Case Studies:

**Pest:** European gypsy moth *Lymantria dispar dispar*

**Disease:** Pine pitch canker *Fusarium circinatum*

Teacher Overview

Students will gain an understanding about one pest and disease that pose a serious threat to the forestry industry in Australia. Students will complete a research case study of one pest and one disease that has been identified as a significant concern to the industry. Links have been provided to assist students with their research outlines. Students will also have the opportunity to complete a glossary of terms related to their case studies.

Stage

Year 11 Agriculture

Syllabus Links

Outcomes

A student:

P2.1 describes the biological and physical resources and applies the processes that cause changes in plant production systems

Students learn about:

The nature and impact on plant production systems of microbes, invertebrates and pests.

Students learn to:

Outline one important disease and one pest for a selected crop/pasture. Evaluate methods that can be used to control or prevent plant pests and diseases.
Lesson Overview

Introduction:
Students will initially be introduced to the terms of “prevention and control” and gain an understanding of the difference of these terms. (5 minutes).

Activity One:
Students will complete a case study on the pest European gypsy moth. A template has been provided to record their research and this should be either printed prior to the lesson or students can complete it in a Word document form. Students may wish to visit alternative sites to complete their research; however, the two links are appropriate to find the required information.

Gypsy Moth Fact Sheet
Gypsy Moth Contingency Plan

N.B: The relevant section for management of the disease is in Section 5.3.

N.B: The contingency plan document (link 2) is very detailed. It is recommended that you scroll and scan through the document with your students in order for them to gain an understanding of what sort of information is provided to stakeholders in the plant industry in Australia. They can then focus on section 5.3 for their management responses. (Approx 25 minutes)

Activity Two:
Students will complete a case study on the disease Pine pitch canker. A template has been provided to record their research and this should be either printed prior to the lesson or students can complete it in a Word document form. Students may wish to visit alternative sites to complete their research; however, the two links are appropriate to find the required information. (Approx 25 minutes)

http://ipm.ucanr.edu/PMG/PESTNOTES/pn74107.html

Activity Three:
During their case studies, students will have researched a number of new terms. Individuals should spend time researching the provided definitions and any other terms they were unfamiliar with during their research. (Approx 10 minutes)
Resources

a) Student worksheet and templates for case study one and two.
b) Online Sources (links provided on the worksheet).

Sample Answers

Activity One

Case Study Common name: European gypsy moth.
Scientific name: Lymantria dispar dispar.
Type of pest/disease: Pest – insect.
Hosts: 650 species of plants including forest, orchard and ornamental trees. Eucalyptus and pines included.
Present in Australia? No.
Distribution:
- Europe and North America.
- “In 2013-2014 plantation forestry production was valued at $1.4 billion. The forest, wood and paper products sector is Australia's 8th largest manufacturing industry” Plant Health Australia

Effect on the host plant: (signs and symptoms)
- Holes in leaves associated with instar larva. As larva growth the entire leaf is consumed.
- Repeated defoliations can cause tree death.
- Death of tree will occur if infestation is associated with another stress event.

Description/information on organism
- Flightless.
- Female is large and wavy dark coloured bands across forewings.
- Males are smaller and brown with darker brown patterns on wings.
- Egg masses 100-1000 eggs on vehicles, cargo containers.

Contingency plan/control measures
(Physical, chemical, biological, other.)

Information from Section 5 of document (mainly 5.3)
- Physical: restricted movement of traffic from infected areas
- Chemical I: hygiene practices (disinfectants etc).
- Physical: destruction of infected material.
- Physical: surveillance.
- Chemical: broad spectrum insecticides via aircraft.
- Chemical: application of Bt insecticides.
- Biological: Bt bacteria, also under investigation are Oencyrtus kuvanae, polyhedrosis virus, parasitoids
- Physical: silvicultural practices are nonviable.

