

# Our Living Resource: *The Forest*

A teaching kit for Grade 5 teachers  
[www.learnforestry.com](http://www.learnforestry.com)

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First printing, 1998  
2nd printing with updates, Jan.2006



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## Sponsors

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*Thanks also to the following contributors...*

COFI: Council of Forest Industries  
Inside Education, Alberta  
Interior Logging Association & Associate Trades  
MoF: Ministry of Forests



## THIS KIT CONTAINS:

- teacher instructions – overviews and lesson plans, teacher background information
- student activities/worksheets/unit quizzes/answer keys
- glossary
- overhead for silviculture systems lesson
- overheads for forest health lesson
- tree planter photograph for careers and technology lesson
- two posters: Silviculture Systems & Between the Stands
- 6 Tree Books – *To order more books for your school, see “Support Materials”*
- tree cookies and bark sample upon request
- 2 videos:   1. Two Sides of Fire  
                  2. The Miracle Resource
- DVD - C.L.E.M. – A Journey Through BC’s Logging Industry  
    Also on the DVD:
  - 1. A Growing Success: Reforestation in BC
  - 2. Fire Smart, Protecting Your Home From Wildfire  
   for lesson plan, visit [www.learnforestry.com](http://www.learnforestry.com), click on: lesson plans, National Forest Week 2004
  - 3. History of Logging Slide Presentation  
   for more information re this presentation, visit [www.learnforestry.com](http://www.learnforestry.com), click lesson plans, Gr, 3 kit
- CD Rom – “Virtual Forest” and “Squeezeplay” (optional)
- tree samples upon request.... Contact local forest educator.

**NOTE:** allow 2 weeks advance notice for all requests.

# **CURRICULAR CONNECTIONS**

## **Science:**

- ◆ **identify living resources in the local environment**
- ◆ **describe how humans use B.C.'s living resources**
- ◆ **describe the known and potential environmental impacts of using B.C.'s living resources**
- ◆ **identify the methods of extracting and processing living resources**
- ◆ **describe how living resources are used in society**
- ◆ **describe the environmental impacts of using a living resource**

## **Social Studies:**

- ◆ **analyze the impact of modern technology on lifestyle and work**
- ◆ **demonstrate an understanding of the concepts of sustainability, stewardship, and renewable versus non-renewable natural resources**

## **Language Arts:**

- ◆ **identify and use sources of information on the internet**

## **Career Planning:**

- ◆ **identify the talents and skills that are required to work in the forest industry**

## REQUEST FORM

**Teacher Name:**\_\_\_\_\_ **School:**\_\_\_\_\_

**Phone:**\_\_\_\_\_ **Fax:**\_\_\_\_\_

**Type of request:**

Classroom Speaker\_\_\_\_\_

Woodlands Tour\_\_\_\_\_

Kit Materials for grade : \_\_\_\_\_

Other (specify) \_\_\_\_\_

**Grade:** \_\_\_\_\_ **# of students** \_\_\_\_\_ **# of adults** \_\_\_\_\_

**Topics to be covered or materials needed:** \_\_\_\_\_

**Desired learning outcome:**\_\_\_\_\_

**Students' prior knowledge of topic:**\_\_\_\_\_

**Date and alternate date for request:** 1)\_\_\_\_\_

2)\_\_\_\_\_

**Preferred time:** am \_\_\_\_\_ to \_\_\_\_\_ **OR** pm \_\_\_\_\_ to \_\_\_\_\_

**PLEASE ALLOW AT LEAST 2 WEEKS NOTICE.**

**Fax completed form to:**





# LESSON OVERVIEW

## WHAT IS A FOREST?

### Learning Outcomes

- ◆ Students will gain an understanding of the components of a forest.
- ◆ Students will learn to look at features of a tree and relate them to the key in the “**Tree Book**” as a means of identifying a tree.
- ◆ Students will begin to develop an understanding of the vocabulary used when discussing the forest and the industries related to forestry.

### Question

- ◆ What is a forest?  
(What is a forest made up of? What are the components of a forest?)
- ◆ How can we identify the various trees that exist in a forest?

### Setting the stage: (approx. lesson time: 1+ hr.)

- ◆ **Part I-** (allow 20-30 min.) Have the students brainstorm to identify to the components of a forest and discuss the format of this unit.
- ◆ **Part II-** Have the students, in small groups, examine tree branches to explore ways of comparing trees. Try to have at least two types of coniferous trees and two types of deciduous trees (with leaves).

**NOTE:** If it is winter, do this lesson using several different coniferous samples. You will need a set of samples for each group. These may be provided for you by contacting a local forest educator at least 2 weeks prior to the lesson. You will also want to arrange for the samples needed for the Tree ID lesson.

### Materials Needed

- ◆ a board or overhead projector
- ◆ the poster “**Between the Stands**”
- ◆ sets of tree samples (one set per group)
- ◆ glossary
- ◆ each group will need a recorder with a paper and pencil
- ◆ tree books (6 are provided). If you require more, contact your local forest educator to see if you can borrow extras or photocopy the pages you will need.

# LESSON PLAN

## WHAT IS A FOREST?

### Procedure

#### Part I (as a class- allow 20-30 min.)

- Have the students brainstorm to answer the question: **What makes up a forest?** Record these ideas on a chalkboard or overhead. When recording, try to categorize the ideas into groups such as trees, animals, insects, plants, birds, water-ways, etc., so that students realize the variety that exists within the environment of the forest.
- When the students run out of ideas, show the poster “**Between the Stands**” and ask if there are more names that they want to add to their brainstorming list?
- After the brainstorming, ask the students to define the word **FOREST**. (Record this definition on the board or overhead.)
- **Introduce the glossary handout** and have the students look for the word **FOREST**. Compare this definition with the one the students came up with and discuss the differences that may exist. Have the students put a colored check mark in front of the word **FOREST**. (**Optional:** Explain that in each lesson they should use a different colored check to mark the words of that lesson. This will tell them which words to study for each lesson in preparation for quizzes and will also point out some key words that reappear under different topics throughout the study of the forest.)

#### Part II (small group activity- allow 30+ min.)

- Arrange the students into small groups according to the number of tree sample sets you made. (Smaller groups will allow all students an opportunity to look at the branches and take part in the discussion.)
- Have each group come up with a list of ways to compare the trees. (colors, size of leaf/needle, edging, etc.) They will need a recorder.
- As a class, share the classifications that the groups came up with.
- Introduce the “**Tree Book**” by looking at pages 8 thru 11. (Have at least one book per group or prepare overheads and/or handouts of pages 8-15)
- Discuss the **features** as they are shown. Have the students look at their tree samples to find these same features.
- Now turn to pages 12 thru 15. Read over the features and the sub-features that exist. Discuss these pages and the headings in detail.
- Choose a feature that matches a tree that each group has a sample of.

- For example, if they all have a lodgepole pine sample:
  - step 1. Find the heading: Trees with needles in bundles of 2, 3 or 5.
  - step 2. Which tree has needles in bundles of 2?
- Ask the students what the book calls that tree (species) and on what page the information about that tree will be found? **Be sure everyone follows the procedure.**
- The answer is: **LODGEPOLE PINE** which is found on **page 28**.
- Turn to the page and read all of the information about the tree. Be sure to note the headings, as students will need to follow this procedure and use the headings when completing the chart for the tree identification station later in this unit. (Borrow extra Tree Books from your local forest educator or photocopy pages you need.)
- Repeat this procedure for another tree sample that the students have.
- Repeat for all the remaining samples (not reading all the information but simply doing the identification) or if the students are comfortable with the procedure, have the groups finish naming their samples as a group rather than as a class.

## Extensions

- ◆ **TREE GAME:** Create a game within the group whereby a student uses the Tree Book to name a feature and a sub-feature. The rest of the group must try to determine the tree name. Whoever gets the correct answer will get to choose a tree and give the clues.

## Closure

- ◆ Journals: Students could record something “new” they learned today and what they thought was the best part of the lesson.
- ◆ Students could begin a title page for this unit.

## Teacher Background:

### **Between the Stands**

(The Poster)

As background information for the introductory lesson, teachers should refer to the poster '**Between the Stands**' brochure (information sheet that accompanies the poster) and the section called **WHAT IS A FOREST?**

The poster and brochure will be referred to again later in the unit. It is worth reading in its entirety as it also has several activities that could be used as extensions.

## GLOSSARY

AESTHETIC	an appreciation of the beautiful (appreciate the natural state of the forest)
BARK (OUTER BARK)	a protective outer layer--insulates against cold, dry, wet and pests
BIODEGRADABLE	able to break down
BY-PRODUCTS	something produced in addition to the main product
BRUSHING	a silviculture treatment to remove brush (shrubs, herbs) and weed species which compete with seedlings for sunlight, water and soil nutrients
BIOLOGICAL DIVERSITY	(biodiversity) the natural variations among living organisms
CAMBIUM	the growing part of the tree which produces new bark and new wood
CLEARCUTTING	a silviculture system in which the old crop is cleared at one time
CONIFEROUS	cone-bearing trees having needles or scale-like leaves, usually evergreen and producing wood known commercially as <b>softwoods</b>
DECIDUOUS	term applied to trees, commonly broadleaf, that usually shed their leaves annually. Also known commercially as <b>hardwoods</b>
ECOSYSTEM	a system or community of plants, animals and other organisms and their environment, which interacts and functions as a unit
ENVIRONMENT	the surroundings and circumstances affecting people
EROSION	soil that has been worn away
FIRE DEPENDENT	trees that need fire to clear out the underbrush so that they may grow well; may need heat to open their cones
FIRE RESISTANT	trees that can withstand some fires going through the area and remain healthy
FOREST	a plant community mostly made up of trees and other woody vegetation growing fairly close together with an associated animal community

FOSSIL FUELS	energy sources which are formed over millions of years from the remains of ancient plants and animals. e.g. coal, oil, etc.
HARVESTING	the cutting and removal of trees from a forested area
HEARTWOOD	dead wood that gives trees strength and rigidity
NATURAL REGENERATION	the renewal of a tree crop by natural means (not by planting); eg. seed is brought in by wind, birds, animals, etc. or from nearby trees
NON-RENEWABLE	something that cannot replenish or restock itself -- once used it is gone
NUTRIENTS	food
PHLOEM (INNER BARK)	a spongy layer which stores food manufactured in leaves and transports it to the stem and the roots
PHOTOSYNTHESIS	occurs in the leaves and needles. This is the chemical reaction whereby the leaves make food for the tree. (Water and minerals come up through the roots. The leaves absorb the sunlight while carbon dioxide is inhaled through the stomata openings. The cells containing chloroplasts combine these ingredients to make sugar which is transported to the trunk and roots, where it is changed to starch and stored for future growth. Oxygen is the tree's waste product which is released into the air for other plants and animals. Water is also a waste product that is released through the leaves.)
PRESCRIBED BURN	the knowledgeable application of fire to a specified land area to accomplish planned management objectives (i.e. the carefully planned use of fire to produce a desired affect)
RECYCLABLE	something that can be broken down to a simpler form and then reformed into a useable product. e.g. paper can be returned to its pulp state and then dried into paper again
REFORESTATION	the natural or artificial restocking of an area with forest trees (also known as regeneration)
RENEWABLE	something that can replenish or restock itself when used. eg. trees
RESOURCE	a supply of a naturally occurring raw material--eg. oil, gas, trees
SAPWOOD (XYLEM)	wood which carries water and dissolved mineral sap up the tree
SEEDLINGS	a young plant grown from seed

SEED TREE	selected trees are left standing, in a cutblock, to provide natural regeneration
SELECTION LOGGING	a continuous, uneven-aged forest is maintained by selecting trees of various ages and sizes for harvest. Harvesting occurs over intervals of 15-40 yrs.
SHELTERWOOD	any harvest cutting of a more or less regular and mature crop, designed to establish a new even-aged crop under the protection of the old
SILVICULTURE	the art and science of growing and tending a forest
SILVICULTURE SYSTEMS	a process following accepted silvicultural conditions whereby forests are tended, harvested and replaced
SITE PREPARATION	disturbance of an area's topsoil and ground vegetation to create conditions suitable for regeneration (reforestation)
SPACING	the act of removing trees from a stand to decrease the stand density and distribute the crop of trees more evenly over the growing room (to prevent overcrowding so that trees have room to grow)
STAND-TENDING	a variety of forest management activities carried out at different stages in the life of a stand. e.g. spacing, brushing, thinning, fertilizing, pest control, site preparation, pruning, etc.
SUSTAINABLE	to be able to keep going
SUSTAINABLE FOREST	concept of producing a biological resource under management practices that ensure replacement of the part harvested by regrowth or reproduction before another harvest. eg: managing a forest so that there will always be a healthy forest and enough trees for the future.
TECHNOLOGY	use of a scientific method
THINNING	process of removing excess and poorer quality trees for the purpose of improving the growth and value of remaining trees





## Teacher Background

### The Station Set-up

The next three lessons have been set up as stations that the students rotate through. There are 3 lessons involved, so you should divide your class into 3 groups rotating through the stations.

Station 1	group 1	Meet A Tree
Station 2	group 2	Tree ID
Station 3	group 3	Video

For smaller groups, arrange to have 6 groups with 2 groups completing the same station assignment at one time. The two groups watching the video can view it as one large group and then separate into 2 groups to do the assignment. This approach will allow you to complete this section in 3 lesson days.

If you have the CD Rom “Squeeze Play” or the CD and booklet “Tree Tales”, you could form extra stations with students visiting the computer lab to complete these activities. The CDs could also be available to students who are finished their work early.

When the stations have been completed there is a short quiz to bring closure to the lessons covered to this point.

#### **NOTE:**

- It is important that each group receive one copy of the lesson overview when working in stations as they are to complete the “setting the stage” section and it lists the materials required. Each student will need a copy of the lesson plan and worksheets.
- It works best if no more than 2 students share a **Tree Book** while working on tree identification. (See the “Support Materials” section should you need to order more books or photocopy parts of the Tree Book).



## LESSON OVERVIEW

### MEET A TREE

#### Learning Outcomes

- ◆ Students will identify parts of the tree and learn their functions.
- ◆ Students will add to their vocabulary.

#### Question

- ◆ Can you identify the parts of the tree and say what their jobs are?  
Yes/No

#### Setting the Stage: (approx. lesson time: 1 hr.)

- ◆ Have the students study the diagrams in their information booklets.
- ◆ If available, have the students look at the poster, The Secret Life of a Tree.

#### Materials Needed

- ◆ Meet a Tree-Information booklet. (one per student)
- ◆ Question Sheets
- ◆ Lesson Overview and Lesson Plan
- ◆ Poster: **THE SECRET LIFE OF A TREE** (if available)

## LESSON PLAN

### MEET A TREE

**Procedure** (After you have looked through the tree information booklet.)

1. Locate the following words in your glossary. (Check the words off after you have read the definition.)

bark	heartwood	photosynthesis
cambium	phloem	sapwood
environment		

2. As a group, take turns to read the information booklet out loud. As you are reading, fill in the worksheet. (The questions are in order as the information appears in the booklet. The coloring will occur on the last sheet of the booklet and should be done last.)

### Extensions

- ◆ Students could perform an experiment with celery placed in colored water (use food coloring) to see what happens over time. They could then relate what they observe to what they have learned about trees transporting food to their leaves.

### Closure

- ◆ Look at a tree cookie and try to identify the layers.
- ◆ How old is this tree?

## MEET A TREE BOOKLET

The characteristics of a general plant are:

**stem** (trunk is a type of stem)

**roots**

**leaves**

**flowers** (cone-bearing trees, such as pine, spruce, fir don't have true flowers)

**seeds/fruit**

### Trees

- trunk
- hard woody trunk
- leaves
- may have flowers
- roots
- bark
- seeds and/or fruit may be present
- branches

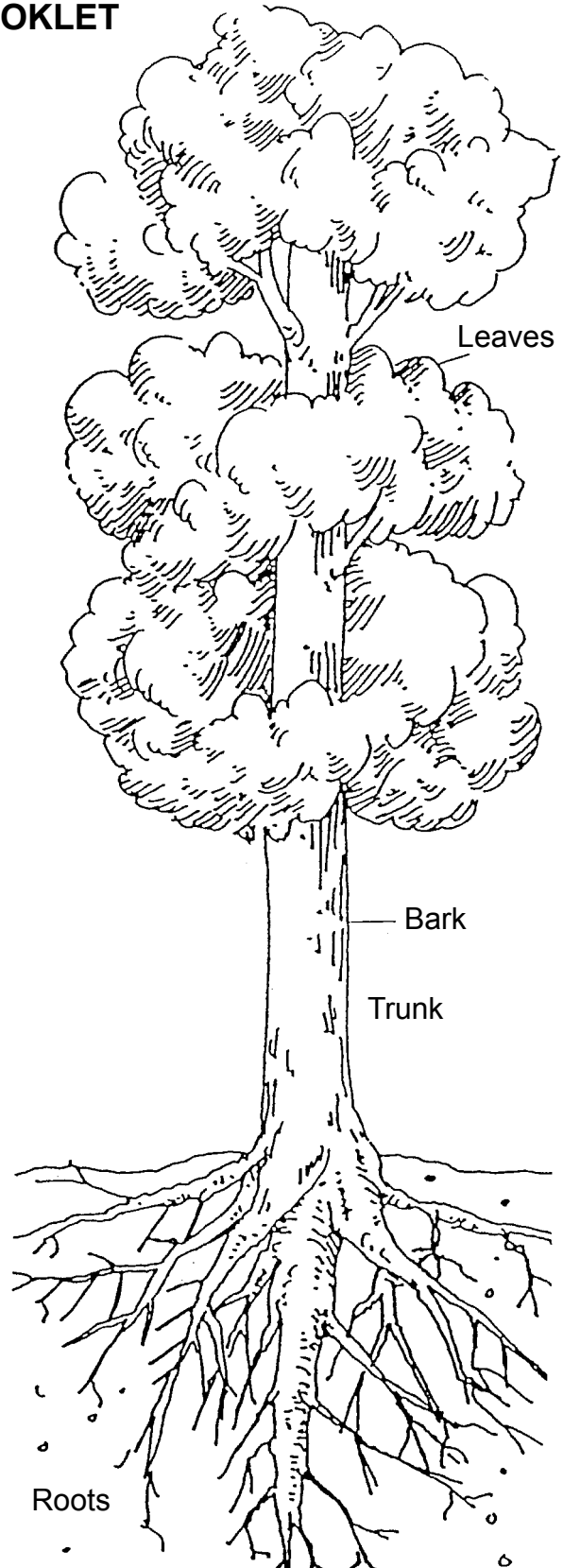
### Herbaceous Plants

- stem
- soft stem
- leaves
- may have flowers
- roots
- no** bark
- seeds and/or fruit may be present
- may or may not have branches

To summarize the difference between trees and herbaceous plants:

- trees are larger than herbaceous plants
- trees have thicker stems
- trees have harder, woody stems & branches
- a tree's leaves are usually larger
- trees have bigger roots

**In general there are 2 major differences between trees and other plants: size and structure.** Trees are bigger and are woody, not soft stemmed. Shrubs are also woody plants but they tend to be smaller than trees and have more than one stem.



