it.
 - c. Now write a short phrase (4-5 words) that tells how the scene, log, or stump affects the rest of the environment--a phrase that describes its value or usefulness, or a phrase describing any thought you have about the stump.
 - d. Write one word that sums up everything, a word that suggests a comparison, an analogy, or synonym.
 - e. Optional: Now, if you wish, go back and give a title to what you have written.

C. Retrieve Data

Encourage people to read their writings if they wish, but keep it voluntary. They may also display their sketches if they want.

CLOSURE

Notice that sketching and writing are other ways to collect data and make interpretations of observations about some of the environment. You have just written a cinquain, a Japanese form of poetry, about the stump or whatever object you wrote about.

TRANSITION

You have learned the basics of many skills which professional foresters use to manage forested lands. The thought processes that enabled you to learn the skills are transferable to new and different environments. The following activity will give you some experience in the transfer process.



TRANSFER THE PROCESS TO OTHER ENVIRONMENTS

CONCEPT	Replication
PRINCIPLE	The goal of education is to provide learning experiences and then test to see if the student understands the concept or processes well enough to use the knowledge and skills to solve other, similar problems.
OBJECTIVE	<ul style="list-style-type: none">• The student will be able to identify other forest elements that would be important to investigate and interpret.• The student will be able to identify how the same processes can be used elsewhere.• The student will be able to summarize, either verbally or in writing, their learning in this activity
PREPARATION	Complete all of the forest investigations you plan to use.
MATERIALS NEEDED	<ul style="list-style-type: none">• Activity Sheet G: <u>Transfer the Process</u> (for each participant)
PROCESSES USED	<ul style="list-style-type: none">• Observe• Infer• Hypothesize• Predict• Communicate
TIME	20 minutes



DOING THE ACTIVITY (indoors)

A. Set the Stage

We have identified a lot of information about the forest. Now we'll look for some additional elements in the forest environment that might be important for you to know.

B. Procedure

Hand out the Transferring the Process Activity Sheet. Have students take a few minutes, and in groups of no more than four, fill out sheet.

ACTIVITY G: Transfer the Process 10 min.
groups

List some other things in this environment that could help us further interpret the forest.

Things in the forest	What it can tell us about the forest?

Identify and list some of the methods and processes we used today in our investigation.

Describe how we could use those methods and processes in another environment to find out more about it (city, schoolyard, etc.).

Investigating Your Environment Forests 



C. Retrieve Data

1. What are some things you listed and what can they tell us about the forest? What were some of the methods and processes used in our investigation? What are some ways we could apply our experience today to other environments back home?
2. Working in groups, list some things you found out about the forest environment.
3. How do these things help us understand how forests are managed?
4. What are some of the economic considerations of forest management? Social? Political?
5. What other information do we need for a better understanding of the forest?

CLOSURE

If we had to put all of these things into one or two big ideas, what would we say? List these on chart paper. How could we use these methods and processes to find out more about another environment (city, schoolyard, etc.)?



ACTIVITY A: Looking at Cross Sections

5-10 min.
individual/group

Write down some things you notice about your cross section.

INFERRING TREE GROWTH RING PATTERNS

Work by yourself or with a partner

Select 3 observations about the cross sections from the group list. List possible reasons for these observations. List ways you could set up an investigation to find out more about your observations and inferences.

Observations (What you noticed)	Inferences (Possible reasons for this)	Investigations (How we could find out)
1.		
2.		
3.		

Tree Rings Information:

The current year's growth is the ring next to the cambium layer just inside the bark. The rapid spring growth is lighter colored than the growth made in the summer, so a light-and-dark colored ring makes one year's growth. It is easier to see and count the summer wood (dark rings) to determine the age of the tree when it was cut.

These rings are easily counted on the stumps of cut trees.



This tree was 42 year old when it was cut.
The dark rings are summer wood and the light rings are spring wood. One light and one dark ring makes one year's growth.



ACTIVITY B: Interpret Data About Tree Growth

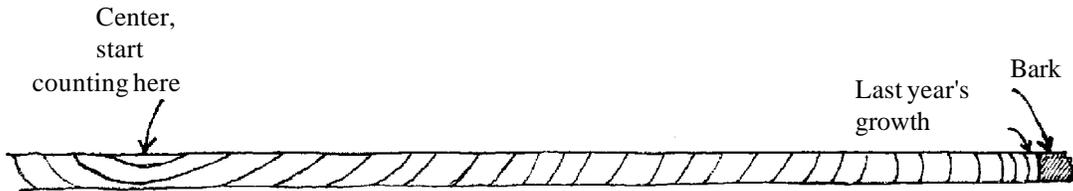
15 min.
groups

1. Observe the tree core your group has been given and record the following information:

Tree no.	Number of dark rings form center to bark (approx. age)	Remarks about the pattern of rings

2. When your group has the above information, one person from the group should record this information on the blackboard or easel board. Chart to be like ACTIVITY C, part 2.

DRAWING OF TYPICAL TREE CORE



Record the following information about tree cores from the master chart. (Instructor will provide the diameter information.)

Tree No.	Number of rings from center to bark (approx. age)	Diameter of tree trunk (Cir. " 3)	Remarks about the ring pattern
1			
2			
3			
4			
5			
6			



ACTIVITY B: Interpret Data About Tree Growth

(continued)

3. Set up an investigation to find out reasons for some of the differences in the data.
 - a. Select 2-3 trees from the list that show differences in growth rates.
 - b. Which trees did you select? (Indicate by number)
 - c. Why did you select these trees?

