

Unit B: Tree Growth and Development

Lesson 3: Identifying Diseases and Pests of Forest Trees

Student Learning Objectives: Instruction in this lesson should result in students achieving the following objectives:

1. Describe the major categories of insect pests of forest trees.
2. Describe the major categories of disease problems of forest trees.
3. Describe management techniques for controlling insect and disease pests in forest trees.

Recommended Teaching Time: 1 hour

Recommended Resources: The following resources may be useful in teaching this lesson:

- A PowerPoint has also been developed with use of this lesson plan
- <http://www.ipm.ucdavis.edu/PMG/r605300111.html>
- http://www.rootsofpeace.org/documents/Afghan_Almond_Nursery_Manual-UC_Davis-May_2009.pdf
- http://forestry.about.com/od/foresthealth/a/tree_pest_index.htm

List of Equipment, Tools, Supplies, and Facilities

Writing surface

PowerPoint Projector

PowerPoint slides

Transparency Masters

Insect specimens

Disease damaged trees

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide #2):

- Bark borers
- Biological controls
- Chemical controls
- Defoliators
- Management controls
- Parasite
- Pathogen
- Root feeders
- Sap suckers
- Tip feeders
- Wood borers

Interest Approach: Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Collect specimens of insect and disease damage on trees to show the students. Allow the students to observe the damage. Ask the students how these pests cause damage to trees. Refer to information presented in earlier lessons such as how nutrients are transported through the tree. Relate that information to how insect damage can slow down the transport of this material. Lead discussion to first objective of the lesson.

Summary of Content and Teaching Strategies

Objective 1: Describe the major categories of insect pests of forest trees.

(PowerPoint Slide #3)

I. One of, if not the most deadly, pests of forest trees are insects. Some insects are pests to all kinds of trees, while others only affect certain species. Insects can cause damage to trees in a variety of ways.

(PowerPoint Slide #4)

A. Bark borers—As the name suggests, **bark borers** are insects that attack trees by tunneling underneath the bark. The soft cambium and newly produced wood and bark cells are destroyed. This effectively girdles the tree cutting off the supply of nutrients.

(PowerPoint Slide #5)

In addition, the damage caused by bark borers often provides an entry point for diseases and other pests to attack the tree. One of the most common insects of this type is the Pine Bark Beetle.

(PowerPoint Slide #6 shows an example of the pine bark beetle.)

(PowerPoint Slide #7)

B. **Defoliators**—This type of insect causes damage to the tree by feeding on the leaves, needles or fruit of the plant. In most cases, insect larvae, instead of the adults, do damage. Gypsy moth, Oriental fruit moth, and Navel orange worm are examples.

(PowerPoint Slide #8 shows examples of these pests.)

(PowerPoint Slide #9)

C. **Wood borers**—Insects in this category eat their way through the sapwood and heartwood of the tree. This damage causes the wood to weaken. The most well known insect in this category is the termite.

(PowerPoint Slide #10 shows some more examples of wood borers.)

(PowerPoint Slide #11)

D. Tip feeders—Insects that attack young twigs, stems, or buds are known as **tip feeders**. These insects attack the most tender parts of the tree.

(PowerPoint Slide #12)

E. **Sap suckers**—These insects are equipped with penetrating mouthparts that allow them to feed on tree sap. These insects rarely cause the tree to die, however, trees are weakened and growth is slowed. Common examples of sap suckers are aphids and scales.

(PowerPoint Slide #13)

F. Root feeders—**Root feeders** are insects in the soil around the tree that feed on the tree's roots. These insects cause the most damage to tree seedlings. Examples of this category are white grubs and wireworms.

****If available find an example of a pest that falls under each one of the categories from your area. Bring them the actual pest in and/or the damage they have caused. Have them students figure out which category they fall under. If you are unable to locate some of these pests, pictures would work too.**

Objective 2: Describe the major categories of disease problems of forest trees.

(PowerPoint Slide #14)

II. Diseases are most often caused by parasites. A **parasite** is an organism that relies on other organism for their food. These parasite organisms can be classified into five major categories: fungi, bacteria, nematodes, viruses, and mistletoes.

(PowerPoint Slide #15)

A. Of the five major categories of parasite organisms listed above, fungi are the cause of the most important diseases that affect forest trees. Whereas, fungi reproduce and spread by tiny spores, they can multiply very quickly.

