

Agriculture in Education Initiative  
**An Educational Unit for Secondary Schools**

Agriculture in Education / Current Unit

# Protecting Australian Food Production Systems through Biosecurity Education

Level

5

Curriculum Area

Science

[Print Resource](#)

## **Rationale**

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This resource has been designed to highlight the relevance of biosecurity to everybody and to encourage all to take action during their everyday activities to help protect our food and environment from harm caused by harmful pests.

The objectives of the educational resources are to:

- Support Primary Industries Education Foundation Australia and its members in expanding awareness about primary industries in Australia by engaging and informing teachers and students about the role and importance of primary industries in the Australian economy, environment and wider community.
- Provide resources, which help build leadership skills amongst teachers and students in communicating about food and fibre production and primary industries in Australia.

- Develop educational resources that can be used across Australia to provide encouragement, information and practical teaching advice that will support efforts to teach about food and fibre production and the primary industries sector.
- Demonstrate to students that everyone can consider careers in primary industries and along the supply chain of food and fibre products.
- Develop engaging learning programs using an inquiry process aligned with the Australian Curriculum.
- Develop in school communities, an integrated primary industries education program that emphasises the relationship between food and fibre industries, individuals, communities, the environment and our economy.
- These educational resources are an effort to provide practical support to teachers and students learning about food and fibre production and primary industries in schools.

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## Resource Description

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The resource is comprised of three inter-related units designed to highlight the relevance of biosecurity to everybody and to encourage all to take action during their everyday activities to help protect our food and environment from harm caused by harmful pests. The resource includes a wide variety of learning experiences, with content that can be delivered over a flexible time frame to suit individual needs.

### Background

Biosecurity will become increasingly important into the future as global food demand rises to unprecedented levels. In Australia, where more than two thirds of the population lives in major cities, there is a growing disconnection between consumers and their food source, and consequently their understanding of food-related issues.

Increased levels of trade and travel have opened up opportunities for Australia's economy and people, but at the same time have increased the risk of pests (i.e. insects, feral animals, weeds, diseases) entering the country. This poses a major threat to Australia's food production, trade, environment and biodiversity.

What can we do about it? The answer is to learn, share and communicate ways to help protect our agricultural industry and for us to be proactive rather than reactive to these challenges. Biosecurity is everyone's business!

Engaging schools in biosecurity education is an important way of sharing the challenges faced by

future generations in order to develop sustainable solutions to protecting our food and environment from harm caused by damaging pests.

Additional relevant activities that could be used as a lead-in to this Biosecurity unit are outlined below.

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## Learning Sequence

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Download the resource learning sequence

[Learning Sequence \(pdf/Learning Sequence Biosecurity.pdf\)](#)

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## Lesson Outcomes

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In this resource, students will:

- Explore where our food comes from and who produced our food
- Investigate what a pest is and how pests can harm our food
- Develop an understanding of what biosecurity is and how biosecurity helps protect our food (and natural environment) from harm caused by pests)
- Take part in a biosecurity activity that is relevant to their location and prepare a report on their work.
- Investigate how biosecurity is embedded in the food supply chain.
- Investigate how biosecurity research has helped to protect our food and environment
- Understand how they can take action in their own home to protect their plants and animals from harm from pests.

### Background reading

- The PIEFA produces unit 'Investigating food and fibres' provides additional relevant activities that could be used as a prelude to this Biosecurity unit.  
<http://www.piefa.edu.au/units/foodandfibres.pdf>  
(<http://www.piefa.edu.au/units/foodandfibres.pdf>)
- The Australian Government Department of Agriculture and Water Resource's Biosecurity webpage <http://www.agriculture.gov.au/biosecurity> (<http://www.agriculture.gov.au/biosecurity>)
- Biosecurity: keeping out unwelcome visitors <http://savanna.org.au/all/biosecurity.html>  
(<http://savanna.org.au/all/biosecurity.html>)

# Australian Curriculum Content Descriptors

This resource relates to the following Australian Curriculum content descriptors.

- ACSHE217 - Scientific knowledge is used to inform personal and community decisions
- ACSIS086 - With guidance, plan appropriate investigation methods to answer questions or solve problems
- ACSSU043 - Living things have structural features and adaptations that help them to survive in their environment

The content has been divided into three sections designed to give students a platform of understanding, practical experience and a robust combination of skills and knowledge able to advocate and promote biosecurity in the own community.

## Structure of this resource

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This resource is comprised of three complementary units, designed to give students a platform of understanding, practical experience and a robust combination of skills and knowledge able to advocate and promote biosecurity in the own community.

The three units are:

**Unit 1:** Biosecurity awareness-raising activities - what is it and why is it important?

**Unit 2:** Practical participation in biosecurity related investigations

**Unit 3:** Promoting a biosecurity-aware community, including the people that work in related occupations

For maximum engagement in the topic, the units can be delivered as a series. There is opportunity to incorporate the Australian Curriculum general capabilities and curriculum content from other learning areas. Alternatively, each unit (or parts thereof) can be delivered independently.

The resources have been designed as a hyperlinked unit to provide a digital format on a website or wiki, or by using an interactive whiteboard.

Teachers are encouraged to explore ways in which the content can be adjusted to suit individual learning programs. Resource sheets are provided for some activities.

## Resourcing the unit

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The resources suggested are on the whole, general rather than specific. Schools and the contexts in which they exist vary widely as does the availability of some resources – particularly in remote areas. There is an emphasis in the units on students investigating how they personally can adopt biosecurity practices and help protect food production systems and environment from harm caused by pests. The practical activities in unit 2 provide opportunity for students to work scientifically. Some YouTube online videos and internet-based resources are suggested in the unit. You will need to determine if these are available at your school. Some State Government agencies or other biosecurity focused organisations welcome invitations to speak with students. Suggested contacts in each state are listed below.

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## Acknowledgements

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This resource was written in collaboration with the Royal Agricultural Society of Western Australia and the Department of Agriculture and Food Western Australia

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### Terminology\* used in the resource

**Biosecurity** is the management of risks to the economy, the environment and the community of pests and diseases entering, emerging, establishing or spreading in Australia.

A **pest** is any animal, plant, invertebrate or pathogen with the potential to have a negative effect.

An **invasive pest** is a pest that requires effort to control it because it is easy for the pest to move into a habitat.

A **disease** is the presence of a pathogenic agent in a host that has the potential to have a negative effect.

**Exotic pests** or **diseases** are not native to, or established in, Australia and may not have predators or other population control mechanisms.

An **established pest** or **disease** has self-sustaining populations in Australia and is not considered eradicable. It may be distributed widely across Australia or only regionally. A regionally distributed established pest or disease may be the subject of containment measures to mitigate further spread.

An **established pest or disease of national significance** is an established pest or disease that has a significant impact nationally on international market access and/or trade economic health of the nation human health natural environment and ecosystems

Infrastructure used by a significant proportion of people over an extensive area amenity of resources, such as public lands, and has the potential to affect more than one state/territory, or Australian culture, cultural assets, practice or custom, or national image.

\*Definitions are from Modernising Australia's approach to managing established pests and diseases of national significance Discussion paper. Downloaded August 2016 from <http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/epdns-discussion-paper.docx> (<http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/epdns-discussion-paper.docx>)

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## Unit 1: Biosecurity awareness-raising activities - what is it and why is it important?

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### Learning Experience 1 - Food security- protecting our food sources to help feed the world.

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#### Lesson Overview

This lesson provides students with some insight into the importance of protecting food systems in order to feed a growing global population.

#### Lesson Outcomes

Students will be able to:

- Interpret graphical information relating to global population
- Understand the finite nature of Earth's resources used to grow food

#### Teacher Background Information

There are two specialist terms relevant to this activity:

**Food security-** This sounds like we are locking up our food to keep it safe- which is partially true. The word security refers to protection, and therefore "food security" is about protecting world food sources so that everyone on the planet has enough to eat.

**Biosecurity-** the management of risks to the economy, the environment and the community of pests and diseases entering, emerging, establishing or spreading in Australia, to protect agricultural

industries.

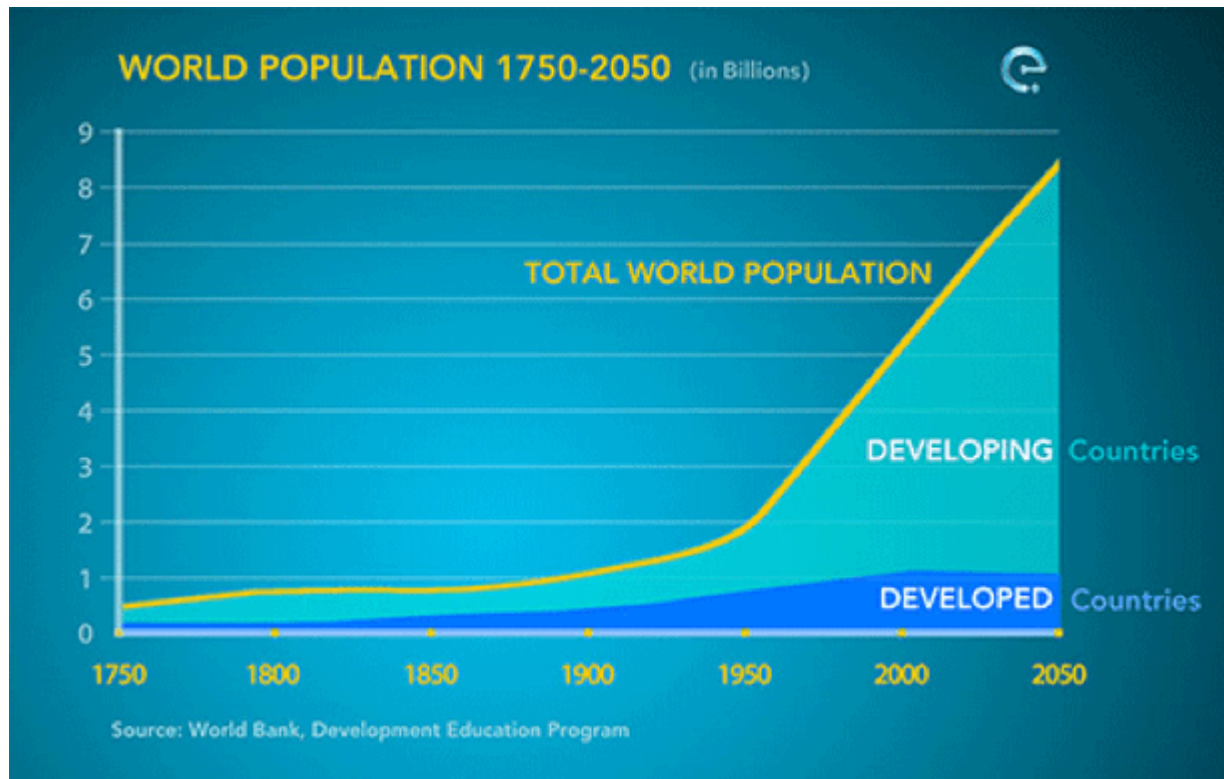
There are a couple of BIG problems that have made us think about protecting our food sources from biosecurity risks.