The major parts of a tree or any plant, (roots, stem and leaves) work together to help it grow. Here is a brief summary of their roles.

### ROOTS

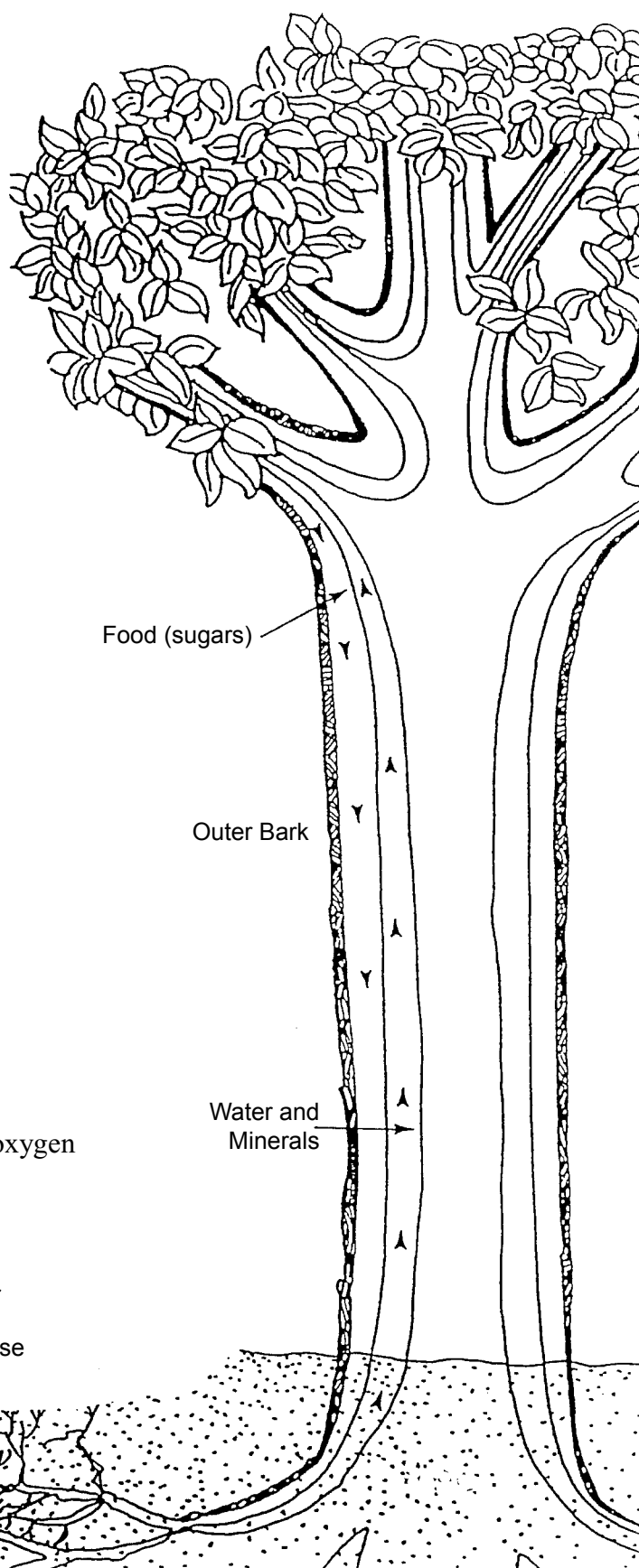
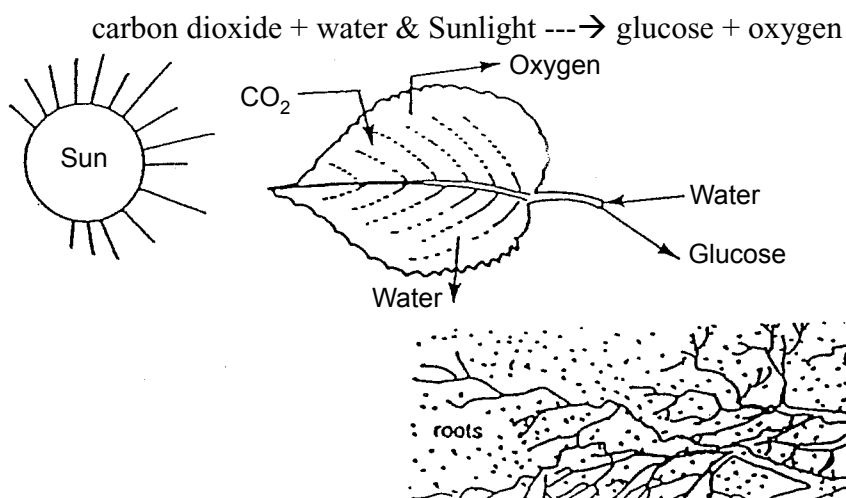
- ◆ anchor the tree
- ◆ take up water and minerals from the soil to feed the tree

### STEM/TRUNK

- ◆ provides support to the tree
- ◆ contains the “plumbing” of the tree, where water and minerals are carried from the roots up to the rest of the tree and sugars are carried from the leaves to other parts of the tree.
- ◆ is the place where all other plant parts are attached
- ◆ a tree’s outer bark is made of hardened, dead cells and serves to protect the tree from damage and disease.

### LEAVES

- ◆ like a mini-factory, leaves make food for the tree through a chemical reaction called **photosynthesis**. Chlorophyll- the green color in leaves- is necessary for the reaction to occur. Carbon dioxide from the air is combined with water from the roots, in the presence of sunlight, to produce sugar (glucose) and oxygen.



# THE TREE

The best known member of the forest community is the tree. What is a tree and how does it grow? It is one of nature's marvels.

Trees are the world's largest plants. They have a single **woody stem**, a **root system** and a **crown of branches and leaves**. Each of these parts performs a special function or job. The cellulose fibres in the woody stem give the tree strength; the roots collect water and nutrients from the soil and transfer them through the stem to the leaves.

The **needles or leaves** of a tree may be small but the work they do is important. They allow the tree to breathe, to release moisture and oxygen and to use sunlight to manufacture food through a process called **photosynthesis**. This "food", mostly sugar and other carbohydrates, provides the energy needed for the tree to grow.

The stem, or trunk of the tree, is made up of several specialized parts. The **heartwood**, the non-living core of the tree's stem, gives it strength. The living **sapwood** surrounds the heartwood. It is through the sapwood that water and nutrients travel, from the roots up to the leaves, where they are changed into food by photosynthesis. The downward passage of food from the leaves, to other parts of the tree, occurs in the **inner bark**. The **cambium**, the thin yellowish-white layer found between the sapwood and the inner bark, performs the important job of making new cells every year, allowing the tree to grow. Covering the outside of the tree is the **outer bark**, which acts as a protective shell for the tree.

Each tree has its own growth chart. Within the tree's structure, the story of how it has interacted with its surroundings is told. A tree grows in layers, one layer for each year. If you cut through the trunk you will see the inside of the tree and the layers will look like rings. The age of the tree can be told by counting the rings. Any changes in climate, weather, soil or light will affect how the tree grows. Good conditions means the tree will grow well and the rings will be farther apart. A cold, dry year means less growth and the rings will be closer together. Trees that are overcrowded will grow less as they fight for sunlight, moisture and nutrients. Thinning (removing trees) can prevent overcrowding.

There are 5 major layers of cells within a tree. Look at page 25, titled “The Layers of a Tree,” and find the 5 layers. Now read about these layers.

## **HEARTWOOD**

This is the oldest part of the tree. Most of the wood in the trunk of an old tree is heartwood. The cells are dead and serve to support the tree.

Sometimes the heartwood can rot or be eaten out by animals. When this happens, a large hollow forms inside the tree and it becomes an excellent habitat for a variety of creatures to live in.

## **SAPWOOD**

Surrounding the heartwood is a layer called the sapwood (or xylem) that is made up of straw-like tubes used to transport water and minerals from the roots to the rest of the tree. As the sapwood ages, it usually gets filled with resin-like material and dies, forming part of the heartwood. New sapwood cells are produced by the cambium layer.

## **CAMBIUM**

Next to the sapwood is a very thin layer of cells called the cambium. It is this layer that produces all the new cells in the trunk, making it grow thicker each year (palm trees do not do this). On the inner side of the cambium, new sapwood cells are produced. On the outer side of the cambium, new inner bark cells are produced.

## **INNER BARK** (phloem-pronounced floam)

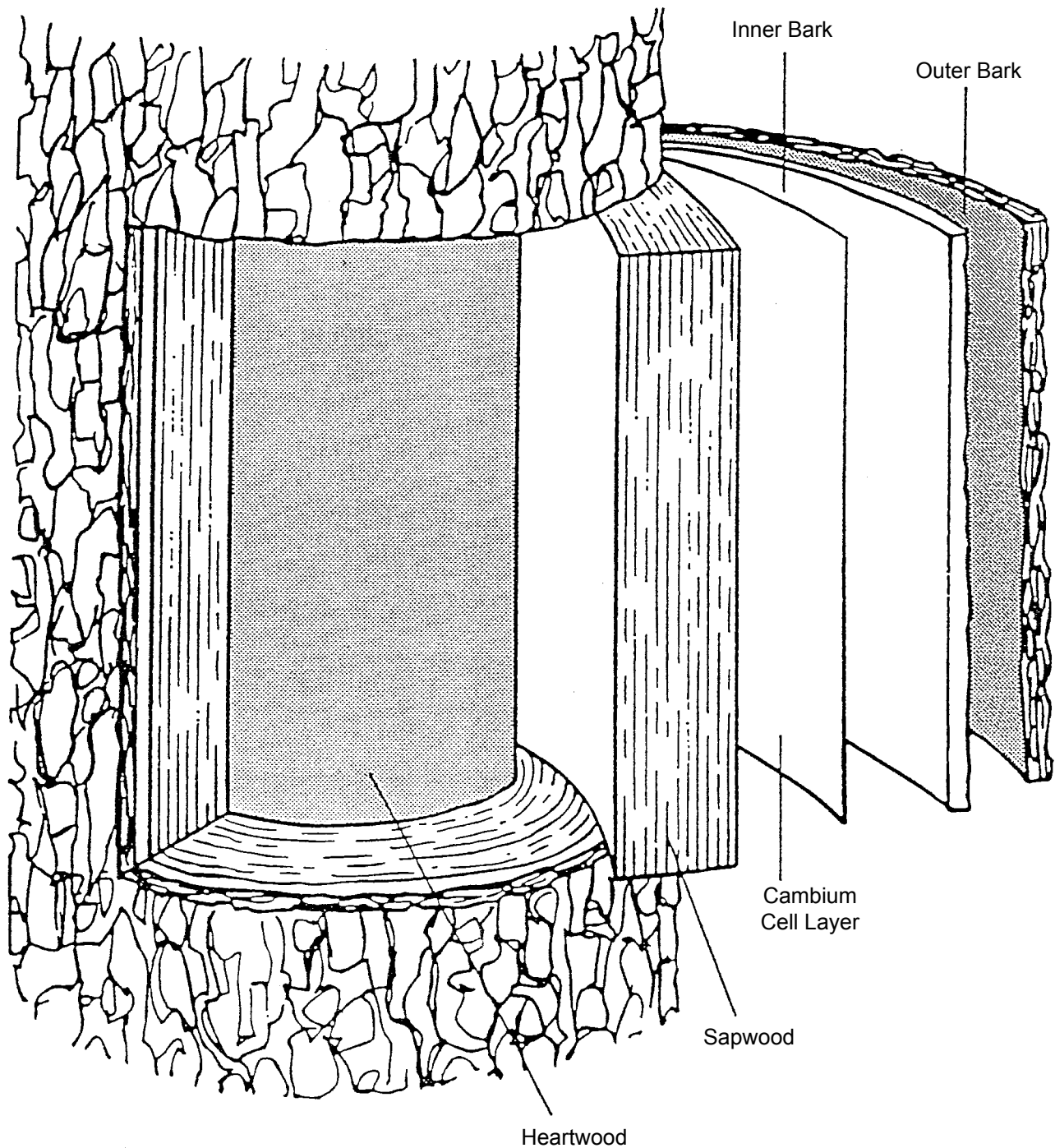
The inner bark cells consist of a series of straw-like tubes used to transport sap (containing glucose produced in the leaves during photosynthesis) from the leaves to feed the rest of the tree. It also carries sugars, stored in the roots, to the rest of the tree in spring when the tree is starting to grow again. It is this flow that is tapped in sugar maple trees to make syrup.

## **OUTER BARK**

The outside layer on a tree is its bark. Different trees have different colors, textures, and thicknesses of bark but it all serves to protect the tree from disease and damage. The bark is made of dead inner-bark cells that are pushed farther away from the cambium layers as new inner bark cells are produced. As the tree pushes outward, the bark often splits and peels under the pressure.



## THE LAYERS OF A TREE





Name: \_\_\_\_\_

## Question Sheet

Score      + bonus       
25 2

### Matching:

- |                     |   |
|---------------------|---|
| a) leaf             | _____ provides support for tree                 |
| b) root             | _____ large plant with woody trunk              |
| c) stem/trunk       | _____ anchors the plant/tree                    |
| d) tree             | _____ short plant with soft stem                |
| e) herbaceous plant | _____ mini-factory that makes food for the tree |

### Fill in the blank:

1. \_\_\_\_\_ and \_\_\_\_\_ are carried through the trunk of the tree.
2. A chemical reaction called \_\_\_\_\_ occurs in the leaves, making food for the tree.
3. A tree's outer bark is made of \_\_\_\_\_ that protect the tree from \_\_\_\_\_ and \_\_\_\_\_.
4. Trees are the world's largest plants. They have a w \_\_\_\_\_ s \_\_\_\_\_ or t \_\_\_\_\_, a r \_\_\_\_\_ system and a c \_\_\_\_\_ of b \_\_\_\_\_ and l \_\_\_\_\_.

### Multiple Choice:

1. The part that allows trees to breath, release oxygen and moisture, and manufacture food is called:  
a) bark                      b) needle / leaf                      c) root
2. The age of a tree can be decided by:  
a) counting growth rings                      b) measuring height  
c) measuring diameter
3. How a tree interacted with its environment can be told by looking at:  
a) branches                      b) roots                      c) the layers/ growth rings
4. The oldest part of the tree is:  
a) the bark                      b) the cambium                      c) the heartwood
5. Straw-like tubes that transport or carry water and minerals from the roots to the rest of the tree are called:  
a) cambium                      b) phloem                      c) sapwood / xylem
6. Color your picture on the last page of your booklet:

heartwood - red  
sapwood - blue  
cambium cell layer - yellow  
inner bark - green  
outer bark - brown

**BONUS:** If you put a nail in a tree one meter from the ground and the tree grows 3 meters taller over the next 5 years, where will the nail be? Why?

## Key

Name: \_\_\_\_\_

### Question Sheet

Score  $\frac{\quad}{25}$  + bonus  $\frac{\quad}{2}$

#### Matching:

- |                     |          |   |
|---------------------|----------|---|
| a) leaf             | <u>c</u> | provides support for tree                 |
| b) root             | <u>d</u> | large plant with woody trunk              |
| c) stem/trunk       | <u>b</u> | anchors the plant/tree                    |
| d) tree             | <u>e</u> | short plant with soft stem                |
| e) herbaceous plant | <u>a</u> | mini factory that makes food for the tree |

#### Fill in the blank:

1. Water and minerals are carried through the trunk of the tree.
2. A chemical reaction called photosynthesis occurs in the leaves, making food for the tree.
3. A tree's outer bark is made of hardened dead cells that protect the tree from damage and disease.
4. Trees are the world's largest plants. They have a woody stem or trunk, a root system and a crown of branches and leaves.