(PowerPoint Slide #16)

Fungus diseases can attack any part of the tree Afghan Pine is susceptible to the disease called Diplodia pinea.

(PowerPoint Slide #17)

Stem diseases are generally considered the most dangerous as far as causing death to the tree.

(PowerPoint Slide #18)

Leaf and root diseases generally do not kill the tree, just weaken the plant and slow down its growth. Examples of a stem diseases are Dutch elm disease, chestnut blight, fusiform rust, heart rot, Brown rot, and Shot hole.

****PowerPoint Slide #19 shows example of fungal diseases. If possible, bring in samples of the tree diseases and try to have the class identify them.**

Objective 3: Describe management techniques for controlling insect and disease pests in forest trees.

(PowerPoint Slide #20)

III. The key to a healthy forest is good forest management. In the controlling of insect and disease pests, there are several alternatives a forest manager has to choose from.

(PowerPoint Slide #21)

A. In controlling the negative effects of insects on forest trees, there are three basic types of controls. They are:

(PowerPoint Slide #22)

1. Biological controls—Natural controls for most insect pest exist in nature. However, these natural controls are slow. Whenever foresters alter these natural controls to manage insect pests, they become **biological controls**.

(PowerPoint Slide #23)

Every insect has a natural enemy. An example of a biological control would be the introduction of a new predator of an insect pest into the infected area. Another example is the introduction of a pathogen. A **pathogen** is any disease-causing organism. The pathogen that attacks the specific insect pest may be available and can be introduced into the insect population.

(PowerPoint Slide #24)

2. **Management controls**—These controls consist of various management practices that the forester can employ. These would include the removal of infested trees and tree parts, the use of insect resistant tree varieties, maintaining proper tree populations, and prescribed burns.

(PowerPoint Slide #25)

3. **Chemical controls**—The use of pesticides on forest trees is regulated by the National Environmental Protection Agency (NEPA). Pesticides offer a quick and effective short-term solution to insect pests; however, often other control measures need to be used for long-term forest management.

(PowerPoint Slide #26)

- B. The most effective control of forest disease is good management by the forester. Many kinds of diseases can be prevented from entering a forest by dusting the stumps of cut trees with borax or creosote.

(PowerPoint Slide #27)

By removing damaged trees from the forest, the likelihood of disease infestation is reduced. In most cases, once a tree becomes diseased, little can be done. Therefore, prevention is the answer to a healthy forest.

****Have students share any personal experiences they have with pests and diseases How were they controlled? You could also create a list of specific controls that are preformed in your area and have the students tell you if they are biological, management, or chemical controls.**

Review/Summary: Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions on PowerPoint Slide # 28 can also be used as a review.

Application: Students will be able to identify pests and diseases from their area.

Evaluation: Use the following sample test to evaluate the students' comprehension of the material covered in this lesson.

Answers to Sample Test:

Part One: Matching

1. c
2. b
3. d
4. a
5. f
6. e

Part Two: Completion

1. parasites
2. sap suckers
3. Stem
4. good forest management

Part Three: Short Answer

1. See Objective 2 in this lesson.
2. Fungi, bacteria, nematodes, viruses, and mistletoes

Sample Test

Name _____

Test

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Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | | |
|----------------|----------------|-----------------|
| a. Bark borers | c. Pathogen | e. Wood borers |
| b. Parasite | d. Defoliators | f. Root feeders |
- _____ 1. Any disease-causing organism.
_____ 2. An organism that relies on another organism for their food.
_____ 3. This type of insect causes damage to the tree by feeding on the leaves or needles of the plant.
_____ 4. Insects that attack trees by tunneling underneath the bark
_____ 5. Insects in the soil around the tree that feed on the tree's roots.
_____ 6. Insects in this category eat their way through the sapwood and heartwood of the tree.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. Diseases are most often caused by _____.
2. Common examples of _____ are aphids and scales.
3. _____ diseases are generally considered the most dangerous as far as causing death to the tree.
4. The key to a healthy forest is _____.

Part Three: Short Answer

Instructions. Provide information to answer the following questions.

1. Explain the various controls a forester can use to manage insects in forest trees.

2. List the five major categories of disease causing organisms.