**First problem:** the area of land we have on Earth is not getting any bigger! Teachers can illustrate this point by doing this demonstration:

[http://www.landlearn.net.au/print/ahttp://www.landlearn.net.au/print/apple\\_earth.htmpple\\_earth.htm](http://www.landlearn.net.au/print/ahttp://www.landlearn.net.au/print/apple_earth.htmpple_earth.htm)

**Second problem:** The world population is growing...and very fast!

The Growing World Population



Source: <http://www.ecology.com/2011/09/26/day-seven-billion/>

(<http://www.ecology.com/2011/09/26/day-seven-billion/>)

## Equipment

Copies of the student worksheet

Print [Learning Exp 1 Student worksheet \(pdf/Learning Experience 1 student worksheet.pdf\)](#)

worksheets that show the graph and questions below.

Teachers may alternatively choose to do this as a graphing activity with students- giving them data for them to construct their own graph using graph paper.

## Lesson Steps

Show the video to help students understand the importance of food security

Video:

- <https://www.youtube.com/watch?v=VCYeLuURxRM&feature=youtu.be>  
(<https://www.youtube.com/watch?v=VCYeLuURxRM&feature=youtu.be>)

Demonstrate the relative area used for world food production using the Apples and Earth activity:

[http://www.landlearn.net.au/print/apple\\_earth.htm](http://www.landlearn.net.au/print/apple_earth.htm) ([http://www.landlearn.net.au/print/apple\\_earth.htm](http://www.landlearn.net.au/print/apple_earth.htm))

Distribute the worksheet and students to complete. If you want students to practice skills in representing data, provide a blank grid and give them some corresponding data.

Provide students with these questions:

- A billion is a very large number. Write it here:
- What was the world's population in 1750:
- What was the world's population in 1950: (This is most likely in your grandparent's lifetime)
- What was the world's population in 2000: (This is in your parent's lifetime)
- What is the world population expected to be in 2050: (This will be in your lifetime)

Extension:

Students could:

- Research the difference between what is meant by "developed" and "developing" countries
- Locate some developing countries on a world map
- Locate some developed countries on a world map
- Suggest reasons why most of the world population growth comes from developing countries

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## Learning Experience 2 - Pests in Agriculture

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### Lesson Overview

In this lesson students research some pests related to food production.

### Lesson Outcomes

Students will be able to:

- Define what is meant by "pest" in simple terms
- Name some agricultural pests
- Classify some agricultural pests according to:
  - Whether it affects plants or animals
  - What type of pest it is

If the Feral Focus resource "What is a pest?" is used students will also:



- Define a pest and identify the characteristics that constitute a pest;
- Understand that different pests create different problems;
- Examine how native animals can sometimes be pests;
- Investigate how pest animals can affect people;
- Recognise that pest management is often complex and can involve a number of different interest groups who can influence the approach and methods of control;
- Understand that different interest groups are likely to have different attitudes towards a pest; and
- Investigate that different viewpoints can be developed by people about whether something is considered a pest

## **Teacher Background Information**

Pests can include types of:

- Invertebrates e.g. insects, nematodes
- Vertebrates
- Weeds
- Pathogen (microorganism) e.g. Viruses, bacteria, fungi

The Feral Focus website contains ready to use activities, such as the unit called “What is a pest?”

<http://www.feralfocus.org.au/units/what-is-a-pest.html> (<http://www.feralfocus.org.au/units/what-is-a-pest.html>)

The webpages include links to resources to help students identify the characteristics of a pest, understand that pests cause different problems and investigate how pests can affect people. Activities include preparing a pest problem poster, researching the specific characteristics of pests and carrying out a debate to discuss the different perceptions people have about kangaroos.

Teachers may choose to use this resource as is or as use some of the information it contains to assist with the lesson detailed further below.

### Resources:

- <https://www.agric.wa.gov.au/pests-weeds-diseases> (<https://www.agric.wa.gov.au/pests-weeds-diseases>)
- <http://www.depi.vic.gov.au/agriculture-and-food/pests-diseases-and-weeds/pest-insects-and-mites/redlegged-earth-mite> (<http://www.depi.vic.gov.au/agriculture-and-food/pests-diseases-and-weeds/pest-insects-and-mites/redlegged-earth-mite>)
- <http://www.pestsmart.org.au/> (<http://www.pestsmart.org.au/s>)
- <http://www.weeds.org.au/weedident.htm> (<http://www.weeds.org.au/weedident.htm>)
- <http://agspsrap31.agric.wa.gov.au/mypestguide/> (<http://agspsrap31.agric.wa.gov.au/mypestguide/>)

- <http://www.feralscan.org.au/rabbitscan/> (<http://www.feralscan.org.au/rabbitscan/>)
- <http://www.hungrypests.com/resources/educators.php>  
(<http://www.hungrypests.com/resources/educators.php>)
- <http://www.watoday.com.au/wa-news/cane-toad-found-in-perth-front-yard-20101116-17v29.html> (<http://www.watoday.com.au/wa-news/cane-toad-found-in-perth-front-yard-20101116-17v29.html>)
- <http://www.kayekessing.com/posters> (<http://www.kayekessing.com/posters>)

## Teacher preparation

Print the pest flashcards for the classification activity and laminate them

[Download Pest flashcards \(pdf/pest flashcards.pdf\)](#)

## Lesson Steps

- Propose a definition of a pest with students

A technical definition is given here:

A pest is any animal, plant, invertebrate or pathogen with the potential to have a negative effect.

Examples include weeds, insects, vertebrate animals, pathogens

**Alternatively**, a pest is any organism that is unwanted or is damaging a valued resource.

- Either follow the Feral Focus activity plans

OR

Discuss with students what they think makes something a pest (for example it could be destructive, unsightly, noisy or messy). Introduce the concept that a pest is any organism that is considered to be unwanted or is damaging a valued resource.

Ask students if they can name a pest found:

- In the home
- In the garden
- On the school oval (you may wish to go out and make observations!)
- In a food production system e.g. a farm
- In bushland

Ask students if they can suggest some ways that pests and diseases could be introduced into food production systems, or spread between places?

- (for example: Wind, water, shoes, vehicles, animals)

Ask students if they can suggest any features of the pest that allow it to be moved to new locations

- Students can design a poster illustrating and naming a pest for each of the environments above, describing what damage it does.

Reiterate that organisms considered pests can be native or introduced species.

It is important to note that a person's perception of whether something is a pest or not will vary over time and from place to place

For example, a Kangaroo is a native Australian animal and most people would not consider it to be a pest but in some instances it is considered a pest, usually where humans modify the landscape in order to grow food.

<http://australianmuseum.net.au/blogpost/lifelong-learning/introduced-species-friend-or-foe>

(<http://australianmuseum.net.au/blogpost/lifelong-learning/introduced-species-friend-or-foe>)

Play the Classifying Pests game

1. Using the flashcards, classify the pests into two categories: do they affect plants or do they affect animals?
2. Further classify each pest by type:
  - a. vertebrate (with a backbone) or
  - b. invertebrate (without a backbone)
  - c. Weed
  - d. Pathogen e.g fungi, bacteria, virus
3. Use the reverse of the flashcard to identify what damage the pest does

You may wish to use the resources to expand the number and types of pests to categorise.

### Example:

Name of pest or disease	Does it affect plants and animals?	What type of pest?
Powdery Mildew	plants	Pathogen-Fungus
Rabbits	plants	Animal-vertebrate
Sheep lice	animals	Animal-invertebrate (insect)
Fleas	animals	Animal-invertebrate (insect)
Cane toad	both plants and animals	Animal-vertebrate
Hendra	animals	Pathogen-virus

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## Learning Experience 3 - Focus on a selected pest

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## Lesson Overview

This lesson provides students with an opportunity to research the biology of a selected pest and present the results of their research either in poster or powerpoint form.

## Lesson Outcomes

Students will be able to:

- provide details about a particular pest, including its origin, introduction (if applicable), features, impact

## Teacher Background Information

Review the definition of a pest and information available at these websites:

- <https://www.agric.wa.gov.au/pests-weeds-diseases> (<https://www.agric.wa.gov.au/pests-weeds-diseases>)
- <http://www.depi.vic.gov.au/agriculture-and-food/pests-diseases-and-weeds/pest-insects-and-mites/redlegged-earth-mite> (<http://www.depi.vic.gov.au/agriculture-and-food/pests-diseases-and-weeds/pest-insects-and-mites/redlegged-earth-mite>)
- <http://www.pestsmart.org.au/> (<http://www.pestsmart.org.au/s>)
- <http://www.weeds.org.au/weedident.htm> (<http://www.weeds.org.au/weedident.htm>)
- <http://agspsrap31.agric.wa.gov.au/mypestguide/> (<http://agspsrap31.agric.wa.gov.au/mypestguide/>)
- <http://www.feralscan.org.au/rabbitscan/> (<http://www.feralscan.org.au/rabbitscan/>)
- <http://www.hungrypests.com/resources/educators.php> (<http://www.hungrypests.com/resources/educators.php>)
- <http://www.watoday.com.au/wa-news/cane-toad-found-in-perth-front-yard-20101116-17v29.html> (<http://www.watoday.com.au/wa-news/cane-toad-found-in-perth-front-yard-20101116-17v29.html>)
- <http://www.kayekessing.com/posters> (<http://www.kayekessing.com/posters>)

Usually organisms become pests as they are “in the wrong place at the wrong time” and because they have a negative impact on other things (plants, animals as well as humans).