## Key

### Multiple Choice:

1. The part that allows trees to breathe, release oxygen and moisture and manufacture food is called: a) bark    b) needle / leaf    c) root
2. The age of a tree can be decided by:  
    a) counting growth rings    b) measuring height  
    c) measuring diameter
3. How a tree interacted with its environment can be told by looking at:  
    a) branches    b) roots    c) the layers / growth rings
4. The oldest part of the tree is:  
    a) the bark    b) the cambium    c) the heartwood
5. Straw-like tubes that transport or carry water and minerals from the roots to the rest of the tree are called:  
    a) cambium    b) phloem    c) sapwood / xylem
6. Color your picture on the last page of your booklet:

heartwood - red  
sapwood - blue  
cambium cell layer - yellow  
inner bark - green  
outer bark - brown

**BONUS:** If you put a nail in a tree one meter from the ground and the tree grows 3 meters taller over the next 5 years, where will the nail be? Why?

Answer: The nail will be one meter from the ground because a tree grows upwards from its top.

## **LESSON OVERVIEW**

### **TREE IDENTIFICATION WITH SAMPLES**

#### **Learning Outcomes**

- ◆ Students will build on their ability to identify a local resource, the tree, by looking at its features
- ◆ Students will increase their ability to use the “Tree Book” as a resource.
- ◆ Students will add to their vocabulary

#### **Questions**

- ◆ Can you identify a tree?
- ◆ What features help you to identify a tree?

#### **Setting the Stage** (approx. lesson time: 1 hr.)

- ◆ Review the use of the “Tree Book” as learned in lesson one. Look at the main features and headings to be sure the students remember how to use the book. Playing the Tree Game would be one method of review.

#### **Materials Needed**

- ◆ Tree Book
- ◆ Tree Samples
- ◆ Copy of worksheet
- ◆ Copy of Lesson Plan

## **LESSON PLAN**

### **TREE IDENTIFICATION WITH SAMPLES**

**Procedure** (after reviewing the use of the Tree Book)

1. Locate the following words in your glossary and color code your check marks.

Coniferous

Deciduous

2. Fill in the worksheet provided for the tree samples you are given.

#### **Extensions**

- ◆ Tree Game: Students take turns choosing a tree and orally giving clues to their group. The first student (using the Tree Book) to identify the tree correctly, gets to choose a tree and give clues.

#### **Closure**

- ◆ Walk around your school yard or neighbourhood and try to identify the trees you see.



**TREE IDENTIFICATION** (with samples)

TREE	FEATURE (leaf/needle)	CONE/FLOWER/FRUIT	BARK

## **LESSON OVERVIEW**

### **TREE IDENTIFICATION WITHOUT SAMPLES**

#### **Learning Outcomes**

- ◆ Students will build on their ability to identify a local resource, the tree, by looking at its features.
- ◆ Students will increase their ability to use the “Tree Book” as a resource.
- ◆ Students will add to their vocabulary.

#### **Questions**

- ◆ Can you identify a tree?
- ◆ What features help you to identify a tree?

#### **Setting the Stage** (approx. lesson time: 1 hr.)

- ◆ Review the use of the “Tree Book” as learned in lesson one. Look at the main features and headings to be sure the students remember how to use the book. Playing the Tree Game would be one method of review.

#### **Materials Needed**

- ◆ Tree Book
- ◆ Copy of worksheet
- ◆ Copy of Lesson Plan

**NOTE:** This exercise may be used to test the student’s ability to use the Tree Book. Space has been left for students to gather information on a tree of their choice.

## LESSON PLAN

### TREE IDENTIFICATION WITHOUT SAMPLES

**Procedure** (after reviewing the use of the Tree Book)

1. Locate the following words in your glossary. (Color code your check marks.)

Coniferous

Deciduous

2. Fill in the worksheet provided. Be sure to read all the information on each tree you identify to confirm your answer.

### **Extensions**

- ◆ Tree Game: Students take turns choosing a tree and orally giving clues to their group. The first student (using the Tree Book) to identify the tree correctly, gets to choose a tree and give clues.

### **Closure**

- ◆ Walk around the school yard or neighbourhood and try to identify the trees you see.

### TREE IDENTIFICATION (without samples)

TREE	FEATURE (leaf/needle)	CONE/FLOWER/FRUIT	BARK	LOCATION
	<ul style="list-style-type: none"> <li>- flat, pointed tip</li> <li>- upper surface yellow green</li> <li>- stand out around twig</li> </ul>	<ul style="list-style-type: none"> <li>- 5-11 cm</li> <li>- seeds are winged at tip</li> <li>- long 3-pronged bracts between scales</li> </ul>	<ul style="list-style-type: none"> <li>- smooth</li> <li>- grey/brown</li> <li>- grooved</li> </ul>	<ul style="list-style-type: none"> <li>- southern half of BC</li> <li>- Vancouver Island</li> </ul>
	<ul style="list-style-type: none"> <li>- in bunches of 2</li> <li>- often twisted in a spiral with sharp points</li> <li>- dark green</li> </ul>	<ul style="list-style-type: none"> <li>- 2-4 cm</li> <li>- seed scales have sharp pricklets at tip</li> <li>- vary in shape from short and cylindrical to egg shape</li> </ul>	<ul style="list-style-type: none"> <li>- thin</li> <li>- orange/brown to grey</li> <li>- finely-scaled</li> </ul>	<ul style="list-style-type: none"> <li>- interior of BC</li> </ul>
	<ul style="list-style-type: none"> <li>- 4 sided</li> <li>- sharp</li> <li>- stiff</li> <li>- arranged spirally on twig</li> <li>- whitish/green</li> </ul>	<ul style="list-style-type: none"> <li>- light brown to purple</li> <li>- hang from upper branches</li> <li>- seed scales have smooth, rounded outer edge</li> <li>- pollen cone is red</li> </ul>	<ul style="list-style-type: none"> <li>- loose</li> <li>- scaly</li> <li>- grey/brown</li> </ul>	<ul style="list-style-type: none"> <li>- Throughout the interior of BC from valley floor to mid-elevation</li> </ul>
	<ul style="list-style-type: none"> <li>- new needles are soft green and turn yellow in the Fall</li> <li>- broadly triangular in cross section</li> <li>- bunches of 15-30</li> </ul>	<ul style="list-style-type: none"> <li>- elongated</li> <li>- red to red/brown</li> <li>- scales have white hairs on lower surface</li> <li>- long slender bracts</li> <li>- yellow pollen cone</li> </ul>	<ul style="list-style-type: none"> <li>- thick, grooved</li> <li>- plate-like</li> <li>- cinnamon-colored scales</li> </ul>	<ul style="list-style-type: none"> <li>- southern interior of BC</li> </ul>
	<ul style="list-style-type: none"> <li>- shiny dark green leaf</li> <li>- 6-12 cm long</li> <li>- pale underneath</li> <li>- vary in form - oval to wedge shape</li> <li>- pointed sharp tip</li> <li>- 7-10 cm wide</li> </ul>	<ul style="list-style-type: none"> <li>- male (2-3 cm) &amp; female (8-20 cm) catkins on trees</li> <li>- release seeds with white fluffy hairs</li> </ul>	<ul style="list-style-type: none"> <li>- smooth yellow-grey on young trees</li> <li>- deep grooves with age</li> </ul>	<ul style="list-style-type: none"> <li>- west of Rocky Mt. and south of the Stikine River</li> </ul>

### TREE IDENTIFICATION (without samples)

TREE	FEATURE (leaf/needle)	CONE/FLOWER/FRUIT	BARK	LOCATION
	<ul style="list-style-type: none"> <li>- 3-5 lobes</li> <li>- maple-leaf shape</li> <li>- coarsely-toothed</li> <li>- dark green on top &amp; grayish underneath</li> </ul>	<ul style="list-style-type: none"> <li>- cluster of winged seeds 2.5 cm long</li> <li>- joined in pairs at V-shaped angle</li> <li>- seeds are wrinkled and indented</li> </ul>	<ul style="list-style-type: none"> <li>- thin</li> <li>- smooth</li> <li>- dark red/brown</li> <li>- rough on larger branches and older trees</li> </ul>	- southern 2/3 of BC

## Key

Tree Identification Activity (if samples aren't available)

1. Douglas fir
2. Lodgepole Pine
3. White Spruce
4. Western Larch
5. Black Cottonwood
6. Douglas Maple

## LESSON OVERVIEW

### FIRE

#### **Learning Outcome:**

- ◆ Students will learn that there are positive and negative sides to fire.
- ◆ Students will learn about different types of fire and the consequences of fire.
- ◆ Students will add to their vocabulary.
- ◆ Students will offer and defend their view on the two sides of fire in the form of a short essay.

#### **Question:**

- ◆ Is fire friend or foe (enemy)? Discuss, as a group, what you think the answer is.

#### **Setting the Stage:** (approx. lesson time: 1 hr.)

- ◆ Have students **view** the video “**Two Sides of Fire**” with the intent of understanding what the 2 sides of fire are and how they affect the environment.

#### **Materials Needed:**

- ◆ The video “**Two Sides of Fire**”. (16 min. video)
- ◆ Lined paper on which to write their essay.
- ◆ Copy of Lesson Overview (one per group)
- ◆ Copy of Lesson Plan for each student

**NOTE:** If this lesson is completed as a station, it is important that students read the overview so as to be sure that they set the stage and have all the materials required.

## Teacher Background:

### **TWO SIDES OF FIRE**

Video Summary (16 minutes)

- ◆ three things determine the behavior of a fire: fuel, weather, topography
  - fuel - undergrowth
  - weather- dry, wet, windy, etc.
  - topography- the physical features of the land--hilly, flat, rivers, etc.
- ◆ fire kills the low growth and cleanses the earth providing opportunity for larger fire resistant trees to grow
- ◆ fire kills diseases and insects and can return nutrients to the earth
- ◆ the two sides to fire are:

<u><b>Controlled</b></u>	<u><b>Uncontrolled</b></u>
-prescribed burn	-wild fire
-cool burn	-hot burn
-kills: undergrowth	-often goes to crown fire,
disease & insects	killing all
	-may cause erosion
-fairly quick to return to health	-can take decades for a healthy forest to return
- ◆ consistent, on-going change is essential to a healthy ecosystem that will allow a sustainable forest to grow
- ◆ today's forests are vulnerable due to our past prevention of fires thus allowing the undergrowth to become dense and overcrowding to occur.  
undergrowth = fuel for fire
- ◆ fire, in the right condition, can do good things. For example, some trees are fire-dependent and require heat to open their cones to release the seed.
- ◆ possible solutions to fire:
  - 1) let nature take over
  - 2) manage the forest by:
    - prescribed burning
    - salvaging dead and dying trees plus thinning
- ◆ homes in nature are beautiful but can become dangerous in an untended forest as wild fires may occur; heat + fuel + oxygen -----> fire may result
- ◆ trees compete for sunlight, water and soil nutrients
- ◆ we enjoy forests for: wood products, nature, beauty



# LESSON PLAN

## FIRE

**Procedure:** (to be completed after first viewing of video.)

1. Locate the following words in your glossary. (Check them off)

<b>ecosystem</b>	<b>fire dependent</b>	<b>spacing</b>
<b>erosion</b>	<b>nutrients</b>	<b>sustainable forest</b>
<b>fire resistant</b>	<b>prescribed burn</b>	<b>thinning</b>

2. **Discuss** the following ideas within your group:
  - What do the terms controlled burn and uncontrolled burn mean?
  - What are some of the positive effects of a controlled burn?
  - What are some of the negative effects of a controlled burn?
  - What are some of the positive effects of an uncontrolled burn?
  - What are some of the negative effects of an uncontrolled burn?
3. **Watch the video a second time** keeping in mind the discussion you just had and see if you can come up with more positive and negative effects.
4. **Write a short essay on Fire.** Paragraph one should tell what a controlled burn is and list some of the positive and negative effects that result from a controlled burn. A second paragraph should tell what an uncontrolled burn is and what positive and negative results occur. A third paragraph should give your views on whether forest companies should use controlled burn as part of their management of the forest. (Be sure to give reasons for your point of view.)

### **Extensions:**

- ◆ Have students record what they learned from the video.
- ◆ Illustrate the changes in the forest from past to present or make a sequence diagram showing: a) before a fire  
b) immediately after a fire c) a few years later

### **Closure:**

- ◆ Students could share their essays with their group or later with the class.



# FORESTRY QUIZ

## Part One

Name: \_\_\_\_\_

Total: \_\_\_\_\_  
25

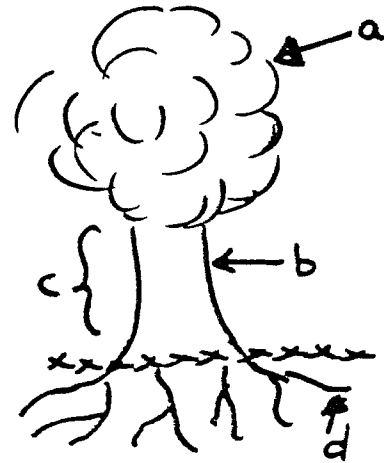
1. Look at the picture of a tree and label the tree parts.

a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_



2. Label the 5 parts of the tree shown in the diagram.

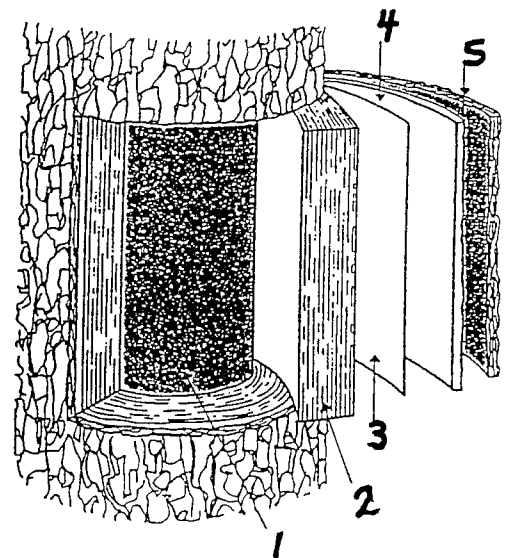
1) \_\_\_\_\_

2) \_\_\_\_\_

3) \_\_\_\_\_

4) \_\_\_\_\_

5) \_\_\_\_\_



Answers for #1 and 2. (answers can only be used once)

cambium

needles/leaves

sapwood

root

outer bark

fruit

inner bark

heartwood

trunk

bark

seeds

stem

**3. Matching:**

- |  |                     |
|--|---------------------|
| ___ a chemical reaction in the leaves that produces food | a) sapwood          |
| ___ provides support for the tree                        | b) herbaceous plant |
| ___ short plant with soft stem                           | c) sun              |
| ___ the part that allows trees to breath                 | d) photosynthesis   |
| ___ the oldest part of a tree                            | e) growth rings     |
| ___ these tell the age of a tree                         | f) leaf             |
| ___ tubes that transport water and minerals              | g) trunk            |
| ___ this is needed for photosynthesis to occur           | h) heartwood        |

**4. Use your **Tree Book** to identify the following tree:**

This tree has flat needles with blunt ends. The needles are of different lengths and the top branch droops. This tree is called \_\_\_\_\_ and is used for\_\_\_\_\_.

**5. What is a controlled burn and why might a forestry company use it? (2 marks)**

**6. What is an uncontrolled burn and why can it be dangerous? (2 marks)**

**7. Define:** a) coniferous

b) deciduous

\*Bonus c) environment

## Key

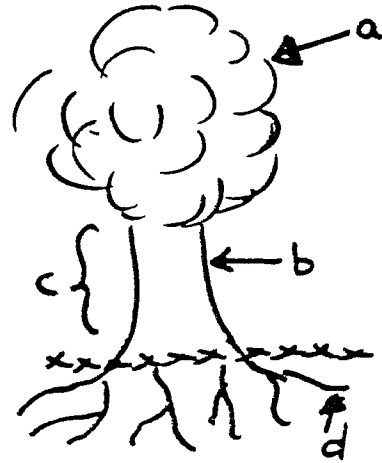
### FORESTRY QUIZ Part One

Name: \_\_\_\_\_

Total: \_\_\_\_\_  
25

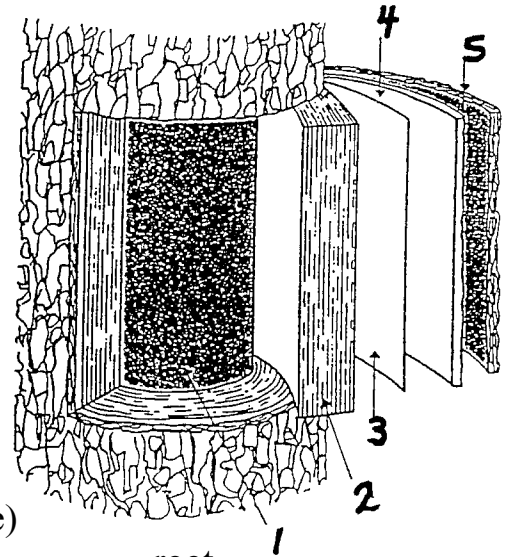
1. Look at the picture of a tree and label the tree parts.