4. Go with your group to the site of the trees you selected for investigation and do (Part 4).
Collect and Record Data. Record your observations:
 - a. Interpret Data. Record possible interpretations of the above data:

 - b. Summarize your Investigation. Write your group's summary below. Include:
what you were trying to find out

what data you collected about it

what interpretations you made

what other data you would collect about your investigation

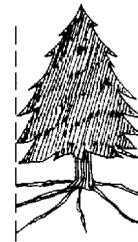
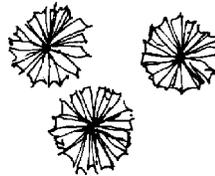
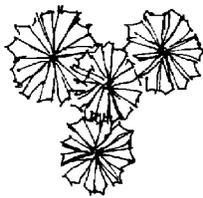
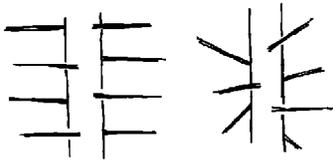


ACTIVITY C: Look at Tree Characteristics

20 min.
groups

Using the characteristics below, look at the trees in a timber stand and mark at least five trees that you think are the best formed and fastest growing, and that should be left standing.

Some Characteristics to look for in Evaluating Trees in a Coniferous Forest:



Tree Selection

The trees I selected to keep had the following characteristics:

The trees I selected to remove had the following characteristics:



ACTIVITY D: Record Evidence of Change

15 - 20 min.
small groups

Look for evidence of change (natural and human-caused) in the environment.
Record and fill out other columns.

Evidence of changes in the environment	What might have caused them?	Effect on the environment



ACTIVITY E: Determine the Site Index of an Area

Work by yourself.

A. Determine the length of your step.

Count the number of normal steps you walk in 200' and record below.

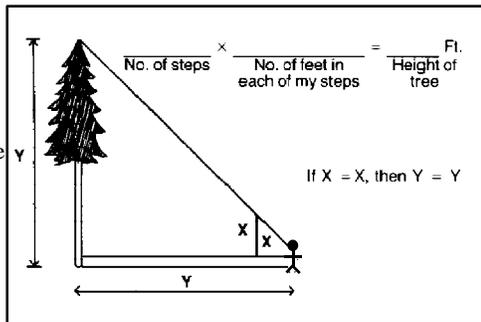
No. of steps walked

Length of step is
(use chart to determine)

no. steps in 200'	_____	length of step
66-73	_____	3'
74-87	_____	2.5'
88-113	_____	2'
114-over	_____	1.5'

B. Determine the height of the tree.

1. Hold your arm in front of you and parallel to the ground. Measure the distance from your hand to your eye. Cut a stick this length.
2. Now hold the stick upright to form a right triangle with your arm.
3. Facing the tree you wish to measure, walk backwards away from the tree on level ground, until the top of the tree can be sighted across the upper end of the stick. Make sure your hand is in line with the base of the tree.
4. You are now the same distance from the tree as the height of the tree. Count the number of steps it takes to return to the base of the tree.



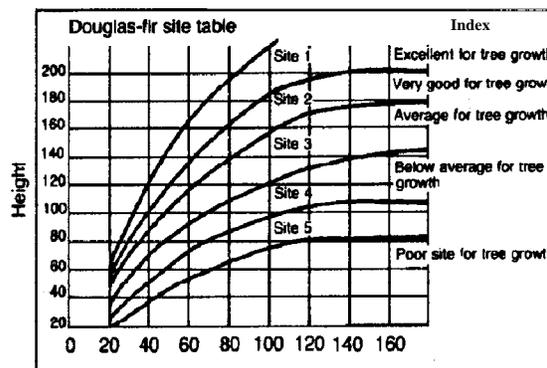
C. Determine the age of the tree.

Count the number of dark rings from the center of the core to the bark, and record in box at right.

Tree species and/or tree no.	Number of dark rings from center to bark (approx. age)

D. Site Classification. Record the tree species, tree height, and age below. Using the following table, determine the site and classification.

Tree Species ____; Ht. ____ ft.; Age ____ yrs.;
Site ____; Index ____.



E. Ground Plant Index.

Identification of ground plants can be used as a rule of thumb for determining site index. Using the chart below, compare the site index determined above.

	Site II	Site III	Site IV	Site V
Sword fern	XXX'	X		
Oxalis	XXX	X		
Ducks-foot (inside-out flower)	XXX	X		
Trillium	XXX			
Sisal	X	X	XXX	XXXX
Oregon grape	X	X	XXX	XXXX
Rose		X		X
Ocean spray		X	X	
Honeysuckle		X	X	
Snowberry		X	X	
Lupine			X	
Kinnikinnik			X	

*f bundance

X Below 25%
XX Between 25 & 50%
XXX Between 50 & 75%
XXXX Over 75%

of ground covered by one species



ACTIVITY F: Analyze a Rotten Stump

20 min.
individuals

Work in groups or by yourself.

NOTE: DO NOT TEAR THE STUMP APART!

1. Record your observations and ideas below:

*LIVING THINGS	EFFECT ON STUMP
*NON-LIVING THINGS	EFFECT ON STUMP

2. In the space below, construct a diagram of one of the *cycles taking place in the rotten log or stump:

*You define the word cycle any way you want to.

ACTIVITY G: Transfer the Process

10 min.
groups

List some other things in this environment that could help us further interpret the forest.

Forest object /organism	What can it tell us about the forest?

Identify and list some of the methods and processes we used today in our investigation.

Describe how we could use those methods and processes to explore another environment (city, schoolyard, etc.).