Factors that may lead to an organism becoming a pest include:

- It has no predator (another organism that controls its numbers)
- It reproduces quickly (it can complete a life cycle in a relatively short period of time)
- Control methods are ineffective
- The environmental conditions suit its growth and development
- It has a means of spreading i.e moving from place to place

## Equipment

Poster sized pieces of paper for students to use to present the results of their research or alternatively access to computers to develop a powerpoint presentation.

Internet access so students can research some of the sites in the resources section to select a pest to research.

Alternatively students could be allocated one of the pest pictures on the flashcards in learning experience 2 to conduct further research on.

This activity could either be collaborative or independent.

## Lesson Steps

- As a class review the definition of a pest - A pest is any animal, plant, invertebrate or pathogen with the potential to have a negative effect.
- Students conduct research on their selected or allocated pest to find out the following:
  - The scientific name of the pest
  - If the pest is present in Australia – if so where and when was it first introduced or discovered in Australia?
    - how was it introduced?
    - A world map showing where it originated and some information about the climate and environment of the source location.
  - The physical signs of a pest presence
  - What features or adaptations the pest has that have allowed it to survive, reproduce and become a pest in Australia?
    - Which of the features identified are structural (what it looks like) and which are behavioural (how does it behave)?
  - The problems the pest causes:
    - How the pest affects the environment
    - How the pest affects people
  - Present the poster or powerpoint to the class
- Alternative idea: Select one fact about the pest, write it up on a piece of card shaped like its body
- As a class use the cards for a display wall and call it “The Pest Nest”

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## Lesson Overview

This lesson allows students to understand the relationship between biosecurity practices and pest risk minimisation

## Lesson Outcomes

Students will be able to:

- Provide a simple interpretation of the word “biosecurity”
- Realise the impact on food production and availability if pests get a foothold

## Teacher Background Information

Review page 9 of the following resource as an example of how different pests could affect everyday eating and activities. You could use this as a model to develop a collection of the ideas presented by students in the group activity.

[http://www.hungrypests.com/resources/HP\\_InvadeMS\\_Curriculum.pdf](http://www.hungrypests.com/resources/HP_InvadeMS_Curriculum.pdf)

([http://www.hungrypests.com/resources/HP\\_InvadeMS\\_Curriculum.pdf](http://www.hungrypests.com/resources/HP_InvadeMS_Curriculum.pdf))

This is similar to part of this activity where students are asked to imagine that a particular food was wiped out.

## Equipment

The Kaye Kessing poster “Out of the Spinifex” is an excellent visual aid to assist students to appreciate the importance of biosecurity (in this case for feral animals) to environment.

There are additional learning activities on the reverse side of the poster. It is available from

<http://www.kayekessing.com/posters> (<http://www.kayekessing.com/posters>)

## Lesson Steps

Introduce the term “biosecurity” with students

Prompts for discussion:

- Break the word “biodiversity” down.

- “Bio” refers to life and living things. It is from the Greek word “bios” meaning life/way of living

Can students think of any other “bio” words? For example: biography, biology, biodiversity How does the “bio” (life) part of the word fit with the rest of the word?

Biography is an account of someone’s life (written by someone else)

Biology is the study of living things

Biodiversity is the variety of life on Earth

“Security” refers to protection from risk or danger. (This word originates from the Latin language in the 1400s!)

- Can students think of any synonyms for the word “security” and “life”?

- Can students think of any antonyms for the word “security” and “life”?

What does it mean when we put the two parts of the word together?

“Biosecurity” could be interpreted as the protection of living things from some sort of risk or danger

Ask students for ideas about why biosecurity is important and encourage them to think about this from an economic, social and environmental perspective.

Importance of biosecurity to Australia:

It is important that Australia has some protection measures (biosecurity) in place to:

- Protect food production systems, so they can keep producing high amounts of good quality food.
- Protect Australia’s markets for food (much of what we produce in Australia is exported to other countries)
- Protect the environment from damage and promote biodiversity.

- Ask students how poor biosecurity could affect them as a consumer of food products.

- Some pests attack food crops which can result in fewer products to sell, which may also be of a lower quality. It may even result in food being unsaleable. For the consumer, this means that you may have to accept food of a lower quality, it may cost more to buy (as there might be less of it, and it may cost more to produce because of pest control).

- Form groups of students (4-5 students)
- In groups allocate a plant or animal product in its raw (fresh) form from the following list:
  - A type of fruit (students to decide)
  - A type of vegetable (students to decide)
  - A type of grain (students to decide)
  - Eggs
  - Milk

▪ Imagine that this particular food was no longer available as a pest had wiped it out.

▪ What things could you no longer have to eat that contains this?

Whilst there are other substitutes available, losing one type of food might not be too drastic. But, what if other types of food also started becoming affected?

If students need help, the activity could be extended by doing some internet research e.g. by putting “products containing ..” in the search box, or using a recipe website such as taste.com.au  
You may like to extend the activity by asking students to name a particular pest or disease that affects their particular product.

Students report back to the class as a group

Ask students if they can give an example of:

- when their food may have been affected by pests?
- having to declare or dispose of food items? Students may be familiar with quarantine bins at airports or at state borders

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## **Learning Experience 5- Monitoring and protecting plants and animals used in food production**

### **Lesson Overview**

This lesson provides an opportunity for students to understand how plants and animals can display visual signs of health and ill-health, and that sometimes this is related to a pest problem.

**Note:** In the 'Teacher Background' section it will be helpful to review with students and identify the original source of some common foods.

### **Lesson Outcomes**

Students will be able to:

- State some factors that plants and animals would need protection from, including pests
- Recognise signs of good and ill health in plants and animals
- Understand some of the impacts of unhealthy plants and animals to individuals, community and industry
- Understand some of the key aspects of biosecurity

### **Teacher Background Information**

Review with your students:

Where does your food come from?

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
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<b>Food item</b>	<b>Is it in a fresh form or has it been changed? Use Fresh (F) or Processed (P)</b>	<b>Identify the main ingredient for processed items (P)</b>	<b>Identify the original source - What plant or animal does it come from?</b>	<b>Identify the industry where the main ingredient is from</b>	<b>Identify the people involved in producing the food</b>
Apple	F	Not applicable	Apple tree	Horticulture	
Bread	P	Flour (from wheat)	Wheat plant	grains	
Ham sandwich	P	Ham, flour	Pig, wheat plant	Pork industry Grains industry	

Discuss with students to identify some of the foods they like to eat, and their original source i.e. the plant or animal it came from.

Discuss with students the origins of the items contained in their lunch box.

Prompts for Discussion:

- What's in your lunch box?
- Where did it come from?
- What food industries are in there?
- Who made it or grew it?

In the following learning experience, students will select a food source from column D for this exercise.

## **Equipment**

Learning Exp 5 Student worksheet (pdf/Learning Experience 5 Student worksheet.pdf)

- Learning Experience 5 Student worksheet

## **Lesson Steps**

- In class, select one of the food sources from column D of their table.
- Students should then suggest factors that the plant or animal needs protection from.
  - Select a food
  - Original source of the food or main ingredient:
  - It would need protection from:

**Note:** Answers for the protection part could include items other than pests, for example protection from the elements, predators or maltreatment (animals). However, the emphasis on the rest of the activity and resource is pests.

### **Focus on plants**

Ask students:

What are some clues that we have whether a plant or animal is unhealthy? For example, plants may have:

- distorted/dicoloured leaves,
  - loss of leaves, wilting, leaf damage (i.e. holes, half-eaten leaves),
  - slow growth,
  - presence of insects or indicators of pest damage
- Students select a plant used in food production (can be the same or different to the example previously selected). On the worksheet, they need to draw a picture of a healthy plant next to an unhealthy plant, with annotations (brief description of the signs of good and ill-health with arrows to the parts of the picture that represent this)
  - The students may include other signs of ill-health (other than pests) that relate to other environmental factors such as wilting (caused by a lack of water), or yellow leaves (caused by poor nutrition).
  - For the unhealthy plant picture students should highlight any of the signs of ill-health that relate to pest damage.

HEALTHY PLANT	UNHEALTHY PLANT	SIGNS OF ILL HEALTH
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Brainstorm as a class some possible consequences of unhealthy plants- these could be generated from a personal viewpoint, community viewpoint, or national viewpoint.

For example:

- unhealthy plants could:
  - make people sick
    - have a pest problem that may spread to other plants
    - make products unsaleable
    - require treatment or removal
    - it costs food producers money and time to do this
- these extra costs may be passed on to the food consumer i.e. food might cost more
- damage Australia's reputation as a producer of clean, quality food and therefore affect trade
  - affect the natural environment
  - cost the government a lot of money to prevent or manage a pest or disease outbreak

Students should include consequences in their table.

### **Focus on animals**

Ask students:

What are some clues that an animal is unhealthy? For example, animals may display signs such as:

- loss of appetite
- hunched appearance
- diarrhoea
- difficulty moving
- difficulty breathing
- noise indicating pain

Students select an animal used in food production.

Examples could include:

- cattle
- sheep
- pigs
- chicken
- goats
- fish

On the worksheet they need to draw a picture of a healthy animal next to an unhealthy animal, with annotations. (brief description of the signs of good and ill-health with arrows to the parts of the picture that represent this)

The students may include other signs of ill-health (other than pests) that relate to other environmental factors such as animal condition (which might be caused by poor nutrition) or physical deformity  
For the unhealthy animal picture students should highlight any of the signs of ill-health that relate to pest damage.