- a) needle/leaf
- b) bark
- c) trunk
- d) roots



2. Label the 5 parts of the tree shown in the diagram.

- 1) heartwood
- 2) sapwood
- 3) cambium
- 4) inner bark
- 5) outer bark



Answers for #1 and 2. (answers can only be used once)

cambium  
outer bark  
trunk

needles/leaves  
fruit  
bark

sapwood  
inner bark  
seeds

root  
heartwood  
stem

## Key

### 3. Matching:

- |  |                     |
|--|---------------------|
| _d_ a chemical reaction in the leaves that produces food | a) sapwood          |
| _g_ provides support for the tree                        | b) herbaceous plant |
| _b_ short plant with soft stem                           | c) sun              |
| _f_ the part that allows trees to breath                 | d) photosynthesis   |
| _h_ the oldest part of a tree                            | e) growth rings     |
| _e_ these tell the age of a tree                         | f) leaf             |
| _a_ tubes that transport water and minerals              | g) trunk            |
| _c_ this is needed for photosynthesis to occur           | h) heartwood        |

### 4. Use your **Tree Book** to identify the following tree:

This tree has flat needles with blunt ends. The needles are of different lengths and the top branch droops. This tree is called Western Hemlock and is used for carving.

### 5. What is a controlled burn and why might a forestry company use it?

(2 marks) A cool burn that may be used to control insects and disease.

The forest can quickly return to health.

### 6. What is an uncontrolled burn and why can it be dangerous? (2 marks)

A hot burn or wild fire that can damage the ground and kill everything.

### 7. Define: a) coniferous – a cone bearing tree with needles.

b) deciduous – a tree that sheds its leaves and does not have cones.

\*Bonus c) environment- your surroundings

## **LESSON OVERVIEW**

### **HUMAN USE OF A LIVING RESOURCE: THE FOREST**

#### **Learning Outcome:**

- ◆ Students will learn to describe living and non-living resources in the environment and apply this to their local area.
- ◆ Students will learn to identify natural and human uses of the forest.
- ◆ Students will learn to define the terms **renewable and non-renewable resources** and **sustainability**.

#### **Question:**

- ◆ What is a living resource? What is a non-living resource?
- ◆ How do humans use a living resource?
- ◆ What are the differences between renewable and non-renewable resources?
- ◆ How can a resource be sustainable?

#### **Setting the Stage:**

##### **Part 1 & 2:** (Time: 30 minutes)

- ◆ Students will do a brainstorming exercise on natural and human use of our forests (Activity Worksheet #1).
- ◆ Following the above session, students will examine the poster "Between the Stands" to make observations of natural and human use of the forest. They will add information to Activity sheet #1.

##### **Part 3:** (Time: 40-45 minutes)

- ◆ Students will view a 15 minute video entitled "**The Miracle Resource**" to determine differences between renewable and non-renewable resources, sustainability of a resource and the products provided by the forest (Activity sheet #2).

#### **Materials Needed:**

- ◆ Poster "Between the Stands"
- ◆ Video: "**The Miracle Resource**"/summary
- ◆ Activity Worksheets: #1 and #2
- ◆ **Quiz:** Human Use of a Living Resource: The Forest

# LESSON PLAN

## HUMAN USE OF A LIVING RESOURCE: THE FOREST

### Procedure:

Locate the following words in your glossary. (Check them off)

biodegradable	recyclable
by-products	renewable
fossil fuels	resource
non-renewable	sustainable

### Part 1: (Time: 15-20 minutes)

Lead students into a brainstorming session:

- **What is a resource?**
- **What do you think of when you hear the words "human use" of a forest resource?**
- **"natural use" of a forest resource?**
- Students record their ideas on Activity Worksheet #1 in both sections. (top half of the paper only)

### Part 2: (Time: 15 minutes)

- Following the above exercise, have students make observations of human and natural use of the forests using the poster "**Between the Stands**".
- Students will then add ideas to the lists they began during Part 1 of this lesson on the lower half of Activity Worksheet #1. (encourage them to include things such as agriculture, mining, fishing, wildlife, recreation, tourism, cultural, archaeological, logging, etc.)



**Part 3:** (Time: 45 minutes)

Video: "**The Miracle Resource**" - Students will be asked to look for the following information while viewing this video (these could be listed on the blackboard or put onto an overhead or chart).

- 1) a variety of forest products***
- 2) the photosynthesis process***
- 3) extracting non-living resources***
- 4) connection to sports and resources***
- 5) the role energy plays in the use of natural resources***
- 6) world population predictions and sustainability***

**Possible options for Part 3:**

- ◆ Full class or group activity - list the video headings (6 listed above) on the blackboard or overhead - have students watch the video the first time to be prepared to discuss at least two of the topics on the list – you may wish to divide the class into groups and assign a topic to each group so that all of the topics will be covered.
- ◆ Lead class into a follow-up oral discussion - what information did they get on each of the six topics - complete Activity Worksheet #2 together or view the video once again and have each student complete the worksheet independently as they watch the video for the second time.
- ◆ Refer to video review sheet and divide video into 5 parts. Do Activity Worksheet #2 (in 5 parts) as a full class activity.

# HUMAN USE OF A LIVING RESOURCE: THE FOREST

## Video Review: The Miracle Resource (15 minutes)

This video will lead into discussion/activities on the following concepts: renewable, non-renewable, recyclable, sustainable, biodegradable, and wood products. It is divided into five main parts - it can be viewed all at once or can be divided into the five main parts each one being addressed in the Activity Worksheet

### Part 1: The Introduction

- about 3+ minutes - (stop at heading "What is Wood") - this part talks about wood qualities and products
- students listen to discover some facts about wood and will be prepared to begin a list of wood products (just a few to start) on Activity Worksheet #2 - question 1

### Part 2: What is Wood?

- explains the photosynthesis process as well as the continuous growing aspects
- students watch this part to discover two things: what powers photosynthesis and to be able to define the term renewable - Activity Worksheet #2 - questions 2 & 3

### Part 3: Wood: The Environmental Choice

- addresses extraction of non-living resources
- students watch this segment to look for two sports they like, to see how the products are made and whether or not the resources are renewable
- what role does energy play in the use of natural resources - Activity Worksheet #2 question 4

### Part 4: Wood for the World

- discusses world population projections and consequences to our resource requirements
- students listen for the word sustainability - be able to define - listen for a figure that represents the expected population growth in 70 years - Activity Worksheet #2 questions 5 & 6

**Note:** The world population as of December 2005, has reached more than 6.5 billion

### Part 5: Wood is Everywhere

- more wood products will be shown
- students could add to their original list - Activity Worksheet #2 - question 1

### Summary of video:

- promotes use of wood as renewable, recyclable, biodegradable, energy efficient, durable, versatile
- non-toxic / beautiful uses of wood
- draws good comparisons to other resources (eg. plastics, aluminum, oil)
- describes photosynthesis process
- answer the question "What is wood?"
- Discusses advantages to managed forests, sustainability

**To Order Video:** Temperate Forest Foundation (503) 579-6762 [www.forestinfo.org](http://www.forestinfo.org)

## HUMAN USE OF A LIVING RESOURCE: THE FOREST

## Activity Worksheet #1

## OUR FORESTS

## HUMAN USES

## NATURAL USES

# HUMAN USE OF A LIVING RESOURCE: THE FOREST

## Activity Worksheet #2

Video: **The Miracle Resource**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**1. Make a list of wood products:**

---

---

---

---

**2. What powers photosynthesis?**

---

**3. Define the word "renewable".**

---

**4. How does energy influence the use of natural resources?**

---

---

**5. Define "sustainability".**

---

---

**6. What is the world population predicted to be in the next 70 years? What resources might we need then?**

---

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# HUMAN USE OF A LIVING RESOURCE: THE FOREST

## QUIZ

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**1. List 10 items that come from trees or that are made from tree by-products.**

**Be sure to include some that surprised you.**

- |          |          |
|----------|----------|
| a) _____ | f) _____ |
| b) _____ | g) _____ |
| c) _____ | h) _____ |
| d) _____ | i) _____ |
| e) _____ | j) _____ |

**2. What is a renewable resource?**

**3. List 2 examples of non-renewable resources.**

- |          |          |
|----------|----------|
| a) _____ | b) _____ |
|----------|----------|

**4. How can a resource be sustained?**

**5. With an increase in the world population, in your opinion, what do you see as resource needs in the years ahead?**



## Human Use of a Living Resource: The Forest

1. **Make a list of wood products.**  
Brainstorm answers
2. **What powers photosynthesis?** the sun
3. **Define the word “renewable”** – a naturally occurring raw material or form of energy that can replenish itself through sustainable development.
4. **How does energy influence the use of natural resources?**  
Everything takes energy to extract and process into products. Energy is limited.
5. **Define “sustainability”** – concept of producing a biological resource under management practices that ensure replacement of the part harvested by regrowth or reproduction before another harvest occurs.
6. **What is the world population predicted to be in the next 70 years?** 12 billion  
**What resources might we need then?** Brainstorm answers

## Key

# HUMAN USE OF A LIVING RESOURCE: THE FOREST

## QUIZ

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**1. List 10 items that come from trees or that are made from tree by-products.**

**Be sure to include some that surprised you. (Answers will vary)**

a) \_\_\_\_\_ f) \_\_\_\_\_

b) \_\_\_\_\_ g) \_\_\_\_\_

c) \_\_\_\_\_ h) \_\_\_\_\_

d) \_\_\_\_\_ i) \_\_\_\_\_

e) \_\_\_\_\_ j) \_\_\_\_\_

**2. What is a renewable resource?**

A naturally occurring raw material or form of energy that can replenish itself through sustainable development.

**3. List 2 examples of non-renewable resources.**

bauxite (aluminum), oil (plastics), gas, coal

**4. How can a resource be sustained?**

Good management practices that ensure replacement of the resource

**5. With an increase in the world population, in your opinion, what do you see as resource needs in the years ahead?**

Answers will vary



# LESSON OVERVIEW

## SILVICULTURE SYSTEMS

.....Extracting and replacing a living resource

### Learning Outcome:

- ◆ Students will learn about the system of extracting a living resource.
- ◆ Students will learn about reforestation in B.C. ...
- ◆ Students will be able to discuss the concept of sustainability.

### Question:

- ◆ What is a silviculture system?
- ◆ What steps have to be taken prior to the extraction of trees from the forest?
- ◆ What happens following the harvesting of trees?

### Setting the Stage:

**Silviculture Systems:** Lesson 1    Part 1,2 = Discussion;  
Part 3 = Student activity

#### Part 1: (Time: 15 minutes) A teacher led activity:

Refer to **TB1 - Silviculture: The Forests of British Columbia – (Teacher Background (TB1) - Part 1)**

Lead into a brainstorming session with students to determine what they already know about forestry - ie. Questions: Who owns the forest land? Who manages it? Who cuts trees? Who decides how much to cut? What is the cost of cutting timber? Is there a limit on how much can be cut? etc.

#### Part 2: (Time: 15 minutes) A teacher led activity:

Refer to **TB2 - Silviculture Systems – (Teacher Background - Part 2)**

Students will learn about the definition of a silviculture system, the activities and the many considerations necessary prior to harvesting any timber.

#### Part 3: (Time: 45-60 minutes) A teacher/student activity:

Silviculture Systems - Students will learn to define some silviculture systems in B.C., identify them on the overhead and complete Activity Worksheet #1 (Refer to **TB2 & TB3**)

## **Materials Needed:**

### **Silviculture:**

Overhead: Silviculture Systems

Teacher Background Information Sheets TB1, TB2, TB3

Additional Reference materials: **FYI:** Brochures - Silviculture Systems in B.C. (optional)

Forest Harvesting: Following Natures Lead –  
{located in pocket in this section} (optional)

Poster: "Silvicultural Systems"

Activity Worksheets

### **Silviculture and Reforestation:**

**Quiz:** To be given following completion of both lessons: Silviculture Systems and Reforestation

## LESSON PLAN

### SILVICULTURE SYSTEMS

#### Procedure:

Locate the following words in your glossary. (Check them off)

aesthetics	selection logging
biological diversity	shelterwood
clearcutting	silviculture
harvesting	site preparation
seed tree	stand tending

#### Silviculture Systems:

##### **Part 1:** (Time: 10-15 minutes)

Teacher led activity: (Refer to: **TB1: Silviculture: The Forests of British Columbia - Teacher Background - Part 1**) - lead into a brainstorming session with students to determine what they know about:

**Who owns and manages the forest land in B.C.?**

**Who is allowed to cut trees and use them?**

If class is fairly advanced or if you wish to extend this part, you might want to proceed with further questions for sections 3, 4 and 5 on the background sheet

##### **Part 2:** (Time: 15 minutes)

Teacher led activity: (Refer to **TB2: Silviculture Systems - Teacher Background - Part 2**) to learn about the definition of a silviculture system, the activities and the many considerations necessary prior to harvesting any timber - ask students:

**Does anyone know what the term "silviculture system" means?**

(teacher defines for students - discusses what the activities include)

**Can you think of some things that foresters might have to consider before they cut the trees down?** (Brainstorm with students - Refer to information section "These systems are based on the following considerations")

**How long do you think it takes before the harvesting can take place?** (Refer to information on "The Planning Process")

**Part 3:** (Time: 45-60 minutes)

Teacher/student activity:

Refer to - **Overhead** of Silviculture Systems and answer key

Teacher background: **TB 2 & TB3: Silviculture Systems - Teacher Background - Part 2, Part 3**

Activity Worksheet #1

- a) Activity Worksheet #1, define as a class a silviculture system  
-students record this definition on the worksheet (definition found on **TB2 - Silviculture Systems - Teacher Background - Part 2**)
- b) Overhead, answer key and Worksheet #1  
(Refer to: **TR3 - Silviculture Systems - Teacher Reference - Part 3**)

**Option #1:**

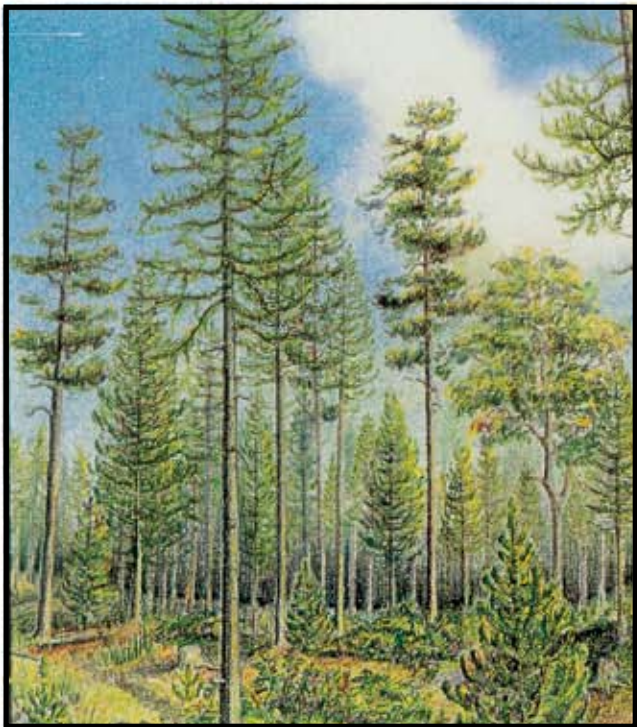
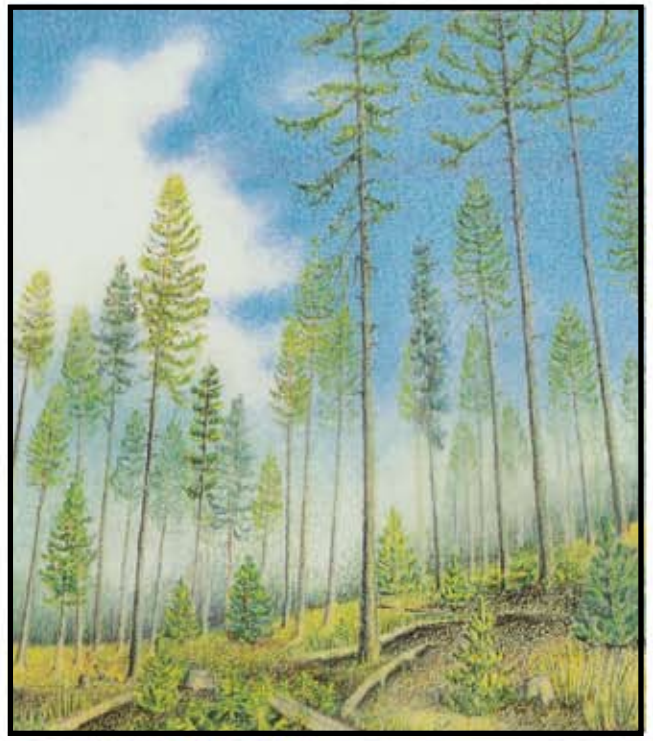
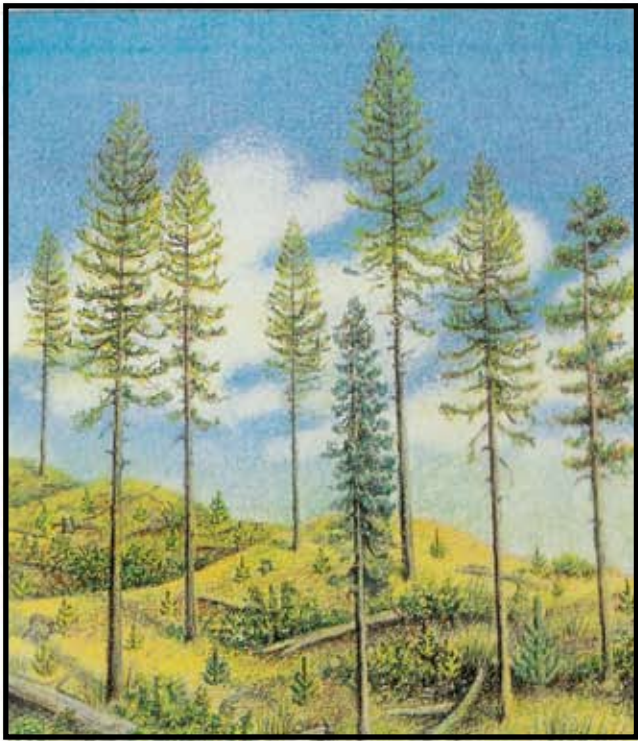
Place the overhead on the projector - tell students you will be discussing four main types of silviculture systems that occur in B.C. - this will be done one at a time - they are to listen to each description to determine two things:

