

# NATIONAL FOREST WEEK 2005

## FOREST HEALTH

### KIT CONTENTS:

1. Lesson Plan (7 pages)
2. Overheads:
  - #1 – Armillaria Root Rot
  - #2 – White Pine Blister Rust
  - #3 – Insect Body Parts and Life Cycle
  - #4a – Defoliators
  - #4b – Defoliator Table
  - #5 – Pitch Tubes and Red Attack
  - #6a – Bark Beetles
  - #6b – Bark Beetle Table
  - #7 – Fire Triangle
3. Samples:
  - Beetles
  - Bark with galleries
  - Blue-stained wood
4. Website for additional information: [www.beetleinfo.com](http://www.beetleinfo.com)
5. Handouts to leave with the teacher: refer to the end of the lesson plan

### CURRICULAR CONNECTIONS:

K/1 Life Science

- Plant and animal life cycles

Grade 2/3 Life Science

- Animals in the environment.
- The balance among organisms and their environment.

Grade 4 Life Science

- Adaptations of organisms.
- Environmental changes that affect animal behavior

Grade 5 Life Science

- The study of living resources.
- Sustaining a living resource.

Grade 6 Life Science

- Classification of organisms.

Grade 7 Life Science

- The study of ecosystems.
- The study of stages of recovery of a damaged ecosystem.

- Each living thing has some effect on all other living things in a community.

**LESSON PLAN:**

**PART I – 5 MIN.**

**Introduction:**

- Ask: Raise your hand if you think a tree can get sick?
- What kinds of things do you think can weaken a tree or make it sick? (take 4-5 answers)
- Explain: Bugs, diseases, fire, wind/weather can all affect the health of the forest. Wind can put stress on a tree causing it to bend or break. Very hot, dry weather for a long period can mean that a tree won't get enough water. Just like you, trees need water to live.
- Ask: Raise your hand if you have ever had a cold? What were the symptoms of your cold.... how did you know you had a cold? (2-3 answers)
- Explain: Trees can get diseases too. Some symptoms of a sick tree are:
  1. the needles or leaves may change color
  2. it may not grow as fast as when it was healthy
  3. lots of sap may run down the trunk
  4. a large number of mushrooms may grow around the base of the tree
  5. fungus or some other growth may grow on the tree

**PART II – 5MIN.**

**Diseases:**

**Show Overhead #1: Armillaria Root Rot**

- Ask: What do you see around the base of the tree? (lots of mushrooms). What do think this means?
- Answer: Lots of mushrooms, might mean that this tree is very sick.
- Look under the bark of the tree. You can see the fungus growing; there is a fan shape to the white markings.
- Armillaria Root Rot will kill the tree by attacking its root system. With a weakened root system the tree cannot efficiently absorb water from the soil and is at risk of being blown over by the wind.

**Show Overhead #2 White Pine Blister Rust**

- Ask: Do you see anything wrong with this tree? Point at one tree at a time
- Answer: The first picture (top left) is showing the fungus spores infecting the main stem/trunk of the tree (the smaller picture to the right is a magnified picture of the spores). The second picture (bottom right) shows what happens to the tree after the spores are released – a canker forms and resinosis (sap running down the tree) can happen - the tree will die if the blister rust reaches the tree trunk.

### **PART III – 10 MIN.**

#### **Defoliators:**

##### **GENERAL OVERVIEW**

- Ask: Does anyone know what a “defoliator” does? (take 2-3 answers)
- Answer: Defoliators eat or remove the leaves or needles from trees
- Ask: Why do you think removing the leaves or needles from a tree is bad? (take 2-3 answers)
- Answer: The leaves or needles are where “photosynthesis” happens, that is where the leaves/needles absorb sunlight and convert it into sugars to feed the tree. If a defoliator eats too many needles or leaves the tree can become very weak (just like if you had no food) and could possibly die.
- Now we are going to talk about some different insects that defoliate/eat the leaves or needles from some trees.

##### **Show Overhead #3: Insect Body Parts Overhead (cover life cycle)**

- Explain: An insect is anything that has a head, a thorax (neck), an abdomen (stomach), 2 antennae and 6 legs – in the adult stage.

##### **Show Overhead #3: “the general life cycle of an insect”**

- Explain: “Complete Metamorphosis” – means that the insect has to completely change to become an adult {like a butterfly going from an egg to a larva (caterpillar), to a pupa (cocoon), and then to an adult}. The insects that we are going to talk about today have this type of life cycle.