Discuss that for animals, we can also get clues about the health of an animal through its behaviour.  
This means how the animal is moving and what it is doing.

You can find out more about what the normal behaviour of different types of animals are here by choosing a species.

<http://www.det.wa.edu.au/curriculumsupport/animalethics/detcms/navigation/species-information/>  
(<http://www.det.wa.edu.au/curriculumsupport/animalethics/detcms/navigation/species-information/>)

<b>HEALTHY ANIMAL</b>	<b>UNHEALTHY ANIMAL</b>	<b>SIGNS OF ILL HEALTH</b>

Brainstorm as a class some possible consequences of unhealthy animals- these could be generated from a personal viewpoint, community viewpoint, or national viewpoint.

For example:

- unhealthy animals could:
  - be suffering from pain and distress, and this needs to be managed
  - have a pest problem that may spread to other animals
  - have a disease that is transferable to humans. This is called zoonoses
- damage Australia's reputation as a producer of clean, quality food and therefore affect trade
- change people's meat buying behaviour
- cost the government a lot of money to prevent or manage a pest or disease outbreak

Students should include consequences in their table.

Discuss these terms in relation to Biosecurity

**Prevention**- this includes strategies to prevent pests being introduced into Australia or between states. An example would be quarantine

**Monitoring**- this means surveillance, i.e looking for signs of pest and disease presence. This could include formal department of agriculture programs, or a producer looking for signs and symptoms in animals or plants

**Managing**- this includes strategies to manage a pest or disease once it is present This could include a range of different techniques, for example the use of chemicals, physical removal, biological controls

**Reporting**- If in the monitoring process something looks unusual or significant, enquiries or reports can be made to state department of agriculture The example used in this resource is the MyPestGuide Reporter (Unit 2)

Agriculture agencies, both state and federal help protect agricultural industries by

- Working with stakeholders to identify and manage biosecurity risks.
- Developing legislation.
- Establishing import controls.
- Conducting inspections.
- Providing quarantine services as required.

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## Learning Experience 6 - Australia helping to feed the world

### Lesson Overview

This lesson provides students with an opportunity to understand the role of Australia as a lead producer and exporter for food to the world.

This lesson includes some quite complex information and may need to be adapted by teachers where appropriate.

## **Lesson Outcomes**

Students will be able to:

- Identify the main countries that import Australian produce
- Identify the main countries that Australia imports food from
- Identify the origin of supermarket food (by reading the food label)
- Explain that harmful pests can be imported along with food and understand trade with other countries is a biosecurity risk

## **Teacher Background Information**

Part 1

Australia produces much more agricultural produce than it needs for its own population. As a result, about two thirds of Australian agricultural produce is exported to other countries. In Western Australia, 80% of the state's agricultural produce is exported.

The following websites can provide further information:

- Australia's major agriculture exports and where they go:  
<http://dfat.gov.au/trade/topics/pages/agriculture.aspx>  
(<http://dfat.gov.au/trade/topics/pages/agriculture.aspx>)  
Australia also imports food.
- Countries that Australia imports goods from and their relative value:  
<http://www.theguardian.com/global/datablog/ng-interactive/2015/feb/23/this-is-where-australias-imported-food-comes-from> (<http://www.theguardian.com/global/datablog/ng-interactive/2015/feb/23/this-is-where-australias-imported-food-comes-from>)
- Page 13 of the following document gives some useful summary information about the value of Australian food exports and imports. These could be used with students to interpret data about different industry types. <http://www.agriculture.gov.au/SiteCollectionDocuments/ag-food/publications/food-stats/daff-food-stats-2010-11.pdf>  
(<http://www.agriculture.gov.au/SiteCollectionDocuments/ag-food/publications/food-stats/daff-food-stats-2010-11.pdf>)

## Part 2

Review the exotic plant pests and disease list at <http://www.agriculture.gov.au/pests-diseases-weeds/plant/pests-disease-list> (<http://www.agriculture.gov.au/pests-diseases-weeds/plant/pests-disease-list>) and pick one or two pests of a food to discuss with students.

Other supporting information for teachers:

“Australia has a world class biosecurity system, but as long as international trade and people movement occurs, there will always be the risk that new plant pests will enter the country. Pests can also be spread to Australia through natural means, such as wind and water currents. Comprehensive biosecurity systems help ensure Australia’s food security and food safety, while good biosecurity practices protect our farmers’ productivity and make good business sense.” Plant Health Australia.

### Equipment

- A copy of a world map for each student. [Download world map \(pdf/world map.pdf\)](#)
- Prepare for part 2 of this lesson by showing students a few food labels and ask students to collect some clean food packaging from home for a week and bring these into class.
- A large poster of the world
- Post it notes.

### Lesson Steps

#### Part 1

- Brainstorm what is meant by the terms “import” and “export”
- Suggest what types of foods are exported from Australia and why?
  - (eg Australian climate is very suitable for grain growing and there is a lot of land)
- Suggest what type of foods are imported by Australia and why?
  - (eg consider why Australia imports maple syrup from Canada.)

### Australian food exports

- Share with students the information about Australia’s major agriculture exports and where they are exported to <http://dfat.gov.au/trade/topics/pages/agriculture.aspx> (<http://dfat.gov.au/trade/topics/pages/agriculture.aspx>)  
They should find that the main countries that Australia exports agricultural produce to are: China, US, Japan, Korea, European Union (regarded as 28 countries)
- Students can locate these countries on their individual world map and write the value of Australian exports (A\$M) nearby to the country

### Australian food imports

- Put the following link up on a screen:  
<http://www.theguardian.com/global/datablog/ng-interactive/2015/feb/23/this-is-where-australias-imported-food-comes-from> (<http://www.theguardian.com/global/datablog/ng-interactive/2015/feb/23/this-is-where-australias-imported-food-comes-from>)
- Students can take turns selecting different food types (drop down arrow) and seeing how the thickness of the line varies (this indicates relative value of the import)  
 The main countries that Australia imports food products (including processed) from are: New Zealand, US, Thailand and the United Kingdom
- Students can locate these places on a world map

### **Extension: comparing Australian imports and exports by industry type**

- Choose one industry graph on page 13 of the following document to focus on:  
<http://www.agriculture.gov.au/SiteCollectionDocuments/ag-food/publications/food-stats/daff-food-stats-2010-11.pdf> (<http://www.agriculture.gov.au/SiteCollectionDocuments/ag-food/publications/food-stats/daff-food-stats-2010-11.pdf>)
- Ask students how the imports for that industry compare to the exports?  
 If you choose to continue to share with the students the other industry graphs, they will soon realise that Australia overall exports much more food than it imports.

### **Part 2**

- As a class develop a list of the advantages and disadvantages of buying fruit and vegetables grown in your home state?
- If not suggested as an item for the list, discuss this statement:  
 “A big disadvantage of importing food from other countries is the risk of pest and disease being imported as well!”

Divide the food packages up and form groups of students. Each group should review the labels on the food packets to see where the foods came from. Ask each student in the group to write the food and the country of origin for one product on a post it note.

Discuss your chosen exotic plant pest/ disease

( <http://www.agriculture.gov.au/pests-diseases-weeds/plant/pests-disease-list>

(<http://www.agriculture.gov.au/pests-diseases-weeds/plant/pests-disease-list>)) and ask students to

indicate on their post-it note if their food is a potential carrier of this pest.

Ask students to place their post-it note on the world poster and discuss how importing food helps feed us but also has potential to import pests as well.



# Learning Experience 7 - Consumer education about food sources

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## Lesson Overview

This lesson provides students with an opportunity to understand the the seasonality of food production. Through better understanding they can consolidate the ideas presented in the previous activities about the need to protect food sources.

## Lesson Outcomes

Students will be able to:

- Understand that food production is seasonal
- Understand that the freshest food is whatever is locally grown and in season
- Help prepare a class seasonal recipe book

## Teacher Background Information

Australia's population is concentrated in its capital cities. Nearly 90% of Australians live in urban areas (cities or towns of more than 1,000 people).

Reference:

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features30April+2013#back7>  
(<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features30April+2013#back7>)

Australia is relatively young country and in generations past many worked on the land, or at least had a much closer relationship with their food source. Over time society has become increasingly disconnected from direct food production- most of us are food consumers rather than food producers. This creates issues in terms of the general population understanding what's involved in food production including how it is grown and factors affecting production.

Australian food consumers generally have a limited understanding of biosecurity as a result. Learning more about food and how it is produced will help people to become more aware, and develop a better understanding of the need to protect food sources.

This lesson is focussed on educating students about growing seasons for common plant products. Many food consumers are unaware that plants used in food production even have different growing seasons.

- they expect them to be available at any time!

Teachers- how connected are you? Test your knowledge of Australian agriculture here:

<http://www.abc.net.au/news/2015-05-27/quiz-10-things-to-know-about-australian-food-production/6481224> (<http://www.abc.net.au/news/2015-05-27/quiz-10-things-to-know-about-australian-food-production/6481224>)

Review what is in season in the different states:

<http://www.vicfarmersmarkets.org.au/content/whats-season>

(<http://www.vicfarmersmarkets.org.au/content/whats-season>)

<http://sydneymarkets.com.au/markets/produce-market/whats-in-season/summer.html>

(<http://sydneymarkets.com.au/markets/produce-market/whats-in-season/summer.html>)

<http://www.adelaidecentralmarket.com.au/cooking/whats-in-season/>

(<http://www.adelaidecentralmarket.com.au/cooking/whats-in-season/>)

<http://buywesteatbest.org.au/> (<http://buywesteatbest.org.au/>)

<http://www.brisbanemarkets.com.au/publications/fruit-and-vegetable-seasonal-guides/>

(<http://www.brisbanemarkets.com.au/publications/fruit-and-vegetable-seasonal-guides/>)

<http://seasonalfoodguide.com/hobart-tas-seasonal-fresh-produce-guide-fruits-vegetables-in-season-availability-australia.html> (<http://seasonalfoodguide.com/hobart-tas-seasonal-fresh-produce-guide-fruits-vegetables-in-season-availability-australia.html>)

## Equipment

Template of a recipe book

[Recipe template \(pdf/Printable Recipe.pdf\)](#)

## Lesson Steps

Ask students to

- individually pick a favourite fruit or vegetable and use the websites provided to research:
  - the season their fruit or vegetable is naturally available.
  - where their fruit or vegetable is grown
- Find a recipe that uses their selected seasonal fruit or vegetable as the main ingredient.
- Make their recipe at home and take a photo for the book.
- Fill in the template recipe book (this will take planning as only one student can fill in the book at once).
- Once the recipe book is completed discuss the recipes with the class focusing on the seasonality of the produce.
- Discuss that for some food products, such as fruits and vegetables, consumers demand products all year round. So generally in the off-season supplies are brought in (imported) from other states or countries and then stocked in supermarkets.