- 1. to be able to locate the correct illustration on the overhead that describes the system** (teacher will then write the name of the system below the illustration on the overhead)
- 2. to listen for key points that describe reasons for using the system**  
students will work along with teacher to record key pieces of information on each system on Activity Worksheet #1 and will then illustrate each system

**Option #2:**

Distribute the information sheet (TB3) to students and have them do the reading to determine if they can identify the systems on the overhead - do one at a time and then label the overhead diagrams with the appropriate name - work as a class to extract the major points from each system to record on their worksheets - illustrate each system in the space provided

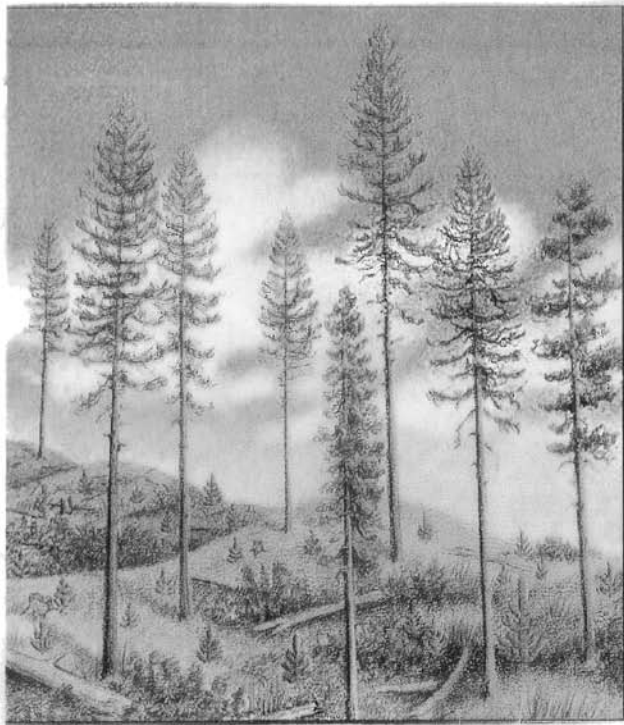




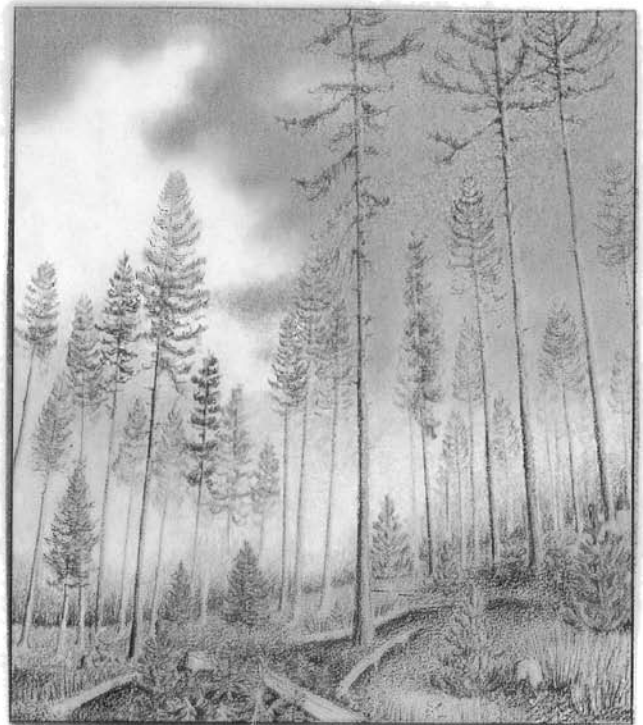




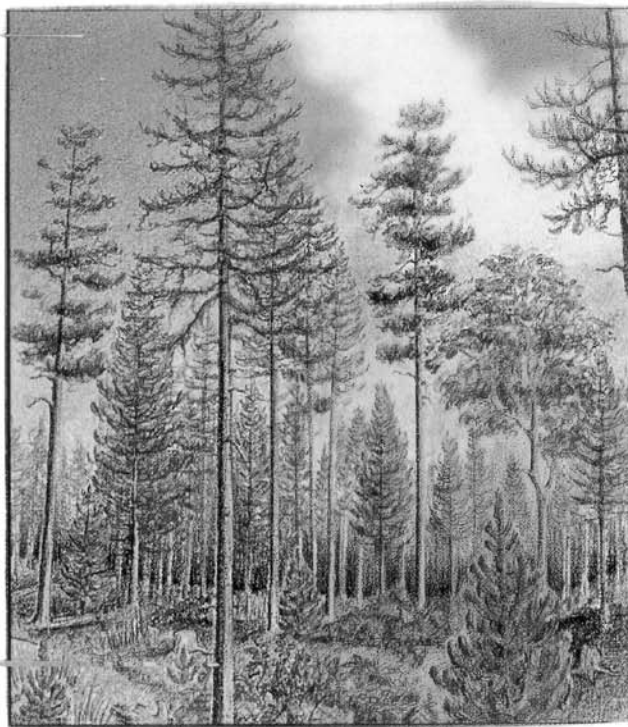
## KEY



**Seed Tree**



**Shelterwood**



**Selection**



**Clearcut**





# Silviculture Systems Activity Worksheet #1

A Silviculture system

is: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Silviculture type

Student illustration

#1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

#2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Silviculture type

Student illustration

#3 \_\_\_\_\_

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#4 \_\_\_\_\_

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# **SILVICULTURE (TB1)**

## **(Teacher Background - Part 1)**

### **THE FORESTS OF BRITISH COLUMBIA**

#### **#1. WHO OWNS AND MANAGES THE FOREST LAND IN B.C.: (as of Dec.2005)**

- the public owns the land - this is referred to as Crown Land
- 94% is publicly owned; 6% is owned privately
- B.C.'s total area is 95 million hectares
- 59 million hectares of this is covered by forests
- 33 million hectares of the 59 is set aside for parks, wilderness reserves and other classes other than forestry - this continues to expand
- the area dedicated to growing timber is 26 million hectares - just over 1/4 of the total area of B.C. - 90% of this allocation is always free of active logging - every year, less than 1% is available for harvesting
- in Canada, over 80% of seven provinces are provincially owned - in the other three provinces (Nova Scotia, Prince Edward Island and New Brunswick) less than half are owned by the province
- in B.C. our government manages the forest through the Ministry of Forests (and Range) - this ministry works in cooperation with other ministries involved in: environment, tourism, First Nations and other natural resource value groups

#### **#2. WHO IS ALLOWED TO CUT TREES AND USE THEM?**

- people who have a license agreement with the government have the right to operate on large tracts of provincially owned land
- these agreements can be made by companies or by private individuals
- the rights and responsibilities for the license holders are defined by the government
- these licenses (long, medium and short term) vary from 1 month to one year up to 25 years
- in B.C. many of the licenses last from 15-25 years and are replaceable providing all of the obligations imposed by the license are met. Some licenses are area based and some are volume based.

### **#3. WHO DETERMINES HOW MUCH TO CUT EACH YEAR AND HOW IS THIS DONE?**

- the Forest Service (MoF&R) decides this for each Timber Supply Area (TSA) and for each licensee
- the annual allowable cut (AAC) on all public forest lands and privately managed forest lands are reassessed every five years
- the Chief Forester must consider a wide range of values, uses and characteristics of the forest as well as the government's economic and social objectives
- B.C. law requires that all provincial public lands be reforested - either naturally or by replanting - companies must pay for the reforestation
- the survival rate of replanting is over 85%
- companies negotiate operating areas amongst themselves and the Ministry of Forests (volume based licenses only)

### **#4. WHAT DOES IT COST TO HARVEST TIMBER?**

- STUMPAGE: the price paid for timber harvested on Crown Land (in '95 it was 1.7 billion dollars)
- FOREST INVESTMENT ACCOUNT (FIA). - represents a portion of stumpage that is put into a special fund for projects, retraining of displaced forest workers, etc.

### **#5. HOW MUCH TIMBER CAN BE CUT EACH YEAR?**

- this is called "Cut Control"
- as an example: In any one year any amount can be cut.
- over a 5 year period, the volume harvested should balance to within +/- 10% of the AAC
- it takes 3-5 years of planning prior to approval for logging
- an exception to this would be if an area had been blown down or attacked by insect, disease or fire
- all users of Crown Lands have "a say" in forest planning and all are encouraged to provide input for balancing the interests of water, visual landscapes, wildlife, fisheries, recreation, range, timber harvesting and silviculture activities

# SILVICULTURE SYSTEMS (TB2)

## Teacher Background - Part 2

### Silviculture System:

-a cycle of activities or treatments by which a forest stand, or group of trees, is harvested, regenerated and tended over time

### These activities include:

- harvesting - removing the trees
- site preparation - preparing the harvested areas for replanting or regeneration
- reforestation - deciding on planting or regenerating naturally
- stand tending - brushing, spacing, pruning, commercial thinning, etc. - looking after the newly planted areas until they are "free growing" (about 7-10 years)

### These systems are chosen based on the following considerations:

objectives set for the type of forest stand and the surrounding landscape  
biological diversity of each area  
fish  
wildlife  
timber  
non-timber forest products - mushrooms, floral vegetation, etc.  
aesthetics - called Visual Quality Objectives  
recreation  
archaeology  
forest health - state of health in the area designated for logging  
range - farmers with range land for livestock  
water - community watersheds, fish bearing streams, etc.

**NOTE: Each system produces a different stand structure - can be set to meet a single or multiple objectives.**

**Before any system is chosen, consideration is given to accommodate:**

Vegetation	Forest Health
Soils	Terrain
Climate	Tree Species
Economics	Social issues
Water	Wildlife

**The Planning Process:**

**No harvesting can take place until a 3-5 year planning process is complete-  
this takes into account all of the stakeholders:**

Ministry of Forests (and Range)  
Other Resource Ministries  
Department of Fisheries and Oceans  
Native Bands  
Interest Groups  
Other resource users  
Public

**The Forest and Range Practices Act of British Columbia:**

**- guides regulations, standards and Ministerial Policy to deal with planning,  
forest practices and protection**

## **SILVICULTURE SYSTEMS (TB3)**

### **(Teacher Background - Part 3)**

**Selection of the correct system minimizes environmental impacts and permits a wide range of resource values (multi-use or integrated forest management)**

#### **#1. CLEARCUTTING:**

- the removal of all trees over an area of one hectare or more in a single harvest
- variations of clearcutting include: **clearcutting with reserves** (some trees left in the cutblock to provide wildlife habitat and aesthetic value): **patch cutting** - small opening less and 1 hectare in size is cut
- the size of clearcut patches has been reduced dramatically today - the large ones are usually due to an area that has bug kill or some other forest health problem (fire, disease)
- certain species are candidates for clearcutting - for example, Lodgepole Pine trees need direct sunlight for regeneration - this species does not grow very large and the root system is rather shallow, so if there is too much space left between remaining trees, they often blow down
- this type of harvesting is often done in an even-aged stand of trees (all of the trees are the same age)
- this is the simplest and most economical method
- the even-aged stand would be replanted or would regenerate naturally

#### **#2. SEED TREE:**

- small groups of trees or individual trees are left standing to provide a seed source for new growth (these would be hardy, healthy trees)
- the largest and healthiest trees are left in the cutblock to provide high quality seeds for the next generation
- the seed trees would be left until the next generation of trees is ready to be harvested - they would then be cut down or left to provide for wildlife habitat and aesthetic value
- the even-aged stand would eventually return either naturally or by reforestation

### **#3. SHELTERWOOD:**

- some mature trees are left standing to provide shelter (protection) for a new even-aged forest that will grow under them
- once the new generation of trees is ready to be harvested, these shelterwood trees may be cut down or left for biological diversity, wildlife habitat or aesthetic value
- more expensive than clearcutting

### **#4. SELECTION:**

- creates an uneven-aged stand of trees by harvesting a limited number of trees of various sizes and ages, over time
- mature and immature trees are harvested individually or in groups
- doesn't often apply to many of the province's ecosystems and tree species
- more expensive to do

### **FOR FURTHER DEVELOPMENT OR FOR INFORMATION:**

- #1. See brochure in this package entitled "Silviculture Systems in British Columbia" - this brochure outlines advantages and disadvantages of all systems and provides some additional background information**
- #2. Contact a local forest company or the Ministry of Forests and Range office and request a classroom speaker to visit and to make a presentation on Forest Management - have students prepare questions ahead of time for your guest.**



# LESSON OVERVIEW

## REFORESTATION

**Reforestation:** (A continuation of the Silviculture lesson)

**Part 1:** (Time: 10-15 minutes)

Students will indicate what they know about Reforestation in B.C. by completing the True and False questions on Activity Worksheet #1 - **column 1 only**

**Part 2:** (Time: 30 minutes)

Students will watch the Video "**A Growing Success: Reforestation in B.C.**"

Teacher will lead students into a brief discussion of some of the details from the video

**Part 3:** (Time: 20 minutes)

Students will then re-answer the True and False questions on Activity Worksheet #1 - column 2

Teacher will then discuss the results of their responses in both columns - did any students change their answers? Why?

### **Materials needed:**

Video: "**A Growing Success: Reforestation in B.C.**"/summary Reforestation (Teacher Background - the history of reforestation in B.C.)

Poster: "Four Billionth Tree - planted 1997" (optional)

Activity Worksheet #1

**Quiz** - Covers both Silviculture and Reforestation

**NOTE:** The Reforestation Video is also found on the C.L.E.M. DVD.

# LESSON PLAN

## REFORESTATION

### Procedure:

Locate the following words in your glossary. (Check them off)

brushing  
natural regeneration  
reforestation  
seedlings  
site preparation

### Part 1: (Time: 10-15 minutes)

- Students will indicate what they know about reforestation in B.C. by completing the True and False questions on Activity Worksheet #1 - **column 1 only** - collect the sheets or have students place them in desks until ready for Part 3

### Part 2: (Time: 30 minutes)

- Students will watch the video "**A Growing Success: Reforestation in B.C.**" to listen for new information - they could share at least 6 new things they learned after listening to the video

### Part 3: (Time: 20 minutes)

- Students will then review their worksheets again, and this time, will complete the True and False statements in column 2
- Following that, the teacher will lead a discussion to determine the following:
  - **How many of you changed your answers in column 2? Why?**
  - **What surprised you the most?**
  - **Tell me something new you learned about reforestation in B.C. (make a class or individual list of responses)**

## **Video Summary: A Growing Success...**

### **A Growing Success: Reforestation in BC**

Ministry of Forests, Silviculture Branch

31 Bastion Square, Victoria, BC V8W 3E7

Phone: (250) 387-1191 or Fax: (250) 387-1467

Time: 15 min.

**AUDIENCE:** Intermediate, senior/adult level

#### **SUMMARY:**

A review of current regeneration statistics and historical overview of some of the accomplishments that created today's reforestation process.

#### **INCLUDED:**

- planning – for all resource values
- monitoring process
- natural regeneration – successes and some problems
- planting – considerations
- cone collection – Tree Seed Center
- nursery process
- tree planting
- statistics on Sayward, Veddeer, West and Sue fires
- site prep
- brushing, grazing, replanting
- economics/environmental impacts



Name:\_\_\_\_\_ Date:\_\_\_\_\_

## REFORESTATION

### Activity Worksheet #1

**TRUE or FALSE** - Circle the correct answer:

**Column 1**

**Column 2**

- |   |   |   |   |   |
|---|---|---|---|---|
| 1. Reforestation in British Columbia is required by law.                                  | T | F | T | F |
| 2. When new seedlings are planted, they have to be strong enough to survive on their own. | T | F | T | F |
| 3. Reforestation has just begun in B.C.   | T | F | T | F |
| 4. Seeds for new trees come from garden centers.  | T | F | T | F |
| 5. B.C. has planted 3 billion or more seedlings.  | T | F | T | F |
| 6. Wildlife won't come back after a fire or following harvesting.                         | T | F | T | F |
| 7. B.C. grows about 100 million seedlings each year.                                      | T | F | T | F |
| 8. All harvested areas are planted by man.  | T | F | T | F |



# SILVICULTURE AND REFORESTATION

## QUIZ

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**1. Define a silviculture system:**

**2. Match the following:**

a) Selection logging

\_\_\_\_\_ the removal of all trees over  
an area in a single harvest

b) Clearcut logging

\_\_\_\_\_ small groups of trees are left  
to provide seed for new growth

c) Seed Tree

\_\_\_\_\_ a limited number of trees are  
harvested

d) Shelterwood

\_\_\_\_\_ some mature trees are left to  
provide shelter for a new forest

**3. List at least 4 things that must be considered before any  
harvesting of trees can take place:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**4. Write a short paragraph about reforestation in B.C.**





## Key

### REFORESTATION

#### Activity Worksheet #1

**TRUE or FALSE** - Circle the correct answer:

**Column 1**

**Column 2**

- |   |          |          |                 |                 |
|---|----------|----------|-----------------|-----------------|
| 1. Reforestation in British Columbia is required by law.                                  | <b>T</b> | <b>F</b> | <b><u>I</u></b> | <b>F</b>        |
| 2. When new seedlings are planted, they have to be strong enough to survive on their own. | <b>T</b> | <b>F</b> | <b>T</b>        | <b><u>F</u></b> |
| 3. Reforestation has just begun in B.C.   | <b>T</b> | <b>F</b> | <b>T</b>        | <b><u>F</u></b> |
| 4. Seeds for new trees come from garden centers.  | <b>T</b> | <b>F</b> | <b>T</b>        | <b><u>F</u></b> |
| 5. B.C. has planted 3 billion or more seedlings.  | <b>T</b> | <b>F</b> | <b><u>I</u></b> | <b>F</b>        |
| 6. Wildlife won't come back after a fire or following harvesting.                         | <b>T</b> | <b>F</b> | <b><u>T</u></b> | <b><u>F</u></b> |
| 7. B.C. grows about 100 million seedlings each year.                                      | <b>T</b> | <b>F</b> | <b>T</b>        | <b><u>F</u></b> |
| 8. All harvested areas are planted by man.  | <b>T</b> | <b>F</b> | <b>T</b>        | <b><u>F</u></b> |

## Key

# SILVICULTURE AND REFORESTATION QUIZ

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### 1. Define a silviculture system:

A process of tending, harvesting, and replacing a stand of trees to produce timber and other forest products.