Activity Two

**Case Study**

**Common name:** Pine pitch canker.

**Scientific name:** *Fusarium circinatum*.

**Type of pest/disease:** Fungus.

**Hosts:** 57 species of Pinus as well as Douglas Fir. Radiata pine most susceptible.

**Present in Australia?** No.

**Distribution:**
- United States, Japan, South Africa, Chile, Spain and Italy.

"In 2013-2014 plantation forestry production was valued at $1.4 billion. The forest, wood and paper products sector is Australia’s 8th largest manufacturing industry" Plant Health Australia

**Effect on the host plant:** (signs and symptoms)
- Infects vegetative and reproductive parts of plants.
- Wilting and yellow green discoloration of needles.
- Shoots droop and branch dieback progresses.
- Resin bleeding.
- Stem girdling and subsequent mortality.
- Sunken stem lesions.
- Structures called sporodochia can be observed.

**Description/information on organism**
- Fungal pathogen.
- Ideal temperature between 20-25 °C.
- Insects can transmit the canker fungus.

**Contingency plan/control measures**
(Physical, chemical, biological, other.)
- Biological: Some trees can recover, and can gain resistance over time.
- Biological: The trees that are resistant should be propagated over time from cuttings to create a resistant stock (not a long term solution as resistance will decrease as pathogen mutates).
- Physical: prevention of movement of pathogen: designated infection zones, limited movement between zones.
- Physical: removal of infected branches and material.
- Chemical: insecticides don't offer a practical way to control pitch canker, fungicides are available but ineffective.

**Activity Three**
Complete the following table of terms;

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Reviewed Date</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem girdling</td>
<td>A stem girdling root is a type of dysfunctional root that is growing against a tree's stem.</td>
<td>30th April 2017</td>
<td><a href="http://www.myminnesotawoods.umn.edu/2009/01/stem-girdling-roots-booklet/">www.myminnesotawoods.umn.edu/2009/01/stem-girdling-roots-booklet/</a></td>
</tr>
<tr>
<td>Dieback</td>
<td>A condition in which a tree or shrub begins to die from the tip of its leaves or roots backwards, owing to disease or an unfavourable environment.</td>
<td>30th April 2017</td>
<td><a href="http://www.dictionary.com/browse/dieback">http://www.dictionary.com/browse/dieback</a></td>
</tr>
<tr>
<td>Crown</td>
<td>The tree crown is the top part of the tree, which features branches that grow out from the main trunk and support the various leaves used for photosynthesis. While all trees feature a crown, several types of crowns adorn different types of trees. Thus, tree crowns are adapted to fit the role they play in the wild.</td>
<td>7th May 2017</td>
<td><a href="http://homeguides.sfgate.com/tree-crown-45365.html">http://homeguides.sfgate.com/tree-crown-45365.html</a></td>
</tr>
<tr>
<td>Lesions</td>
<td>Any localised, defined area of diseased tissue, as a spot, canker, blister, or scab.</td>
<td>30th April 2017</td>
<td><a href="http://www.dictionary.com/browse/lesion">http://www.dictionary.com/browse/lesion</a></td>
</tr>
<tr>
<td><strong>Sporodochia</strong></td>
<td>A small, compact stroma (mass of hyphae) usually formed on host plants parasitised by fungi. Viewed 30th April 2017 <a href="https://en.wikipedia.org/wiki/Sporodochium">https://en.wikipedia.org/wiki/Sporodochium</a></td>
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<tr>
<td><strong>Instars</strong></td>
<td>A stage of an insect or other arthropod between one molt and the next. Viewed 30th April 2017 <a href="http://www.thefreedictionary.com/instars">http://www.thefreedictionary.com/instars</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Broad spectrum insecticides</strong></td>
<td>When using broad-spectrum pesticides, the chemical can harm both pests and non-pest organisms. Viewed 30th April 2017 <a href="http://study.com/academy/lesson/what-are-pesticides-definition-and-difference-between-narrow-spectrum-broad-spectrum.html">http://study.com/academy/lesson/what-are-pesticides-definition-and-difference-between-narrow-spectrum-broad-spectrum.html</a></td>
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<tr>
<td><strong>Silviculture</strong></td>
<td>Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis Viewed 7th May 2017 <a href="http://forestry.sfasu.edu/faculty/stovall/silviculture/index.php/silviculture-textbook-sp-9418/149-silviculture-and-definintions">http://forestry.sfasu.edu/faculty/stovall/silviculture/index.php/silviculture-textbook-sp-9418/149-silviculture-and-definintions</a></td>
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