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## Learning Experience 8 - Biosecurity threats to our environment

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## Lesson Overview

This lesson provides students with an opportunity to understand that biosecurity protects our environment from harm.

## Lesson Outcomes

Students will be able to:

- Identify some examples of Australia's unique flora and fauna
- Identify some of the pests that could harm Australia's flora and fauna

## Teacher Background Information

Review the information about the following possible threats to Australia's flora and fauna:

- Invasive species that threaten Australian biodiversity  
<https://www.environment.gov.au/biodiversity/invasive-species>  
(<https://www.environment.gov.au/biodiversity/invasive-species>)
  - Threats to Australian wildlife (<https://www.ehp.qld.gov.au/wildlife/threats/>  
(<https://www.ehp.qld.gov.au/wildlife/threats/>))
  - Eucalyptus rust (see Eucalyptus rust fact sheet for more information on this pest)  
<http://www.agriculture.gov.au/pests-diseases-weeds/plant/forestry/eucalyptus-rust>  
(<http://www.agriculture.gov.au/pests-diseases-weeds/plant/forestry/eucalyptus-rust>).
  - Cane toads. The cane toad in Oz website (<http://www.canetoadsinoz.com/>  
(<http://www.canetoadsinoz.com/>)) and webpages has a lot of information on this invasive and destructive pest. Watch the Youtube video(<https://www.youtube.com/watch?v=azQnClq--RU>  
(<https://www.youtube.com/watch?v=azQnClq--RU>)) - this is 46 minutes long
  - Aquarium fish (<http://www.aquariumindustries.com.au/why-you-shouldnt-release-your-aquarium-fish-into-our-environment/>  
(<http://www.aquariumindustries.com.au/why-you-shouldnt-release-your-aquarium-fish-into-our-environment/>) ) and plants  
(<https://www.environment.gov.au/biodiversity/invasive/weeds/publications/guidelines/wons/pubs/c-caroliniana.pdf>  
(<https://www.environment.gov.au/biodiversity/invasive/weeds/publications/guidelines/wons/pubs/c-caroliniana.pdf>) ) can turn into invasive and damaging pests if released into waterways. Watch the Youtube video (<https://www.youtube.com/watch?v=DTHGxwSKE9Q>  
(<https://www.youtube.com/watch?v=DTHGxwSKE9Q>) ).
  - Tramp ants (note this example links to the Ant School hands on activity  
<http://www.schoolofants.net.au/for-teachers/>  
(<http://www.schoolofants.net.au/for-teachers/>))

- Varroa mites – see fact sheets (<http://beeaware.org.au/archive-pest/varroa-mites/#ad-image-0>)

## Equipment

Internet

## Lesson Steps

Discuss the statement

“Australia has outstanding unique fauna and flora”.

- What does this statement mean?
- Can you think of some examples of Australia’s unique flora and fauna?
- Are these animals and plants under threat by any pests?
- Refer the students to the provided websites, and divide the students into groups and allocate each group a pest to research.
- Students should prepare a poster to document their results of their research of their pest (framework for poster – pest name and details of the pest; what the pest harms; what is being done to minimise harm from this pest; what I can do to help eg don’t throw aquarium fish into waterways).
- Display the posters in class.

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# Unit 2: Practical participation in biosecurity-related investigations

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## Learning Experience 9 - Investigating fruit flies

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### Lesson Overview

This lesson will provide students with an opportunity to collect fruit fly surveillance data

Students will:

- Research fruit flies and the harm they cause
- Prepare their own fruit fly trap, collect fruit flies, collate class data and prepare a poster summarising their work

Students will make their own fruit fly trap, set it up in their backyard, MyPestGuide Reporter app/online reporting tool to report on the numbers of fruit flies collected in their trap, Students will collate class data and write a report on what their class found.

## **Lesson Outcomes**

Students will:

- Research a pest and the harm caused by the pest
- Understand how fruit flies' structural features and adaptations results in their survival and designation as a pest.
- Plan and carry out an investigation of the occurrence of fruit flies in their local area
- Prepare a report on their research findings.

## **Teacher Background Information**

Refer to page 10 of the Investigate Fire ants booklet for a description of how to keep tests fair

[http://www.tocal.nsw.edu.au/\\_\\_data/assets/pdf\\_file/0005/656816/NSWDPI-Investigate-fireants.pdf](http://www.tocal.nsw.edu.au/__data/assets/pdf_file/0005/656816/NSWDPI-Investigate-fireants.pdf)  
([http://www.tocal.nsw.edu.au/\\_\\_data/assets/pdf\\_file/0005/656816/NSWDPI-Investigate-fireants.pdf](http://www.tocal.nsw.edu.au/__data/assets/pdf_file/0005/656816/NSWDPI-Investigate-fireants.pdf))

Fruit flies are damaging insect pests that attack a wide range of fruit and vegetables globally. These pests damage fruit and vegetables and make them unsaleable. In Australia, the presence of some species of exotic fruit fly could reduce the Australia's capacity to sell our fruit and vegetables in overseas markets. See the Plant Health Australia Fact sheet (<http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/QFly-and-Medfly-FS.pdf>) on Mediterranean and Queensland Fruit flies for more information. The Mediterranean Fruit Fly is a pest in most parts of the world, including Western Australia. Queensland Fruit Fly is native to Australia, but it is not present in South Australia, Western Australia or Tasmania.

The fruit fly activities are suitable for the summer months in areas where there are fruit flies - check the fruit fly occurrence map (<http://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:7e56f930-daa8-4344-be7d-11348e1e68cc>) to see if this activity is suitable for your area. Note that the Atlas of Living Australia website (<http://www.ala.org.au/> (<http://www.ala.org.au/>)) also has interesting information about distribution of fruit flies and how other countries have worked to eradicate this pest.

This fruit-fly focused activity is based on the fruit fly activities in pages 18 – 21 of the Plant Pest Investigators Book available under Education and Training from this webpage

<http://www.pbcrc.com.au/sites/default/files/managedfiles/PlantPestInvestigators.pdf>  
(<http://www.pbcrc.com.au/sites/default/files/managedfiles/PlantPestInvestigators.pdf>)

If you wish to use the MyPestGuide Reporter app to collect and map your student's data:

- Contact the MyPestGuide team at [mypestguide@agric.wa.gov.au](mailto:mypestguide@agric.wa.gov.au) so they can allocate a project to you [this will help you review your classes data]
- Download the MyPestGuide Reporter app and practice using the app.
- Practice using the on-line reporting tool and the MyPestGuide pest reports map.

## Equipment

See pages 18 - 21 of the Plant Pest Investigators Book for full details of required equipment.

You can choose to follow the experiment outlined in Plant Pest Investigators – this involves the students collating their data in a science book or you could choose to use the MyPestGuide Reporter app to collect and collate their data and display the data on the online Google-earth based map.

If you plan not to use the MyPestGuide Reporter app you will need a poster-sized map of the area where your students live.

If you plan to use the MyPestGuide Reporter app or on-line reporting tool students and/or parents will need access to a Smartphone, tablet or iPad (or digital camera and internet enabled computer) to enable them to use these tools to report on the number of collected insects to the MyPestGuide map.

## Lesson Steps

Preparation:

Ask students to bring the materials required to make the Fruit Fly traps to school. If using MyPestGuide Reporter ask students and parents to download the app.

The Lesson

- Provide students with a copy of the Plant Health Australia Fact sheet on Mediterranean and Queensland Fruit flies and in class review this factsheet and the information on fruit flies at Atlas of Living Australia and discuss with students:

- The life cycle of fruit flies
- The harm caused by fruit flies
- How fruit flies' structural features and adaptations results in their survival and designation as a pest.
- Control measures for fruit flies in backyards [https://www.agric.wa.gov.au/fruit/mediterranean-fruit-fly?page=0%2C1#smartpaging\\_toc\\_p1\\_s1\\_h2](https://www.agric.wa.gov.au/fruit/mediterranean-fruit-fly?page=0%2C1#smartpaging_toc_p1_s1_h2)  
([https://www.agric.wa.gov.au/fruit/mediterranean-fruit-fly?page=0%2C1#smartpaging\\_toc\\_p1\\_s1\\_h2](https://www.agric.wa.gov.au/fruit/mediterranean-fruit-fly?page=0%2C1#smartpaging_toc_p1_s1_h2))

- Use the MyPestGuide online map or the map poster to discuss with students how surveillance reports help map the location of pests and assist with planning control of the pests. Discuss the aim of the class's surveillance with the students.

Prepare the fruit fly traps and ask students to take the traps home and place the traps in their backyard. Students should check their trap each day for two to three days and record how many fruit flies they catch every day.

- Two to three days later

- If you chose to use the poster record the numbers of trapped fruit flies on the poster and review the results with the class. Discuss how the reports help build a picture of the occurrence of fruit flies and how the community could use this information to direct control activities.

- If you chose to use the MyPestGuide reports map review the reports on the map with the students and discuss how the reports help build a picture of the occurrence of fruit flies and how the community could use this information to direct control activities.