### 2. Match the following:

- |                      |  |
|----------------------|--|
| a) Selection logging | _b_ the removal of all trees over an area in a single harvest      |
| b) Clearcut logging  | _c_ small groups of trees are left to provide seed for new growth  |
| c) Seed Tree         | _a_ a limited number of trees are harvested                        |
| d) Shelterwood       | _d_ some mature trees are left to provide shelter for a new forest |

### 3. List at least 4 things that must be considered before any harvesting of trees can take place:

any of the following: forest health, vegetation, soils, terrain, climate, tree species, economics, wildlife, biodiversity, fish, visual, water, range, recreation, other users

### 4. Write a short paragraph about reforestation in B.C.

# LESSON OVERVIEW

## CAREERS AND TECHNOLOGY

### Learning Outcome

- ♦ Students will observe the diverse role that technology plays in extracting a renewable resource... trees.
- ♦ Students will identify various careers in forestry and use the computer to research information on a career of their choice.
- ♦ Students will have an opportunity to further their understanding of forest management.

### Question

- ♦ What types of technology or equipment do you think are used in logging?
- ♦ Name some careers or jobs that you would see if you visited a logging site.
- ♦ Can you name some careers that are related to or support the forest industry?

### Setting the Stage (approximately three 1 hour lessons)

- ♦ Day 1 – Have students brainstorm to compile a list of logging-related careers and a list of logging equipment. Follow this activity with the DVD “CLEM” and then revisit the brainstorming lists to make additions. Tell students they will later complete a question sheet based on forestry information learned in the video.
- ♦ Day 2 – Review computer research skills to enable students to complete a research project based on a career listed in the brainstorming session or in the list provided.
- ♦ Day 3 – (Optional) Students will share their research with the class or in small groups.

### Materials Needed

- ♦ Overhead projector
- ♦ Create an overhead of the Forestry Career List
- ♦ TV/DVD player
- ♦ CLEM (DVD) - Computer Logging Education Module
- ♦ Tree Planter Picture
- ♦ Worksheets/Handouts: CLEM Worksheets  
Forestry Career Internet Activity Pages  
Website list  
Glossary list

## LESSON PLAN

### CAREERS AND TECHNOLOGY

**Procedure:** (3 class periods... 3<sup>rd</sup> session is optional)

#### Day 1

Part 1: (Time: 10 min.)

- Brainstorm: What careers do you think exist in logging? (Record on the board.)
- Brainstorm: What technology/machines are used in logging? (Record on the board.)

Part 2: (Time: 25 min.)

- Show the DVD “CLEM” - Ask the students to watch for careers (jobs) and machines shown in the video. Mention they will be adding to their brainstorming lists after they have watched the video.
- Tell the students there will be a worksheet covering the general forestry information discussed in the video.

Part 3: (Time: 10 min.)

- As a class or in small groups, use the information learned from the DVD to add to the lists of careers and machines compiled earlier.
- Ask the class if they can think of other careers that would relate to those shown in the video? Add these to the lists on the board and explain that you will return to this list at a later date.

**NOTE: Be sure to keep the list for the next lesson.**

Part 4: (Time 15 min.)

- Work in pairs to answer the worksheet provided.  
(**Note:** Part IV of the worksheet may be introduced now and completed as homework or finished as part of the “closure” section)

#### Day 2

Part 5: Review of last day and introduce the research project (Time: 20 min.)

- Mark the question sheets from last day... see answer key
- Revisit and build on the brainstorming session from last day:
  - 1) Have the students orally read the list.
  - 2) Show the picture of the planter and ask:
    - a) What job/career is shown in this picture?
    - b) What activities would have come before this picture? What jobs/careers would be involved with these activities?

(road construction, harvest planning & gaining approval, harvesting, site preparation for planting...) Add these careers to the list from last day.

- c) What activities would follow this picture? What jobs/careers would be involved with these activities? (looking after the trees until they are free growing, health of the forest until it reaches maturity, future harvest planning & approval, road building, harvesting, site prep, replanting...) Add these careers to the list from last day.

**NOTE: This discussion will help students to identify the cycle that exists within Forest Management and career choices.**

Part 6: Computer Research Activity (Time: 45 min.)

- The main intent of this activity is to give the students an opportunity to explore more about one particular forestry-related career of interest.
- Hand out the “Forestry Careers Table” and “Glossary” sheets. Note the headings and orally discuss the careers listed. (See glossary for further information.)
- As a class, quickly review the brainstorming list and discuss where each career would be placed, using the headings for the Forestry Careers Table:

1) Assessment and Planning	2) Harvesting
3) Reforestation	4) Forest Maintenance and Protection
- Handout the activity sheet... The directions and questions in the activity sheet are intended to help guide the students through the research process.
- Review basic computer research skills.
- Students will answer the questions in section #1 of the activity sheet and then use the internet to find answers to the questions in section #2. **Be sure to provide students with the list of recommended websites.**
- Students will go to the computer lab and complete the activity sheets. You may want the students to hand in their papers or take a third session to share their research.

### **Day 3 (Optional)**

Part 7: Sharing the research projects (5-30 min. depending on method of sharing)

- Students could share their research with a buddy, within a small group or with the whole class.

**Closure:** (5 - 40 min. - depending on which of the following you choose to do)

- ♦ Ask: “What was the most interesting thing you learned in this unit?” (5-10 min.)
- ♦ Art activity – complete activity mentioned in Part IV of C.L.E.M. worksheet: (30 min.)
  - design a forestry machine of the future
  - name it
  - tell what the machine can do
  - explain how it would be useful in logging.
- ♦ If you have the video “Amazing Machines”, show it to the class. As this video was produced in the mid 1990s, a class discussion comparing it to C.L.E.M. will offer an opportunity to look at how technology has changed. (40min.)



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## C.L.E.M. Worksheet

### Part I

**True or False:** (5 marks)

1. By law, forest companies must make sure that reforestation takes place after harvesting.
2. On average, 100 million seedlings are planted each year.
3. Trees reach the “free to grow stage” or “free growing stage” once they are stronger and taller than the surrounding bushes and shrubs competing against them for sunlight and nutrients.
4. Companies must write a prescription or plan that is approved by government before they can harvest trees.
5. On average, 6 trees are planted for every tree that is cut down.

### Part II

**Circle the best answer:** (4 marks)

1. A feller buncher is a \_\_\_\_\_.  
A) machine that pulls logs down the hill.  
B) machine that chips the logs.  
C) machine that cuts down one or more trees and lays them into piles.
2. A skidder is a machine that \_\_\_\_\_.  
A) picks up a bunch of trees and drags them to a landing  
B) slides down slopes.  
C) plants trees.
3. The processor in the video had an attachment that \_\_\_\_\_.  
A) puts the log onto a logging truck.  
B) picks up the tree and takes the limbs off.  
C) picks up the tree, takes the limbs off and cuts the log to length.
4. A machine that off-loads a logging truck trailer and loads logs on is a \_\_\_\_\_.  
A) tractor  
B) loader  
C) skidder

### Part III

**Fill in the blank by choosing the correct answer from this list.** (16 marks)

heat	gloves	harvester	mountain	helicopter	unacceptable
hardhat	yarder	simulator	chainsaws	safety vest	safety glasses
lumber	forwarder	steel toed boots		water buckets	

1. The cut-to-length harvesting method uses two machines. One is a \_\_\_\_\_ which reaches out with its boom and felling head to cut the tree down and then delimbs the tree and cuts the tree into shorter logs which it then lays in neat piles.
2. The other machine used in cut-to-length logging is a \_\_\_\_\_ which picks up the logs and carries them to the road to be loaded on a truck.
3. Machine operators learn how to operate the machinery by practicing on a \_\_\_\_\_ in a safe environment.
4. Hi-Lead logging is a method used on steep hills or \_\_\_\_\_ sides.
5. Hi-Lead logging does not use a feller buncher, instead hand fallers use \_\_\_\_\_ and machines called \_\_\_\_\_ which have long cables to pull or yard the cut tree down the slope.
6. All harvesting methods involve some danger therefore everyone must work safely. The slogan in the woods is “Unsafe is \_\_\_\_\_”.
7. List 5 items of clothing that workers of the forest wear for safety.
8. \_\_\_\_\_ logging is a method of logging used when it is difficult to build logging roads.
9. The logs are taken to a mill where they will be made into wood products like pulp for paper products, plywood, \_\_\_\_\_ and other wood products.
10. Helicopters with \_\_\_\_\_ are used to put out fires.
11. Lodgepole pine cones need \_\_\_\_\_ from fire before they can open and drop seeds.

#### Part IV

Invent a machine of the future that can help to make the logging process easier. Draw your invention and give a short explanation of what it will do. (Remember, the machine must have a purpose.)

**Key:****C.L.E.M. Worksheet****Part I**

1. True                      2. False (200 million)                      3. True                      4. True                      5. False (3-5)

**Part II**

1. C                      2. A                      3. C                      4. B

**Part III**

1. harvester                      2. forwarder                      3. simulator  
4. mountain                      5. chainsaws, yarder                      6. unacceptable  
7. hardhat, safety vest, steel toed boots, safety glasses, gloves  
8. helicopter                      9. lumber                      10. water bucket                      11. heat

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**Forestry Careers Activity Website List**

The websites provided below will help the students explore more about forestry related careers. Most of the information found on these websites can be accessed by following the links or using the word “forestry” or “careers” with each website search engine. Since there are various ways to access the same information on a website, teachers may wish to explore the websites ahead of time and record the directions to help make it easier for students.

- [www.khake.com](http://www.khake.com)
- [www.nextsteps.org](http://www.nextsteps.org)
- [www.jobstvnews.com](http://www.jobstvnews.com)
- [www.jobsetc.ca](http://www.jobsetc.ca)
- [www.careerccc.org/careerdirections](http://www.careerccc.org/careerdirections)
- [www.cchrei.ca/ee](http://www.cchrei.ca/ee)
- [www.for.gov.bc.ca](http://www.for.gov.bc.ca)
- [www.cofi.org](http://www.cofi.org)



## Possible Forestry Careers

Assessment & Planning	Harvesting	Reforestation	Maintenance & Protection
<ul style="list-style-type: none"> <li>- Excavator</li> <li>- Road Engineer</li> <li>- Hydrologist</li> <li>- Geologist</li> <li>- Prescription Specialist</li> <li>- Forest Technician</li> <li>- Forester</li> <li>- Forest Pathologist</li> <li>- Forest Entomologist</li> <li>- Wildlife Biologist</li> <li>- Ecologist</li> <li>- Fish Biologist</li> <li>- GIS Specialist</li> <li>- Administrators</li> </ul>	<p><u>Heavy Equip Operator</u></p> <ul style="list-style-type: none"> <li>- Feller Buncher</li> <li>- Loader Operator</li> <li>- Logging Truck Driver</li> <li>- Cut-to-length Operator</li> <li>- Forwarder Operator</li> <li>- Yarder Operator</li> <li>- Helicopter Pilot</li> </ul> <p><u>Harvesting Worker</u></p> <ul style="list-style-type: none"> <li>- Hooktender</li> <li>- Chaser</li> <li>- Faller</li> <li>- Rigger</li> <li>- Choke Setter</li> <li>- Bucker</li> <li>- Supervisor</li> </ul>	<p><u>Heavy Equip Operator</u></p> <ul style="list-style-type: none"> <li>- Excavator</li> <li>- Skidder/Bulldozer</li> </ul> <p><u>Land-based Worker</u></p> <ul style="list-style-type: none"> <li>- Tree Planter</li> <li>- Nursery Worker</li> <li>- Supervisor</li> </ul>	<ul style="list-style-type: none"> <li>- Brusher</li> <li>- Thinner</li> <li>- Spacer</li> <li>- Pruner</li> <li>- Prescription Specialist</li> <li>- Forest Technician</li> <li>- Forester</li> <li>- Forest Pathologist</li> <li>- Forest Entomologist</li> <li>- Wildlife Biologist</li> <li>- Ecologist</li> <li>- Fish Biologist</li> <li>- Firefighter</li> <li>- Supervisor</li> </ul>

## **Forestry Career Glossary for Internet Activity Sheet**

### **FOREST PROFESSIONALS:**

Professional Forester: Oversees all aspects of forest management.

Forest Technician: Works with other professionals in caring for the forest.

Forest Pathologist: Studies forest disease and how it relates to forest health.

Forest Entomologist: Studies forest insects and how they relate to forest health.

Forest Ecologist: Studies the relationships between organisms & their environment.

Hydrologist: Helps assess and protect water supplies and water quality.

GIS Specialist: Geographical Information Systems Specialists develop maps and data bases showing forest information (plants, soil, animal habitat)

### **FOREST WORKERS:**

Brusher: Removes plants competing with seedlings for light, water and nutrients (food).

Spacer/Thinner: Removes selected trees to prevent overcrowding so that the remaining trees can grow better.

Pruner: Prunes branches on the trees to improve the quality of the wood.

Choke Setter: Fastens steel cables or chains around logs that are to be dragged by machinery, such as a skidder or helicopter.

Faller: Cuts down or harvests trees using a chainsaw.

### **HARVESTING MACHINES/HARVESTING TYPES:**

Feller Buncher: Cuts down trees and lays the timber down into piles.

Forwarder: Picks up the logs and carries them to the logging road.

Harvester: Cuts the tree down, takes off the branches, measures it, then cuts the tree into logs ready for the forwarder.

Loader: Loads logs onto logging trucks for transport to the mill.

Processor: Removes the limbs, then cuts them to length after the trees are dragged to a landing.

Skidder: Drags felled timber either randomly or on skid trails to the landing.

Yarder: Transports logs to the landing site by lifting and pulling them.

High-Lead Logging: Type of logging where fallers and cables are used on steep hills and mountain sides.

## **Forestry Career Internet Activity Sheet**

### **Section #1: Answer the following questions.**

1. List one or more careers (jobs) that you found the most interesting when watching the "C.L.E.M." DVD and tell why you chose it/them.

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2. List one career that was discussed in class, but not shown on the C.L.E.M. video, that you found interesting. Explain why you think it would be interesting.

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3. From the brainstorm list, choose a forestry career that you want to learn more about.

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4. Write down everything you already know about the career you chose in #3.

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### **Section #2: Use the web-addresses provided by your teacher, to answer the following questions and learn more about your chosen career.**

5. Using the Council of Forest Industries Website ([www.cofi.org](http://www.cofi.org)) look for a college or university that offers schooling for your chosen career and then list some of the High School courses/subjects that are needed to enter the program.

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6. Describe one important safety issue that you would have to consider if you were working in your chosen job/career.

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7. Using the Google search engine, type in the name of your chosen career then explore some of the websites that are suggested. Write down the address of at least two websites that have useful information.

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8. After looking at the various websites, use the information you have learned to write a short essay telling about or describing your chosen career. (Be sure to include information that you did not already know.)

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# LESSON OVERVIEW

## FOREST HEALTH

### Learning Outcomes

- ◆ Students will learn about factors that affect the health of a renewable resource - a forest.
- ◆ Students will gain an understanding of a tree's defence mechanisms against diseases and pests.

### Question

- ◆ What types of factors affect the health of a forest? (living and non-living?)
- ◆ How can we tell if a tree is unhealthy?

### Setting the stage (approx. lesson time: 1+ hr)

- ◆ **Part I: Brainstorm & Cluster** – (allow 10 min.) Have the students brainstorm factors (living and non-living) that affect the health of a forest and discuss how you can tell if a forest is unhealthy.
- ◆ **Part II: Lesson** – (allow 50 min.) Go through the overheads and information on tree diseases and pests. Have the students fill out the forest health worksheet as you go along. Refer to the teacher background information for more details on each disease and pest.