#### **PRIMARY:**

##### **Show Overhead #4a Defoliators (show one insect at a time by covering the other insects with a piece of paper)**

###### Douglas Fir Tussock Moth (larva and adult)

- Larva – Mention: that the larva has big tufts of hair on its back.
- Moth – Explain: top picture is the female, bottom picture is the male
- Ask: What is different between the male and female moth? (take 2-3 answers)
- Answer: The female has no wings so she cannot fly.
- Explain: The female gives off a pheromone, which is like a perfume. The male then uses his plumose antennae (plumose meaning feather-like) to smell the female’s pheromone/perfume and flies to her to mate.

###### Western Hemlock Looper (larva and adult)

- Larva – Ask: How is this larva different from the Tussock larva? (take 2-3 answers) Explain: It does not have any hair and it is like an “inchworm” (using your finger show how it moves – the front stretches out then the back end catches up).
- Moth – This moth can be recognized by the fine lines that zigzag across its wings (point to lines on wings)

Western Spruce Budworm (larva and adult)

- Larva – Mention: This larva is also quite different. It has no hair but it has little spots on its back, which help to identify it.
- Moth – Mention: This moth has different colouring than the other moths, which helps to identify it.
- Comment: Remember that the life cycle of all of these defoliating insects goes from an egg to a larva to a pupa and then to a moth. And the larva stage is the stage of the insect that is responsible for defoliating/eating the needles or leaves of the tree.

**Conclusion:**

- Mention: As you can see different trees can have one or more insects that attack it. These defoliators can damage a tree by removing the leaves/needles, which is the tree's food supply, but they will not always kill the tree.

**INTERMEDIATE:**

**Show Overhead #4b – Defoliator Table (show one column at a time)**

Tussock Moth column

- Read out the information in each row.
- Under adult moth description Ask: Does anyone know the difference between filamentous and plumose antennae? (take 1-2 answers)
- Answer: Filamentous means filament or string-like and plumose means feather-like.
- Ask: What is the difference between the male and female moth (point to the picture)? (take 2-3 answers)
- Answer: The female has no wings so she cannot fly.
- Explain: The female gives off a pheromone, which is like a perfume. The male then uses his plumose antennae (feather-like) to smell the female's pheromone/perfume and flies to her to mate.

Hemlock Looper column

- Read out the information in each row.
- Mention: The larva is like an "inch-worm" (using your finger show how it moves – the front stretches out then the back end catches up).

Budworm Column

- Read out the information in each row.
- Note: The Budworm attacks Douglas fir and not Spruce – the reason for this is the Budworm was first discovered in Eastern Canada attacking spruce so they named it Eastern Spruce Budworm. Then years later the budworm was discovered in Western Canada so they just assumed it attacked spruce so they named it Western Spruce Budworm. Once they discovered that this budworm actually attacked Douglas fir it was too late to change its name. (Normally insects are named after the tree they attack).

**Conclusion:**

- *Mention:* As you can see different trees can have one or more insects that attack it. These defoliators can damage a tree by removing the leaves/needles, which is the tree's food supply, but they will not always kill the tree.

**PART IV – 10 MIN.**

**Bark Beetles:**

**GENERAL OVERVIEW**

- Hold up a sample of bark beetles or put a few on the overhead.
- *Ask:* Does anyone know what these are? (take 2-3 answers)
- *Ask:* What do they do? (take 2-3 answers)
- *Answer:* These bark beetles attack a tree by “boring” into the tree and then making galleries to lay their eggs.

**Show bark sample**

- *Explain:* These are the beetle's galleries or tunnels that they make which cuts off the food and water supply (that is living tissue that transports sugars from the leaves to the roots and water from the roots to the leaves) to the tree which ultimately kills the tree. (just like you need food and water to live so do trees)
- *Ask:* There are some trees that can survive a beetle attack. How do you think they fight off the beetles? (take 2- 3 answers)
- *Answer:* The tree increases its chances of survival by using its sap to pitch out or push the beetles out like in this picture (refer to overhead #5). The tree may still not win.

**Show Overhead #5: Pitch Tubes (cover picture of red attack)**

**Show blue stained wood sample**

- *Ask:* What do you think caused this wood to be blue? (take 2 –3 answers)
- *Answer:* The beetles *bring* a fungus into the tree, which grows into the wood of the tree and stains it a blue colour. This does not affect the strength of the wood but certain markets like Japan required no blue stain on any wood products that they buy from Canada.
- *This fungus serves 2 purposes:* it helps to plug up the tree's sap, which helps the beetle from being pitched/pushed out of the tree, and it is a food source for the new larvae (babies) that hatch.