- Ask students to prepare a poster to summarise their investigation. The poster should cover Why, How, What and So What of their investigation.

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## **Learning Experience 10 - Foods that attract fruit flies**

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### **Lesson Overview**

This lesson will provide students with an opportunity to explore what types of foods attract fruit flies

Students will:

- Research fruit flies and the harm they cause
- As a class prepare fruit fly traps, bait the traps with different foods, place the traps in an appropriate area for two to three days, count the caught fruit flies, collate the data, discuss the results and prepare a poster summarising their work.

### **Lesson Outcomes**

Students will be able to:

- Research a pest and the harm caused by the pest
- Understand how fruit flies' structural features and adaptations results in their survival and designation as a pest.
- Plan and carry out an investigation of the which foods attract fruit flies
- Prepare a report on their research findings.
- Understand how to keep tests fair.

## Teacher Background Information

Refer to page 10 of the Investigate Fire ants booklet for a description of how to keep tests fair ([http://www.tocal.nsw.edu.au/\\_\\_data/assets/pdf\\_file/0005/656816/NSWDPI-Investigate-fireants.pdf](http://www.tocal.nsw.edu.au/__data/assets/pdf_file/0005/656816/NSWDPI-Investigate-fireants.pdf) ([http://www.tocal.nsw.edu.au/\\_\\_data/assets/pdf\\_file/0005/656816/NSWDPI-Investigate-fireants.pdf](http://www.tocal.nsw.edu.au/__data/assets/pdf_file/0005/656816/NSWDPI-Investigate-fireants.pdf))).

Fruit flies are damaging insect pests that attack a wide range of fruit and vegetables globally. These pests damage fruit and vegetables and make them unsaleable. In Australia, the presence of some species of exotic fruit fly could reduce the Australia's capacity to sell our fruit and vegetables in overseas markets. See the Plant Health Australia Fact sheet on Mediterranean and Queensland Fruit flies for more information.

The Mediterranean Fruit Fly is a pest in most parts of the world, including Western Australia.

Queensland Fruit Fly is native to Australia, but it is not present in South Australia, Western Australia or Tasmania.

The fruit fly activities are suitable for the summer months in areas where there are fruit flies - check the fruit fly occurrence map to see if this activity is suitable for your area. Note that the Atlas of Living Australia website also has interesting information about distribution of fruit flies and how other countries have worked to eradicate this pest.

This fruit-fly focused activity is based on the fruit fly activities in pages 18 – 21 of the Plant Pest Investigators Book available under Education and Training from this webpage

<http://www.pbcrc.com.au/sites/default/files/managedfiles/PlantPestInvestigators.pdf>

(<http://www.pbcrc.com.au/sites/default/files/managedfiles/PlantPestInvestigators.pdf>)

[http://www.tocal.nsw.edu.au/\\_\\_data/assets/pdf\\_file/0005/656816/NSWDPI-Investigate-fireants.pdf](http://www.tocal.nsw.edu.au/__data/assets/pdf_file/0005/656816/NSWDPI-Investigate-fireants.pdf)

([http://www.tocal.nsw.edu.au/\\_\\_data/assets/pdf\\_file/0005/656816/NSWDPI-Investigate-fireants.pdf](http://www.tocal.nsw.edu.au/__data/assets/pdf_file/0005/656816/NSWDPI-Investigate-fireants.pdf))

## Equipment

See pages 18 - 21 of the Plant Pest Investigators Book for full details of required equipment

## Lesson Steps

Preparation

Work out where the students can hang their fruit fly traps.

Ask students to bring a selection of food baits and the materials required to make the Fruit Fly traps to school

The Lesson

Provide students with a copy of the Plant Health Australia Fact sheet on Mediterranean and Queensland Fruit flies and in class review this factsheet and the information on fruit flies at Atlas of Living Australia and discuss with students:

- The life cycle of fruit flies
- The harm caused by fruit flies



- How fruit flies' structural features and adaptations results in their survival and designation as a pest.
- Control measures for fruit flies in backyards [https://www.agric.wa.gov.au/fruit/mediterranean-fruit-fly?page=0%2C1#smartpaging\\_toc\\_p1\\_s1\\_h2](https://www.agric.wa.gov.au/fruit/mediterranean-fruit-fly?page=0%2C1#smartpaging_toc_p1_s1_h2)  
([https://www.agric.wa.gov.au/fruit/mediterranean-fruit-fly?page=0%2C1#smartpaging\\_toc\\_p1\\_s1\\_h2](https://www.agric.wa.gov.au/fruit/mediterranean-fruit-fly?page=0%2C1#smartpaging_toc_p1_s1_h2))

- Discuss the aim and how to keep test with the students.
- Prepare the fruit fly traps and ask students to hang the traps in the designated area. Students should check the traps each day for two to three days and record how many fruit flies they catch every day.
- Two to three days later
- Collate all the data and discuss the results with the students.
- Ask students to prepare a poster to summarise their investigation. The poster should cover Why, How, What and So What of their investigation.

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## **Learning Experience 11 - Weed surveillance project**

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### **Lesson Overview**

This lesson will provide students with an opportunity to plan and carry out their own weed surveillance project using the MyPestGuide pest reporting tools.

### **Lesson Outcomes**

Students will:

- Review information about the weeds in their area and the harm these weeds cause
- Understand how weed species structural features and adaptations results in their survival and designation as a weed.
- Plan and carry out a weed survey in their local area
- Prepare a report on their research findings.

### **Teacher Background Information**

Review the information available on the Weeds in Australia website:

- What is a weed (<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/what.html>  
(<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/what.html>))
- Why are weeds a problem?  
<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/index.html>

(<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/index.html>)

- National weeds list

<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/index.html>

(<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/index.html>)

- Weeds in each state:

Western Australian Organism List (<https://www.agric.wa.gov.au/organisms>) (for WA)

A-Z of weeds (<http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/weeds/a-z-of-weeds>) (for Victoria)

NSW Weedwise (<http://weeds.dpi.nsw.gov.au/>) (for NSW)

Non-declared weeds (<https://www.business.qld.gov.au/industry/agriculture/species/non-declared-pests/weeds>), Declared weeds

(<https://www.business.qld.gov.au/industry/agriculture/species/declared-pests/weeds>) (for Queensland)

(missing ACT)

A – Z of weeds (<http://www.lrm.nt.gov.au/weeds/find>) (for the Northern Territory)

Alert weeds

([http://www.pir.sa.gov.au/biosecurity/weeds\\_and\\_pest\\_animals/weeds\\_in\\_sa/alert\\_weeds](http://www.pir.sa.gov.au/biosecurity/weeds_and_pest_animals/weeds_in_sa/alert_weeds))

(for South Australia)

Dennis Morris Weeds and Endemic Flora Database

(<http://library.dpipwe.tas.gov.au/public/weeds/>) (for Tasmania)

The Weeds Australia website contains an 80 page long booklet Weedbusters that is a wonderful resource for understanding weeds and it includes weed-related activities. The Queensland Government also has a Weedbusters webpage that includes a Junior Action Plan for students to follow to help prevent the spread of weeds.

The MyPestGuide project is an Australia wide project that asks everybody to report pests (insects, weeds, diseases and animals) to the Department of Agriculture and Food, WA (DAFWA). As outlined on the MyPestGuide webpage – “By using the MyPestGuide app you will be supporting your local community, defending Western Australia’s agriculture industry and protecting the natural environment from unusual or suspected exotic pests.”

Students will upload the free MyPestGuide Reporter app onto their device (link to [Google Play Store](#) and [Apple iTunes Store](#)) or may use the online reporting tool (<https://mypestguide.agric.wa.gov.au/>) to send in a report of a pest (insect, weed, disease or animal). Subject matter experts will identify the pest and send an email response back to the person making the report within 2 working days. All reports

are mapped onto the MyPestGuide map (<https://mypestguide.agric.wa.gov.au/>).

Teachers and students could use MyPestGuide Reporter to run a weed survey of their local area.

Students will receive a response to their report with the ID of the weed and could then prepare a 'What am I' on their pest. Alternatively, students could review the results of their Backyard Blitz on the MyPestGuide map and write a report on their results.

If teachers would like to use MyPestGuide reporting tools to carry out a weed survey please contact the MyPestGuide team ([mypestguide@agric.wa.gov.au](mailto:mypestguide@agric.wa.gov.au)) to set up a project for your students to send their reports.

## **Equipment**

Equipment Students and/or parents will need access to a Smartphone, tablet or iPad (or digital camera and internet enabled computer) to enable them to use these tools to report on the number of collected insects to the MyPestGuide map.

## **Lesson Steps**

Preparation

If using MyPestGuide Reporter ask students and parents to download the app.

The Lesson

Provide students with a copy of fact sheets on relevant local weeds (downloaded from one of the sites below) and in class review this factsheet(s) and the information on these weeds at Atlas of Living Australia and discuss with students:

- The biology of the weed
- The harm caused by the weed
- How the weed's structural features and adaptations results in their survival and leads to its designation as a pest.
- Control measures for the weed – Note that Atlas of Living Australia has webpages devoted to biological control of weeds.

Work with the students to plan a weed survey in a suitable area. The area could be the school grounds, a local park, student's backyards. Agree on an aim for the survey such as identify the location of all XXX weeds growing in the specific area.

Using a Smartboard or similar show the students how to use the MyPestGuide Reporter app to collect reports of the weeds (and/or demonstrate the online reporting tool).

Agree on the timelines for completion of collection of the survey and discuss a framework for presentation of the survey results in poster form by each student (poster to show Why, How, What and So What of the survey).