### Materials Needed

- ◆ Lesson Overview and Lesson Plan
- ◆ Chalkboard, or overhead
- ◆ Overheads:
  - #1 – Tree Disease Chart (p. 105)
  - #2 – Needle Blights
  - #3 – Wood Decay
  - #4 – Mistletoe
  - #5 – Root Rot
  - #6 – Insect Biology
  - #7 – Defoliating Insects
  - #8 – Gall Adelgids
  - #9 – Bark Beetle Chart
  - #10 – Weevils
  - #11 – Wood Borers
- ◆ Gallery and blue stain samples (from Mountain Pine Beetle Teacher Resource Package)
- ◆ Worksheets:
  - #1 – Forest health worksheet
  - #2 – Create your own forest pest
- ◆ Forest Health Glossary Sheet
- ◆ Teacher Background Information (TB)

**Optional:** Market Outreach Package “BC’s Mountain Pine Beetle Intermediate Resource Package” (MPB package)

# LESSON PLAN

## FOREST HEALTH

### Procedure

#### Part I: Brainstorm and Cluster (as a class – allow 10 min.)

- **Review:** the forest health glossary prior to the lesson or as you go along.
- **Mention:** just as humans get sick so do forests.
- **Brainstorm:** living (biotic) and non-living (abiotic) factors that affect the health of a forest. Record their answers on the chalkboard or overhead.
- **Discuss:** some signs that a tree is unhealthy. (Possible answers: change in leaf/needle colour, broken branches, mushrooms around the base of the tree, sap running down the trunk, fungus growths on the branches/trunk, etc)

#### Part II: Lesson (as a class – allow 40+ min.)

- Have the students fill in Worksheet #1 (Forest Health) as you go through each section.
- For more details on each living factor refer to the Teacher Background (TB) section that is noted.

##### 1. Non-Living (Abiotic) Factors

- **Discuss:** how non-living (abiotic) factors affect the health of a forest.
  - Prolonged periods of hot and dry weather conditions – lack of water causes stress to the tree decreasing its ability to defend itself from disease and insect attack. Extreme drought conditions can cause trees to die.
  - Windstorms – High velocities of wind can uproot trees, causing them to die. Wind can also break branches allowing diseases to enter into the tree more readily.
  - Fire – Forest fires often kill many trees, however they allow new healthier forests to regenerate. Fire can destroy insects and disease, therefore increasing the overall health of the forest.

##### 2. Living (Biotic) Factors

###### a) Tree Diseases

- **Mention:** living (biotic) factors that affect the health of the forest are either a disease or an insect and they attack different parts of the tree.
- **Show overhead:** #1 Tree Disease Chart - discuss one column at a time.
- **Show overheads:** #2 Foliar Disease (TB1), #3 Wood Decay (TB2), #4 Mistletoe (TB3), #5 Root Disease (TB4).

###### b) General Insect Biology

- **Explain:** more living factors that affect the health of a forest are insects.
- **Show overhead:** #6 Insect Biology - review the general biology and life cycle of the insect. Distinguish between the 2 life cycles: complete and incomplete metamorphosis and mention that the insects that you are going to talk about undergo complete metamorphosis.

c) Defoliating Insects

- **Discuss:** What type of insect would affect the foliage of a tree? Mention that some insects are called defoliators (they defoliate/eat the needles and leaves of trees).
- **Discuss:** How do you think defoliating insects affect the health of the tree? Remind the students that the foliage is where photosynthesis occurs and without foliage the tree cannot make sugars to feed the tree. This can stress the tree and make it susceptible to attacks from other pests.
- **Show overhead:** #7 Defoliating Insects: (TB5)

d) Gall Adelgids [a-del-jid] (Aphid-like Insects)

- **Mention:** there are other insects that affect the foliage of the tree. They are called gall adelgids (aphid-like insects).
- **Show overhead:** #8 Gall Adelgids (TB6)

e) Bark Beetles

- **Discuss:** What type of insect would attack the inner bark of the tree? Mention how bark beetles are some of the most damaging forest pests.
- **Discuss:** the general biology of bark beetles. (TB#7)
- **Show overhead:** #9 Bark Beetle Chart

f) Weevils (snout beetles)

- **Mention:** there are other beetles that affect the health of trees.
- **Show overhead:** #10 Weevils: (TB8)

g) Wood Borers

- **Show overhead:** #11 Wood Borers: (TB9)

**Closure** (allow 10+ min.)

- Mountain Pine Beetle DVD (from Market Outreach – BC’s Mountain Pine Beetle Intermediate Resource Package).
- Journal Entry - have students write 3 new interesting things they learned from the lesson.

**Extensions**

- Worksheet #2 (Create your own Forest Pest) – 1 per student or get students to do the assignment on poster paper. (**Insect biology overhead should be displayed**)
- Guest Speaker from MOF
- Mountain Pine Beetle Lesson (from Market Outreach – BC’s Mountain Pine Beetle Intermediate Resource Package)
- General Forest Health Lesson (from [www.learnforestry.com](http://www.learnforestry.com))
- Force of Fire Binder

## Forest Health Glossary

**Abiotic factors** – Nonliving: The abiotic factors of the environment include light, temperature, wind, and dissolved nutrients.

**Biotic factors** – Having to do with life or living organisms; produced or caused by living organisms.

**Complete metamorphosis** – the type of life cycle where an insect passes through four separate stages of growth, as an egg, larva, pupa, and adult (ie. butterflies and beetles).

**Foliage** – Plant/tree leaves and needles.

**Hyphae** – Any of the threadlike filaments forming the mycelium of a fungus.

**Incomplete metamorphosis** – The type of life cycle where the immature stages of the insect, called nymphs, resemble the adult; there is no pupa stage (ie. crickets and grasshoppers).

**Lateral leader** – The branches of a tree that grow horizontally.

**Mycelium** – The vegetative part of a fungus, consisting of a mass of branching, threadlike hyphae.

**Photosynthesis** – The process in green plants/trees and certain other organisms by which sugars are made from carbon dioxide and water using sunlight as an energy source. Most forms of photosynthesis release oxygen as a by-product.

**Signs of disease** – Physical structures indicating the presence of a disease (ie. mycelium, mushrooms, conks etc.).

**Symptoms of a disease** – Changes in a tree's normal characteristics that indicate that a disease is present (ie. discolouring of needles, reduction in growth, deformed growth patterns etc.).

**Terminal leader** – the top stem of a tree that grows vertically and is responsible for increasing the tree's height.

## Teacher Background Information (TB)

### 1. Foliar Disease:

#### a) Brown Felt Blight

- ⇒ Attacks the foliage of the tree.
- ⇒ Symptoms that the tree is infected: Discolouring of needles, thinning of the foliage.
- ⇒ Signs of the disease: Dark masses of mycelium on the branches.

#### b) Douglas Fir Needle Blight

- ⇒ Attacks the foliage of the tree.
- ⇒ Symptoms that the tree is infected: Discolouring of needles, thinning of the foliage, dark spots on the needles.
- ⇒ Signs of the disease: Black fruiting bodies on the needles.

### 2. Wood Decay:

#### a) Brown Crumbly Rot

- ⇒ Attacks the tree wood.
- ⇒ Symptoms that the tree is infected: Brittle cube-like wood structure.
- ⇒ Signs of the disease: Staining of the wood, conks on the stem.

#### b) White Laminated Rot

- ⇒ Attack the tree wood.
- ⇒ Symptoms that the tree is infected: Pitted wood structure.
- ⇒ Signs of the disease: Yellow discolouration of the wood.

### 3. Mistletoe:

#### a) Douglas Fir Dwarf Mistletoe

- ⇒ Attacks branches and stems.
- ⇒ Symptoms that the tree is infected: Reduction in tree growth.
- ⇒ Signs of the disease: Large broom-like structures forming on the branches of the crown.

### 4. Root Disease:

#### a) Armillaria Root Rot

- ⇒ Attacks the root system.
- ⇒ Symptoms that the tree is infected: Discolouring of needles, thinning of the foliage, reduction in tree growth.
- ⇒ Signs of the disease: Whitish fan-like fungal mycelia between the bark and wood and mushrooms at the base of the tree.

#### b) Laminated Root Rot

- ⇒ Attacks the root system.
- ⇒ Symptoms that the tree is infected: Discolouring of needles, thinning of the foliage, reduction in tree growth.
- ⇒ Signs of the disease: Pitted wood structure, red-brown stains on fresh stumps or on cross sections of major roots.

## 5. Defoliating Insects

### a) Tussock Moth

- ⇒ This insect attacks Douglas fir.
- ⇒ The larvae are responsible for defoliating the foliage.
- ⇒ The female adult does not have wings; she emits a pheromone (scent), which attracts the male to her.
- ⇒ For more information refer to pest leaflet #9.  
**www.pfc.cfs.nrcan.gc.ca**

### b) Tent Caterpillar

- ⇒ These insects attack many deciduous trees (alder, ash, birch, cottonwood, willow, and many fruit trees).
- ⇒ The larvae are responsible for defoliating the foliage.
- ⇒ They got their name from the silk tent like nests they make in the tree.

## 6. Gall Adelgids (Aphid-like Insects)

- ⇒ The Cooley Spruce Gall Adelgid alternates between two trees: Douglas fir and spruce.
- ⇒ It causes cone-like galls or swellings on the branches of spruce trees.
- ⇒ Light infestations are common, yet not seriously damaging.
- ⇒ Small trees stressed by environmental conditions are often more heavily infested.

## 7. Bark Beetles

- ⇒ Galleries – every year female bark beetles fly to a new large, mature tree and bore into the bark of the tree and start making galleries (tunnels) under the bark (this prevents the flow of nutrients and water to the crown of the tree resulting in mortality). They then lay eggs in galleries. **(show gallery sample from Mountain Pine Beetle package)**
- ⇒ Pheromone – the female beetle emits a pheromone to attract more beetles to the tree to overcome the tree's defence mechanism (the more beetles the better the chance of overcoming the tree's defence mechanism) and to attract a mate.
- ⇒ Pitch Tubes – the tree's only defence mechanism against the beetle is to pitch them out with its sap.
- ⇒ Blue Stain – the beetles introduce a fungus into the tree, which grows into the sapwood of the tree and causes it to turn a blue colour. When growing into the sapwood the fungus prevents the tree from pitching out the beetles. **(show blue stain sample from MPB package)**
- ⇒ Current Epidemic – Beetle outbreaks are a *natural occurrence* in our forests, but right now the mountain pine beetle is out of balance in nature and is a big problem in BC. It is killing millions of hectares of trees every year. We will not win this battle, but we will learn from it... we need to react quickly (even if the attack is in a park), we need to understand the ecological process that mature and over mature pines are a target to these bark beetles.

## 8. Weevils (Snout Beetles)

- ⇒ There are 2 main species of weevils in BC:
  - Spruce Leader Weevil, *Pissodes strobi*: attack spruce
  - Lodgepole Pine Terminal Weevil, *Pissodes terminalis*: attack lodgepole pine
- ⇒ Weevils attack the terminal leader of the tree.
- ⇒ The female lays her eggs in the terminal leader.
- ⇒ The larvae mine (eat) down the terminal leader.
- ⇒ The terminal leader wilts and dies, which forces the lateral leaders to take over the vertical growth.
- ⇒ Weevils rarely kill trees but rather affect the growth of trees.
- ⇒ Defects:
  - Crease – minor defect, little or no stem curvature at the point of attack.
  - Crook – a major defect, stem curvature by at least ½ the stem diameter.
  - Fork – a major defect resulting when 2 lateral stems assuming the vertical growth of the tree.
  - Staghead – a major defect resulting from 3 or more lateral stems assuming the vertical growth of the tree.

## 9. Wood Borers

### a) Flat headed wood borers:

- ⇒ Adults are often metallic in colour.
- ⇒ Adults are attracted to dead and dying trees.
- ⇒ They lay their eggs in bark crevices.
- ⇒ Larvae have flat heads.
- ⇒ Larvae make galleries under the bark and into the wood.
- ⇒ Larval galleries in the wood are oval and they enter the wood at an angle.
- ⇒ The holes that are made in the wood by the larvae decrease the wood value.

### b) Long horned wood borers:

- ⇒ Adults have antennae that are half as long as their body or longer.
- ⇒ Adults are attracted to dead and dying trees.
- ⇒ They lay their eggs in bark crevices.
- ⇒ Larvae do not have flat heads.
- ⇒ Larvae make galleries under the bark and into the wood.
- ⇒ Larval galleries in the wood are circular and they enter the wood straight on.
- ⇒ The holes that are made in the wood by the larvae decrease the wood value.

**NOTE: For Additional Information on these diseases/pests and a variety of others please visit: <http://www.pfc.cfs.nrcan.gc.ca> - click on the bookstore website, type 'pest leaflet' in 'series and volume' categories. All available leaflets will be listed.**





## Tree Diseases

	<b>Foliar Disease</b>	<b>Wood Decay</b>	<b>Mistletoe</b>	<b>Root Disease</b>
<b>Location on the tree</b>	Needles/leaves	Wood inside the main stem	Branches	Roots
<b>Signs of the disease</b>	The presence of spots, discolouring, shrivelling or the dropping of the foliage	The presence of conks on the main stem	Swelling of the branches and growth of mistletoe shoots, broom-like structures in the crown	Yellowing and/or thinning of the foliage, gradual reduction in annual vertical growth
<b>Damage</b>	Reduced growth if foliage is lost over many years.	Breaks down the components of wood tissue and absorbs the resulting nutrients	Drain nutrients and water from the tree causing a decrease in growth and making it susceptible to attack by other pests.	Kills young trees quicker than older trees, blow down due to weakened roots
<b>Examples</b>	- Needle blights - Needle casts	- Brown rots - White rots	- Dwarf Mistletoe species that attack Douglas fir, Larch, Lodgepole pine and Hemlock	- Armillaria root disease - Laminated root rot

# Needle Blights

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**Brown Felt Blight** - Brown felt-like masses of mycelium covering the needles and branches



**Spruce**



**Subalpine fir**

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## Douglas Fir Needle Blight



**Dark fruiting bodies of the fungus on a Douglas fir needle.**



**Red-brown spots on infected Douglas fir needles.**

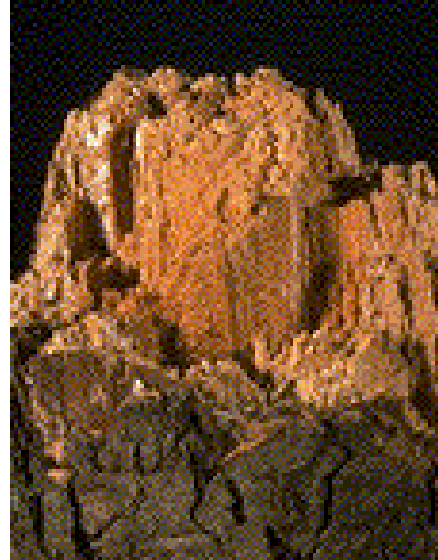
# Wood Decay

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## Brown Crumbly Rot



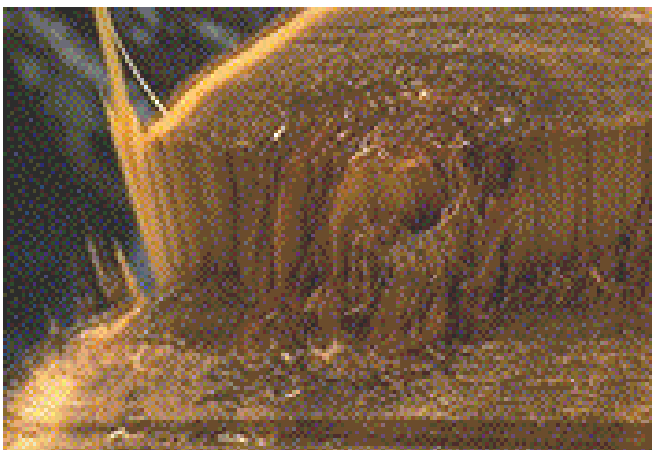
**Conk (fruiting body) of  
Brown Crumbly Rot**



**Brittle cube-like  
wood structure**

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## White Laminated Rot



**Laminate decay in western  
redcedar**



**Pitted wood structure  
common to many white rots**

# Mistletoe

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## Douglas Fir Dwarf Mistletoe



**Broom symptoms of  
Douglas fir mistletoe**



**Broom symptoms of  
Douglas fir mistletoe**

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## Other Dwarf Mistletoes – broom symptoms