**PRIMARY:**

**Show Overhead #6a: Bark Beetles**

- *Explain:* All 3 of these beetles look very similar. They are about the size of a grain of rice.
- *Ask:* How could we determine which beetle is which if we did not have a microscope to see the beetles up close? (take 2-3 answers)

- *Answer:* Each beetle makes a different patterned gallery or tunnel under the bark of the tree (The design is the beetle's signature).
- *Mention:* You can also determine what beetle you have based on what species of tree it was attacking:
  - Douglas Fir Beetle – Douglas Fir trees
  - Mountain Pine Beetle – Most pine trees (lodgepole, ponderosa...)
  - Spruce Beetle – All Spruce trees

**Show Overhead #5: Beetle Attack (cover pitch tubes)**

- *Explain:* Here is a picture of a large area of forest that has been killed by the Mountain Pine Beetle. Notice how red the trees are (they are all dead).
- *Comment:* Beetle outbreaks are a **natural occurrence** in our forests, but right now the Mtn. 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, as you can see in this picture. 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 MPB.

**INTERMEDIATE:**

**Show Overhead #6b: Bark Beetle Table (show entire table at once)**

- *Explain:* Point at the pictures of the adult beetles and mention that these 3 bark beetles look very similar, they are about the size of a grain of rice.
- *Ask:* Looking at this table can anyone tell me how are these beetles different? (take 1 answer) – Now we are going to go over the table to see other ways in which these beetle are different.
- Starting with “Common Name” read out the information in each row comparing each beetle.
- *Mention:* The easiest and quickest way to identify the species of bark beetle, without having to look at the beetle under a microscope, is by looking at the type of gallery the beetles have made (the design of the gallery is like the beetle's signature).

**Show Overhead #5: Beetle Attack (cover pitch tubes)**

- *Explain:* Here is a picture of a large area of forest that has been killed by the Mountain Pine Beetle. Notice how red the tree are (they are all dead)
- *Mention:* There are some methods to manage bark beetle but none of them are a perfect solution and many of them are too expensive and will not work when there is a massive outbreak like in this picture:
  - MSMA chemical treatment - using an axe you hack around the base of the tree and then apply the chemical into the tree. The chemical needs to get inside the tree to kill the beetles. This is very time consuming and expensive.
  - Fall and burn – bate a tree and then cut it down and burn it. This is a method for small outbreaks.

- Fall and peel – bate a tree and then cut it down and peel off the bark. This is a method for small outbreaks
  - Single-tree removal – cut down single infected trees. This is a method for small outbreaks.
- Comment: Beetle outbreaks are a ***natural occurrence*** in our forests, but right now the Mtn. 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, as you can see in this picture. 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 MPB.

**PART V – 5 MIN.**

**Fire:**

- Ask: Who knows what 3 things are needed to create fire? (fuel, heat, oxygen) {if a student says “matches”... say “That’s right, we need a source of HEAT. If they say “wood”... respond “Yes, we need FUEL. Someone might say we need “air”...respond “Yes, we need oxygen from the air.”}

**Show Overhead #7: Fire Triangle**

- Explain: This overhead shows the three things we need. Do you remember at the beginning of the lesson we said that dry weather will weaken a tree because it won’t get the water it needs? We also talked about diseases and bark beetles cutting off the water supply.
- Ask: What happens to a tree if it doesn’t get water? (Like people, trees will weaken and eventually die without water.)
- Explain: Weak or dead trees are more susceptible to diseases, beetle attacks and fire.
- Explain: Fire is a natural part of nature. A fire can destroy a forest and the diseases and bark beetles living in the forest BUT nature then allows a new forest to grow back. We can help a forest to grow back by planting trees. The new forest will have some diseases and beetles and defoliators because they are all an important part of the forest ecosystem, but they will be in balance until an event occurs that encourages things to go out of balance again. It is part of nature for these cycles to take place. We can help prevent loss of forests to diseases, pests and fire by:
1. Harvesting trees before they become old and start to weaken.
  2. Having controlled burns to clear out the dead underbrush in a forest.
  3. Being very careful with camp fires and cigarettes.
  4. Watching over our forests carefully to try to remove diseased or dying trees before they become a problem.... This is sometimes very hard to do because we have so many trees in BC.

**PART VI – 5 MIN.**

**Lesson Conclusion:**

*Introduce Song* – Play “Pheromone Frenzy” and have students listen carefully to the words to see if they can hear any of the words that they learned about in the lesson. (Intermediate – play the song a couple of times and get the students to see if they can hear a mistake in the words. The mistake is the line that says the beetle “produces” a fungus. The beetle brings the fungus into the tree on its body; it does not actually produce the fungus).

*Extension:* The “BC’s Mountain Pine Beetle - Intermediate Teacher Resource Kit” which should be at each elementary school with intermediate grades in BC. The included video will examine the Mtn. Pine Beetle problem that BC is facing and a binder will contain lesson plans, bark samples and beetle samples. We have added blue stain wood samples and tree cookies. We have also added a general forest health lesson (suitable K-7) and a master copy of the “Pheromone Frenzy” song CD (you are free to make copies).

**HANDOUTS:**

- Poster: Forest Health
- Worksheets: Beetles and Defoliators