If possible students could:

1. Students collect a sample of reported weed and prepare a pressed sample of each weed (note it takes 6-8 weeks to dry samples of weeds or you can choose to microwave the weeds dry them; see page24 of Weedbusters for instructions on how to do this).
2. Refer students to one of the weed databases below to find out more about the weed they found in their state. Refer to:

Western Australian Organism List (<https://www.agric.wa.gov.au/organisms>) (for WA)

A-Z of weeds (<http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/weeds/a-z-of-weeds>) (for Victoria)

NSW Weedwise (<http://weeds.dpi.nsw.gov.au/>) (for NSW)

Non-declared weeds (<https://www.business.qld.gov.au/industry/agriculture/species/non-declared-pests/weeds>), Declared weeds

(<https://www.business.qld.gov.au/industry/agriculture/species/declared-pests/weeds>) (for Queensland)

(missing ACT)

A – Z of weeds (<http://www.lrm.nt.gov.au/weeds/find>) (for the Northern Territory)

Alert weeds

([http://www.pir.sa.gov.au/biosecurity/weeds\\_and\\_pest\\_animals/weeds\\_in\\_sa/alert\\_weeds](http://www.pir.sa.gov.au/biosecurity/weeds_and_pest_animals/weeds_in_sa/alert_weeds)) (for South Australia)

Dennis Morris Weeds and Endemic Flora Database

(<http://library.dpipwe.tas.gov.au/public/weeds/>) (for Tasmania)

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## **Learning Experience 12 - Examine the potential of garden plants to become weeds**

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### **Lesson Overview**

This lesson will provide students with an understanding of why some plants are more likely to become weeds.

### **Lesson Outcomes**

Students will:

- Review information about the weeds in their area and the harm these weeds cause

- Understand how weed species structural features and adaptations results in their survival and designation as a weed.
  - Plan and carry out an experiment to examine which plants are more likely to survive outside gardens
  - Prepare a report on their research findings.

## Teacher Background Information

Review the information available on the Weeds in Australia website:

- What is a weed (<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/what.html> (<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/what.html>))
- Why are weeds a problem?  
<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/index.html> (<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/index.html>)
- National weeds list  
<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/index.html> (<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/index.html>)
- Weeds in each state:
  - Western Australian Organism List (<https://www.agric.wa.gov.au/organisms>) (for WA)
  - A-Z of weeds (<http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/weeds/a-z-of-weeds>) (for Victoria)
  - NSW Weedwise (<http://weeds.dpi.nsw.gov.au/>) (for NSW)
  - Non-declared weeds (<https://www.business.qld.gov.au/industry/agriculture/species/non-declared-pests/weeds>), Declared weeds (<https://www.business.qld.gov.au/industry/agriculture/species/declared-pests/weeds>) (for Queensland)
  - (missing ACT)
  - A – Z of weeds (<http://www.lrm.nt.gov.au/weeds/find>) (for the Northern Territory)
  - Alert weeds ([http://www.pir.sa.gov.au/biosecurity/weeds\\_and\\_pest\\_animals/weeds\\_in\\_sa/alert\\_weeds](http://www.pir.sa.gov.au/biosecurity/weeds_and_pest_animals/weeds_in_sa/alert_weeds)) (for South Australia)
  - Dennis Morris Weeds and Endemic Flora Database (<http://library.dpipwe.tas.gov.au/public/weeds/>) (for Tasmania)

The Weeds Australia website contains an 80 page long booklet Weedbusters that is a wonderful resource for understanding weeds and it includes weed-related activities. The Queensland Government also has a Weedbusters webpage that includes a Junior Action Plan for students to follow to help prevent the spread of weeds.

## Equipment

See page 37 of Weedbusters (<http://www.weeds.org.au/docs/weedbst.pdf>) for information on how to carry out this activity.

## Lesson Steps

Provide students with a copy of fact sheets on relevant local weeds (downloaded from one of the sites below) and in class review this factsheet(s) and the information on these weeds at Atlas of Living Australia and discuss with students:

- The biology of the weed
- The harm caused by the weed
- How the weed's structural features and adaptations results in their survival and leads to its designation as a pest.
- Control measures for the weed – Note that Atlas of Living Australia has webpages devoted to biological control of weeds.

Work with the students to plan the experiment. Agree on an aim for the experiment such as examine which types of plants are more likely to survive if parts of the plant are thrown away. Discuss a framework for presentation of the experimental results in poster form by each student (poster to show Why, How, What and So What of the experiment).

Ask students to bring the required equipment and plant cuttings to school. Plant the cuttings and evaluate over time whether or not the cuttings grow.

Students to prepare their posters.

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## Learning Experience 13 - Participate in the worldwide Pieris Project

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### Lesson Overview

This lesson will provide students with an understanding that some species are invasive (have moved from their original locations to other parts of the world) and provides the opportunity to participate in a world-wide survey of the distribution of white cabbage moth.

## Lesson Outcomes

Students will:

- Review information about cabbage white moth and the harm this pest causes
- Understand how cabbage white moth's structural features and adaptations results in it's ability to invade other areas
  - Plan and carry out a weed survey in their local area
  - Prepare a report on their research findings.
- Understand and carry out the steps required to collect specimens for a survey
- Present the class results in a poster.

## Teacher Background Information

The Pieris Project is a worldwide project that asks people from all over the world to help collect cabbage white butterflies (*Pieris rapae*). The Pieris Project was founded with the intention of creating a range-wide, long-term collection of an insect to explore questions about invasion biology and species responses to environmental change. The website provides information on white cabbage moths, how to collect and send the moths and shows an up to date map of where moths have been collected.

<http://www.pierisproject.org/> (<http://www.pierisproject.org/>)

If teachers chose this project they would need to source small rigid containers to send the collected moths to the Pieris team and students would be required to catch cabbage moths and freeze them to kill them.

Sean Ryan, the Director of the Pieris Project welcomes students sending in samples of cabbage moths and has advised that students and teachers should be aware that it will take up to three weeks for samples sent from Australia to arrive, be analysed and results published on the Pieris Project website.

Sean asked that if you send in a sample please let him know and he will prioritise your sample(s).

Email Sean at ([pierisproject@gmail.com](mailto:pierisproject@gmail.com)).

\*White Cabbage moth is a notifiable pest in the Northern Territory. If you find a white cabbage moth in the Northern Territory, please use the MyPestGuide Reporter app to send in a report of this insect or call the Plant Pest Hotline 1800 084 881.

This exercise is suitable for the winter months and all States apart from the Northern Territory\* – see occurrence map of white cabbage moth ([http://biocache.ala.org.au/occurrences/search?q=White%20cabbage%20moth#tab\\_mapView](http://biocache.ala.org.au/occurrences/search?q=White%20cabbage%20moth#tab_mapView)).

## Equipment

Internet

Refer to the Pieris Project website for instructions on how to make a butterfly net. You will also need to source crush proof containers to contain the student's samples and sent to the USA.

If you wish to display a map of where your students found white cabbage moths you will need a poster sized map of your local area.

## Lesson Steps

### Preparation

- Ask students to bring the required equipment to school (material to make butterfly net and container).
- In class review the information available on the Pieris Project website. Discuss the biology of the white cabbage moth and brain storm which structural features and adaptations have led to it being an invasive pest.
- Draw the student's attention to the aim of the Pieris Project and ask them for their thoughts on the aim. Discuss other invasive pests such as cane toads or rabbits or weeds.
- Discuss the framework for students presentation of the survey results – a poster (Why, How, What, So what).
- Prepare the butterfly nets and discuss how the students should record their data and why.
- Students to catch white cabbage moths, record their data and send off their samples.
- In class review all the data and students to put a pin in the map showing where they found their cabbage moth.
- Students to prepare a poster to summarise the survey (Why, How, What and So What).

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## Learning Experience 14 - Ant-related activity (School of Ants (<http://schoolofants.net.au/>))

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### Lesson Overview

This lesson will provide students with an understanding of the diversity of ant species in Australia and provides the opportunity to participate in an Australia-wide survey of ant species.

### Lesson Outcomes

Students will be able to:

- Review information about ants and the harm caused by some species of ants
- Understand how ant's structural features and adaptations results in it's ability to invade other areas
- Participate in an ant survey
- Prepare a report on the results of their survey.
- Understand and carry out the steps required to collect specimens for a survey
- Present the class results in a poster.



## Teacher Background Information

This activity is suitable for all States and Territories. There are several species of Tramp ants that have invaded Australia. These ants can affect human health and the environment or impact on agricultural industries. Factsheet on tramp ants is as

<https://www.environment.gov.au/system/files/resources/49574b42-7256-4e82-981e-644102b3ec16/files/fs-tramp-ants.pdf>

(<https://www.environment.gov.au/system/files/resources/49574b42-7256-4e82-981e-644102b3ec16/files/fs-tramp-ants.pdf>)

The Tramp Ants webpage (<https://www.environment.gov.au/biodiversity/invasive-species/insects-and-other-invertebrates/tramp-ants> (<https://www.environment.gov.au/biodiversity/invasive-species/insects-and-other-invertebrates/tramp-ants>)) shows the distribution of invasive tramp ants in each State and Territory and provides links to more information about each type of tramp ant.

School of Ants is a Citizen Science project being run by Dr Kirsti Abbott, Department of Zoology, University of New England in New South Wales. The School of Ants webpage invites Citizen Scientists to carry out an ant survey in their area. The webpage provides the data sheets and instructions on how to survey and collect ants and send the collected ants to Dr Abbott who will identify the ants and provide a summary of collected ants back to the students. Students could write a scientific report on their survey (why, how, what, so what).

Teachers should look at the School of Ants activity as being a two stage activity as it will take up to 8 weeks for Dr Abbott to provide a summary back to students. If you are planning to participate in School of Ants (<http://schoolofants.net.au/register/>) register and let Dr Abbott know you are using the activity as part of your biosecurity education program.

## Equipment

Prepare data sheets and purchase food baits and cards (see instructions on the School of Ants website).

Locate a freezer where you can freeze your trapped ants (as you need to freeze your captured ants before you send them to School of Ants).

Digital camera (to take photos of the ants on the cards).

A map of the school or area where you intend to place the ant traps will help you discuss/plan the survey with your students.

## Lesson Steps

- In class review the information available on the Ant School and Tramp Ants webpages. Discuss the biology of ants and brain storm which structural features and adaptations have led to some species of ants being invasive pests.