**Lodgepole pine  
dwarf mistletoe**



**Larch dwarf mistletoe**



**Hemlock dwarf mistletoe**

# Root Rot

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## Armillaria Root Disease



**Whitish fan-like mycelia  
beneath the bark of a root**



**Mushrooms (fruiting bodies) of  
Armillaria growing at the base  
of an infected tree**

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## Laminated Root Rot



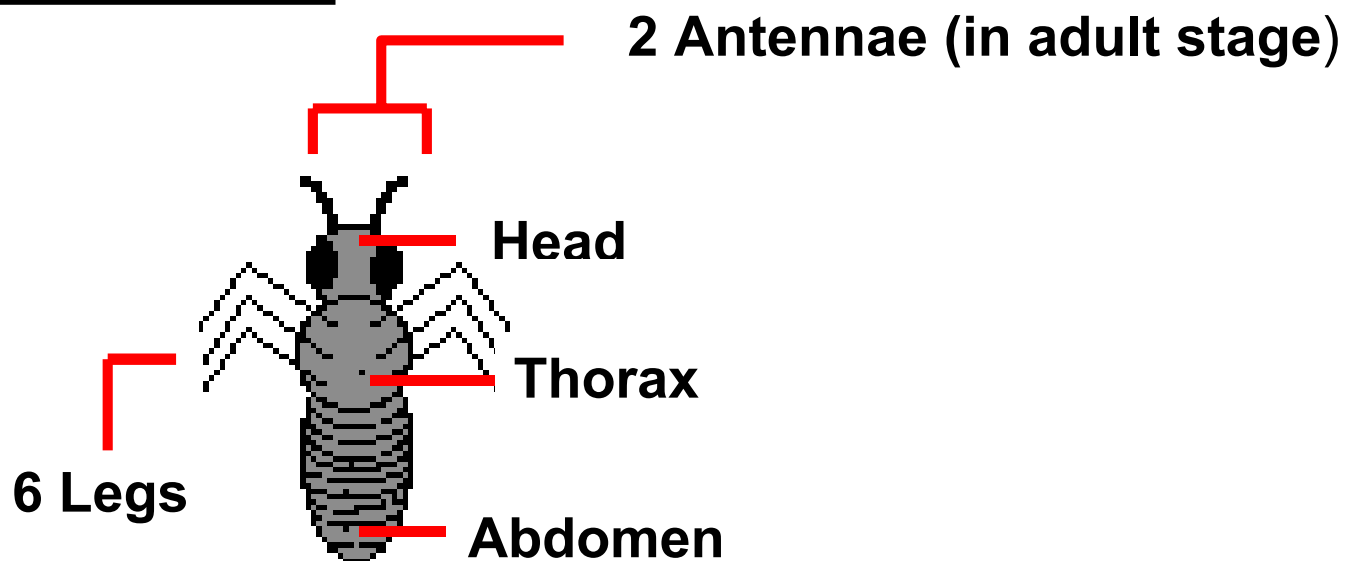
**Red-brown stains  
on fresh stumps**



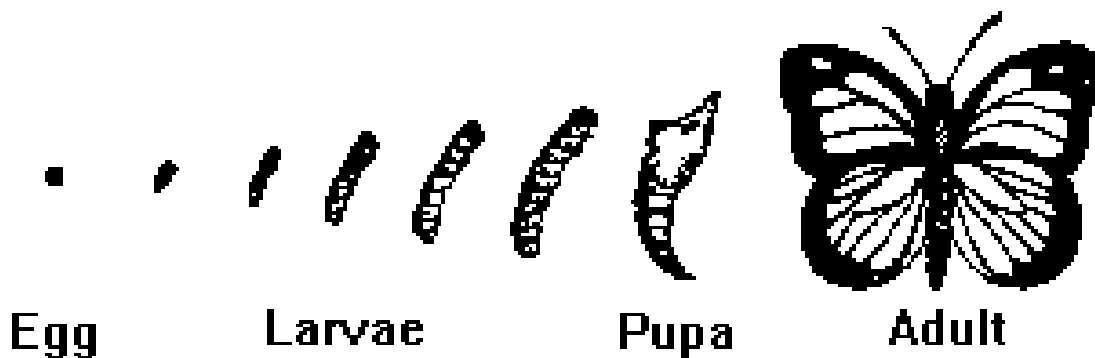
**Stem breakage on infected  
Western redcedar**

# INSECT BIOLOGY

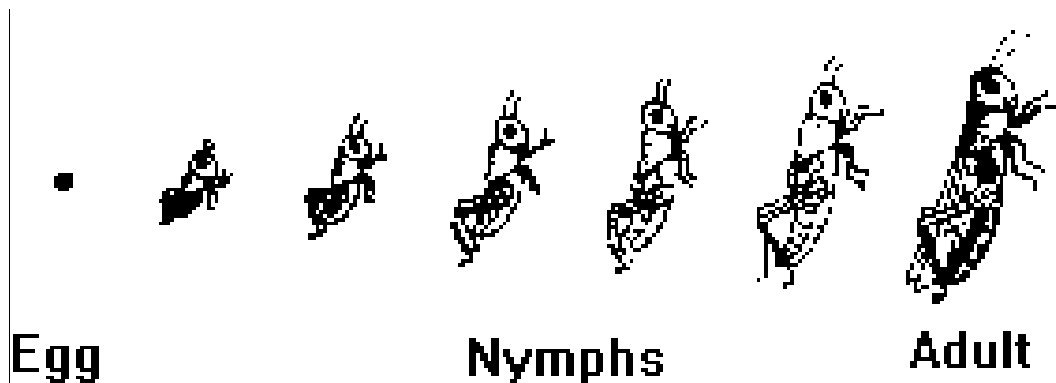
## Insect Parts



## Complete Metamorphosis



## Incomplete Metamorphosis





# Defoliating Insects

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## Douglas Fir Tussock Moth



Larva



Male Adult



Female Adult

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## Tent Caterpillar



Larva

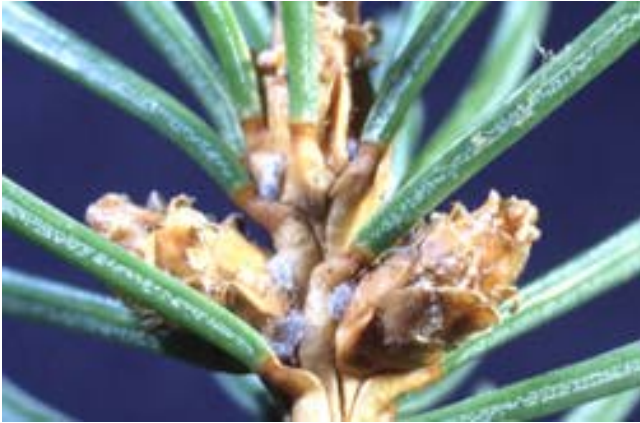


Adult

# Gall Adelgids

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## Cooley Spruce Gall Adelgid



**Cooley Spruce Gall Adelgids on Douglas fir**





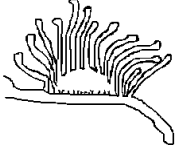
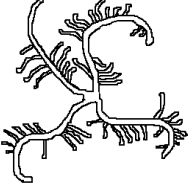




**Cone-like gall on Spruce tree**



**Cross section of a gall showing the developing insects**



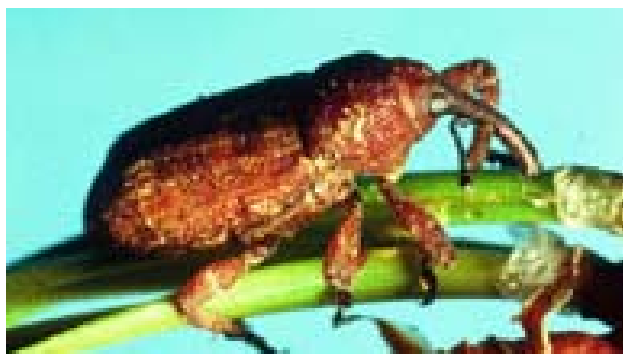
## Bark Beetles

Common Name	Mountain Pine Beetle	Douglas Fir Beetle	Spruce Beetle	Balsam Bark Beetle
Scientific Name	<i>Dendroctonus ponderosae</i>	<i>Dendroctonus pseudotsugae</i>	<i>Dendroctonus rufipennis</i>	<i>Dryocoetes confusus</i>
Preferred Host Species	Most pine	Douglas fir	All spruce	Subalpine fir
State of Host	Living trees only	Living trees or windfall/slash	Living trees or windfall/slash	Living/stressed or windfall
Galleries				
Adult Picture				

# Weevils

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## Lodgepole Terminal Weevil



**Adult Weevil**

Photographer: Ron Long, SFU



**Damage to the terminal leader of a small pine tree**

Photographer: Jerald E. Dewey, USDA Forest Service

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## Spruce Leader Weevil



**Adult Weevil**



**Damage to the terminal leader of a spruce tree**

# Wood Borers

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## Flat-Headed Wood Borers



**Adult flat-headed wood borer**



**Larvae with flat heads**

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## Long-Horned Wood Borers



**Adult long-horned wood borer**



**Larvae with round heads**



# Forest Health Worksheet #1

## Non-Living (Abiotic) Factors

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

## Living (Biotic) Factors

### a) Tree Diseases

Disease Name	Type of Disease	What Part of the Tree it Attacks	Symptoms that the Tree is Infected	Signs of the Disease
Brown felt blight	Foliar Disease			Dark masses of mycelium on the branches
Brown crumbly rot	Wood Decay		Brittle cube-like wood structure	
Douglas fir dwarf mistletoe	Mistletoe			Large broom-like structures forming on the branches of the crown
Armillaria root rot	Root Disease		d. Discolouring of needles e. Thinning of the needles f. Reduction in tree growth	

b) Defoliating Insects

Insect Name	Host Species	Interesting Fact(s)

c) Bark Beetles

Common Name				
Host Species				
Gallery Sketch				

d) Gall Adelgids - Cooley Spruce Gall Adelgid

g. Host Species: \_\_\_\_\_

h. Signs of Infestation: \_\_\_\_\_

e) Weevils

i. 2 Main Species in BC: \_\_\_\_\_

j. Location of Attack: \_\_\_\_\_

k. Damage: \_\_\_\_\_

f) Wood Borers

l. 2 Types: \_\_\_\_\_

m. Damage: \_\_\_\_\_

## Key

# Forest Health Worksheet

### Non-Living (Abiotic) Factors

- Hot and dry weather conditions
- Windstorms
- Fire

### Living (Biotic) Factors



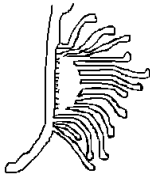
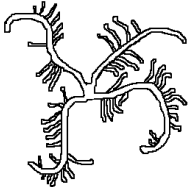
#### a) Tree Diseases

Disease Name	Type of Disease	What Part of the Tree it Attacks	Symptoms that the Tree is Infected	Signs of the Disease
Brown felt blight	Foliar Disease	Foliage	<ul style="list-style-type: none"><li>• Discolouring of needles</li><li>• Thinning of the needles</li></ul>	<ul style="list-style-type: none"><li>• Dark masses of mycelium on the branches</li></ul>
Brown crumbly rot	Wood Decay	Tree Wood	<ul style="list-style-type: none"><li>• Brittle cube-like wood structure</li></ul>	<ul style="list-style-type: none"><li>• Staining of the wood</li><li>• Conks on the stem</li></ul>
Douglas fir dwarf mistletoe	Mistletoe	Branches /Stems	<ul style="list-style-type: none"><li>• Reduction in tree growth</li></ul>	<ul style="list-style-type: none"><li>• Large broom-like structures forming on the branches of the crown</li></ul>
Armillaria root rot	Root Disease	Roots	<ul style="list-style-type: none"><li>• Discolouring of needles</li><li>• Thinning of the needles</li><li>• Reduction in tree growth</li></ul>	<ul style="list-style-type: none"><li>• Whitish fan-like fungus between the bark and wood</li><li>• Mushrooms at the base of the tree</li></ul>

b) Defoliating Insects

Insect Name	Host Species	Interesting Fact(s)
Tussock Moth	Douglas fir	Female has no wings, emits a pheromone to attract a male: larvae eat the needles
Tent Caterpillar	Alder, ash, birch, cottonwood, willow, and many fruit trees	Larvae eat the leaves, name comes from the silk tent the larvae make

c) Bark Beetles

Common Name	Mountain Pine Beetle	Douglas Fir Beetle	Spruce Beetle	Balsam Bark Beetle
Preferred Host Species	Most pine	Douglas fir	All spruce	Subalpine fir
Gallery Sketch				

d) Gall Adelgids - Cooley Spruce Gall Adelgid

- Host Species: Alternate between Douglas fir and Spruce.
- Signs of Infestation: cone-like galls on the branches of spruce trees.

e) Weevils

- 2 Main Species in BC: Spruce Leader Weevil and Lodgepole Pine Terminal Weevil.
- Location of Attack: Terminal Leader.
- Damage: Causes deformities in the growth (Crease, Crook, Fork, Staghead).

f) Wood Borers

- 2 types: Flat headed and long horned.
- Damage: Larvae make holes in the wood, which decreases the value.



# Worksheet #1

## CREATE YOUR OWN FOREST PEST

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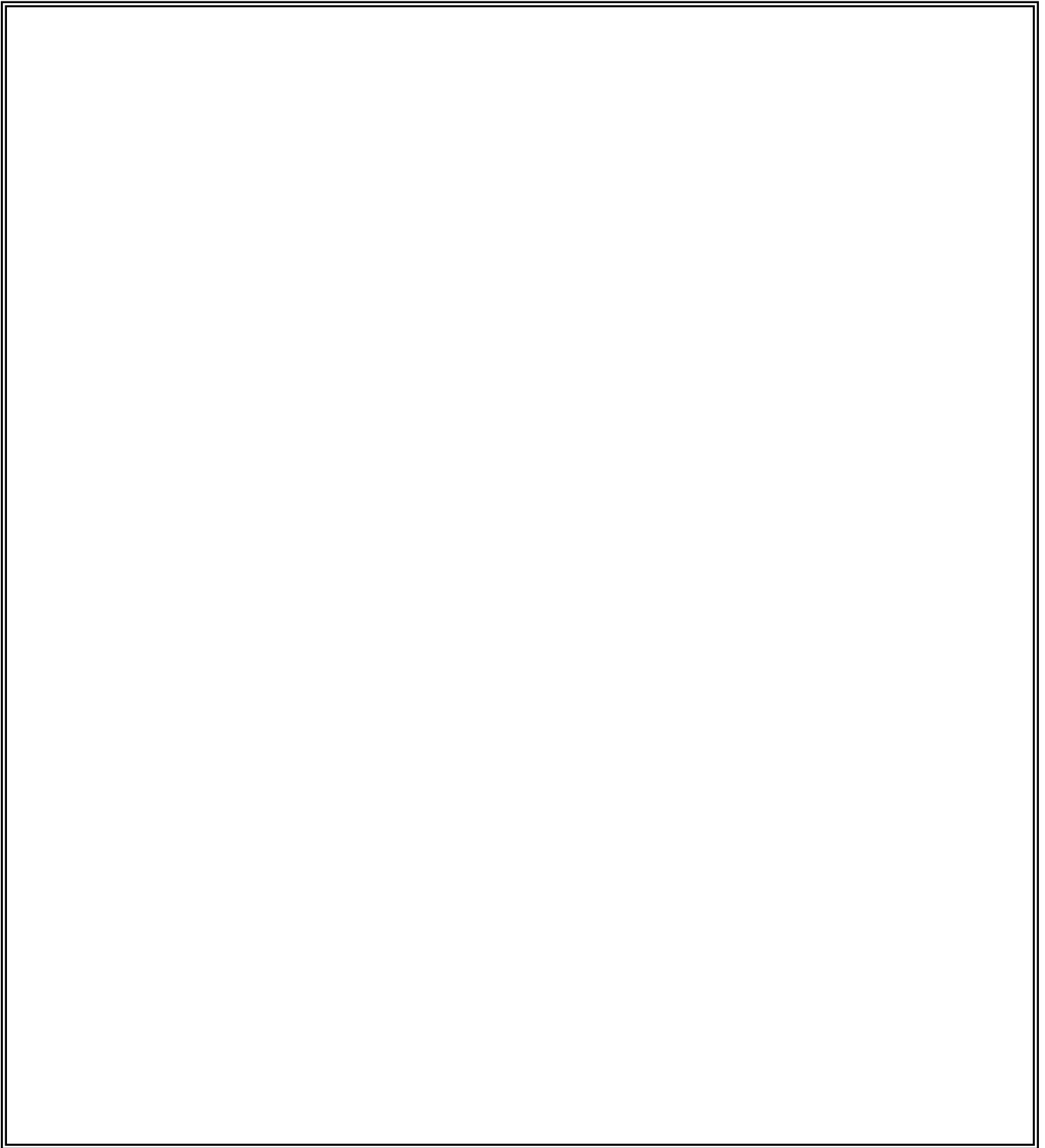
### Things to Include:

- ☐ Name your insect
  - ☐ Pick a type of life cycle (complete or incomplete lifecycle)
  - ☐ Draw the life cycle showing pictures of all stages
  - ☐ Draw the host tree (Include tree name)
  - ☐ Write a short paragraph telling what your insect does to the host.  
Be sure to include the host's defence mechanisms, and any interesting facts about your insect (ie. differences between male in female adult)
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Pest Name: \_\_\_\_\_

Life Cycle: \_\_\_\_\_

Host Tree: \_\_\_\_\_



[illegible]

## Support Materials

- ◆ This kit is also available on our website: **[www.learnforestry.com](http://www.learnforestry.com)** . Should any updates or changes occur prior to the next workshop, they will be posted on this site.
- ◆ Tree Tales: This is an interactive Forest Science computer program with teacher's guide and CD Rom. It is recommended for grades 4-7. To order a copy, contact **[wild@gems5.gov.bc.ca](mailto:wild@gems5.gov.bc.ca)** or call 250-356-7111. (compatible with "mac" computers)
- ◆ Tree Books: You may order Tree Books from **[wild@gems5.gov.bc.ca](mailto:wild@gems5.gov.bc.ca)**
- ◆ Language Arts Connections:
- ◆ An excellent poetry book that describes trees and is beautifully illustrated is "Canadian Trees" by Colleayn O. Mastin. Illustrated by Jan Sovak. ISBN 1-895910-20-X.
- ◆ "A Special Gift" is a primary book that we recommend for buddy reading. Contact **[wild@gems5.gov.bc.ca](mailto:wild@gems5.gov.bc.ca)** to order or try your local Ministry of Forests office.
- ◆ A book bibliography, appropriate to intermediate students, is available on our website at **[www.learnforestry.com](http://www.learnforestry.com)**. (click on resources and scroll down)
- ◆ Pest Leaflets can be found on the Ministry of Forests website at: **[www.pfc.cfs.nrcan.gc.ca](http://www.pfc.cfs.nrcan.gc.ca)**