- Draw the student's attention to the aim of the Ant School project and ask them for their thoughts on

the aim. Discuss other invasive pests such as cane toads or rabbits or weeds.

- Use the map and discuss/plan where the students will place the ant traps and the importance of accurate data collection.
- Prepare the ant cards and discuss how the students should record their data and why.
- Discuss the framework for students presentation of the survey results – a poster (Why, How, What, So what).
- Students carry out the ant survey. Make sure the time of placing the traps is staggered so you can visit each trap after the end of the one hour long period and take a photo of the ants on the ant card.
- Freeze the ants and send the collected ants to School of Ants.
- Divide the class into groups and ask each group to count the ants on the photos. Collate and data and calculate the average of the results. Review the data and students to - Prepare a poster to summarise the survey (Why, How, What and So What).

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## **Learning Experience 15 - Mildew Mania (<http://mildewmania.com.au/>) (Western Australia only; must register to participate before the end of April each year)**

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### **Lesson Overview**

Students take part in a WA-wide survey of the prevalence of powdery mildew (a disease of barley).

### **Lesson Outcomes**

Students will be able to:

- Plant barley seeds, grow barley plants, inspect the plants for presence of powdery mildew and take samples of leaf tissue for analysis
- Understand that pathogens like powdery mildew can adapt to their environment and develop fungicide resistance
- Prepare a report on the results of their experiment.

### **Teacher Background Information**

Mildew Mania provides an opportunity for Western Australian teachers and students to participate in a citizen science research project focused on mapping the spread of powdery mildew across the State. Powdery mildew is a fungal disease that is the major cause of economic loss for Western Australian barley growers—up to \$100 million annually. If you wish to participate you need to register on the Mildew Mania website in December (to participate in the next year).

Refer to The Mildew Mania website <http://mildewmania.com.au/> (<http://mildewmania.com.au/>)

contains information on powdery mildew, and all the instructions you need to participate. Each year, the study booklet will outline the aim of the experiment/survey and provides information on what each participating school needs to do as well as what will be provided to each school.

<http://mildewmania.com.au/wp-content/uploads/2015/09/booklet2015.pdf>

(<http://mildewmania.com.au/wp-content/uploads/2015/09/booklet2015.pdf>)

Participating in this activity provides a useful example of the importance of research in mitigating the impact of harmful pests.

## **Equipment**

Please refer to the Mildew Mania booklet.

## **Lesson Steps**

These will vary according to the aim of the survey. Please refer to the Mildew Mania booklet.

Depending on the aim of the experiment/survey teachers will be able to explore one or more of the following topics:

- The barley industry
- Fungal diseases and the effect of powdery mildew on the industry
- Plant breeding with the aim to produce resistant strains of barley
- Fungal diseases and development of resistance of fungicides

Preparation of a report poster (Why, How, What and So what).

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## **Learning Experience 16 - Investigate fire ants**

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Please refer to the Investigate fire ants webpage for information

<http://www.dpi.nsw.gov.au/education/resources-for-schools/investigate-fire-ants>

(<http://www.dpi.nsw.gov.au/education/resources-for-schools/investigate-fire-ants>). This is an integrated package designed to stimulate an interest in science, technology and agriculture in students and to support the teaching of these subject areas in schools.

This activity is for students in New South Wales only. The 2016 competition closes on 9 May 2016.

However teachers can adapt it to suit their own needs and include

Participating students will undertake an investigative survey of their school for fire ants. Students will learn about and research biosecurity measures, design and test a lure to attract ants and analyse their results. Students will also prepare a fire ant related communication product to inform and educate others in their school about fire ants, their investigation method and results.

## Unit 3: Promoting a biosecurity-aware community, including the people that work in related occupations

### Learning Experience 17 - Biosecurity is everywhere

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#### Lesson Overview

This lesson provides students with an opportunity to consider where their food comes from and the role of different people in keeping food safe from damaging pests. Students will research the journey of food from paddock to plate, how different people keep food safe from damaging pests and prepare a poster showing this journey for one food.

#### Lesson Outcomes

Students will be able to:

- Name the occupation of some people along the food supply chain
- Understand how various occupations along the food chain protect food from harm from pests.
- Understand how vulnerable of our food is to harm caused by pests.

#### Equipment

Worksheet as provided A4 size and if possible a poster sized copy of each worksheet to be used to share and discuss the roles with the whole class. If it is not possible to prepare a poster sized worksheet you could write the information on a whiteboard or use a Smartboard.

Internet access

#### Lesson Steps

Discuss where food comes from – you could use props such as packets of grains (eg rolled oats, wheatgerm, pearl barley, lentils etc; a bottle of canola oil).

Provide students with a copy of the worksheet and ask them to work in groups to research the people shown in the table and how each person has a role in biosecurity.

Work as a class to collate the information and fill in the poster/whiteboard/smartboard.

Discuss:

- The number of people required to deliver food to us to eat.
- The vulnerability of our food to harm – only one breakdown in the food supply chain means our food would be unsafe for consumption.

Discussion:

From paddock to plate everyone handling our food has a role to play in keeping our food safe from harmful pests and diseases. Have a class brain storm and fill in the tables below.

Table 1: These are the people who deal with livestock from the paddock to plate pathway

<b>The people who deal with livestock</b>	<b>Their role in biosecurity</b>
Animal breeder	
Animal researcher	
Owner of livestock	
Farm hand (the person who looks after the livestock)	
Neighbours of the farmer who owns the livestock	
Farmer who grows feed for the livestock to eat	
Stockfeed manufacturer who make livestock feed	
Veterinarians who keep livestock healthy	
Stockfeed transporters	
Abattoir workers	
People who dispose of abattoir waste	
People who package the livestock products	
People who handle the packaged products	
Consumers who eat the final packaged products	

Table 2: These are the people who deal with plants from the paddock to plate pathway

The people who deal with plant-based foods	Role in biosecurity
Plant breeder	
Plant researcher	
Owner of the growing crops	
Farm hand (the person who looks after the crops)	
Neighbours of the farmer who is growing the crops	
Fertiliser company who makes a product for crops	
Agronomist who checks on the health of the crops	
Crop transporters	
People who process the crops into products	
People who dispose of crop waste	
People who package the plant food products	
People who handle the packaged products	
Consumers who eat the final packaged products	

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## Learning Experience 18 - Zones of restriction (within Australia)

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### Lesson Overview

This lesson provides students with an opportunity to examine each State and Territory's quarantine requirements and the reasons underpinning these requirements.

## Lesson Outcomes

Students will be able to:

- Research intrastate and territory quarantine requirements
- Understand the drivers\* for these quarantine requirements

\*Scientific knowledge of the harm caused by pests has led to government (community) decision to have quarantine areas.

## Teacher Background Information

Each state and territory of Australia has specific quarantine requirements – review the information available at <http://www.quarantinedomestic.gov.au/> (<http://www.quarantinedomestic.gov.au/>). At this webpage you can see what is not permitted to be taken into each of the States and Territories. Also note that some states have internal restriction zones e.g. Travellers within Victoria may not take fruit or fruiting vegetables (including capsicum, chilli, tomato and eggplant). Into the Greater Sunraysia Pest Free Area. This is just an example - there are other areas in other states.

For your state review information about relevant pests e.g. in WA review information about Queensland fruit fly and Varroa mites (these contribute to the ban on taking fresh fruit and vegetables and honey products from other states into WA).

## Equipment

Internet

Worksheets (seven different sheets – one for each Australian State and territory and each worksheet should have enough space for students to write within each state the names of items that cannot be carried across state borders eg fresh fruit and vegetables cannot be brought into WA from other states.

<http://www.teachthis.com.au/products/view-resource/link/Australia-Youre-Standing-In-It-Unlabelled/id/4161/> (<http://www.teachthis.com.au/products/view-resource/link/Australia-Youre-Standing-In-It-Unlabelled/id/4161/>)

## Lesson Steps

- Discuss the aim of quarantine and use a couple of your state relevant examples to help students understand the relevance of quarantine to themselves (eg for WA use Queensland Fruit Fly and Varroa mite as an example).
- Divide the class into groups and allocate each group a state or territory to research. Provide each group with the relevant worksheet and let each group research quarantine requirements for their allocated state and fill in their worksheet. Students should draw pictures of food items and put a cross

or tick on the item on their map.

- Ask each group to present their findings to the class. Discuss these findings and the importance of everybody's behaviour in protecting our agricultural industries from harmful pests.

#### Discussion:

- What things are you not allowed to bring into your state or country? This webpage provides information on what you may and may not bring into each of the Australian States and Territories

<http://www.quarantinedomestic.gov.au/destination-western-australia.html>

(<http://www.quarantinedomestic.gov.au/destination-western-australia.html>)

- What about travelling within your home state?

- Use a map to locate the zones with restrictions.

- Draw some pictures of the food items and put a cross through them and place them on your map.

- For food production systems (where plants and animals are produced to make food), biosecurity generally refers to practices that help reduce the likelihood of pests and diseases being introduced, established, or spread.

- What is the difference between the words "introduction", "establishment" and "spread" in relation to pests and disease?

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## **Learning Experience 19 Biosecurity and personal security**

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### **Lesson Overview**

This lesson provides students an opportunity to examine the scientific reasons behind Australia's quarantine requirements.

### **Lesson Outcomes**

Students will be able to:

- Review Australia's quarantine requirements
- Appreciate the harm caused by past introductions (intended or accidental) of pests into Australia and deliver a poster report summarising their research.
- Understand the procedure for declaring items when travelling to Australia from other countries

### **Teacher Background Information**



The following links should be viewed prior to delivering this lesson as teachers may like to select out particular parts to focus on:

- Sydney Morning Herald article

This article describes five recent cases of harm caused by introductions (intended or accidental) of pests into Australia.

<http://www.smh.com.au/technology/sci-tech/someone-should-tell-johnny-depp-about-these-five-biosecurity-disasters-20150514-gh1zl8.html> (<http://www.smh.com.au/technology/sci-tech/someone-should-tell-johnny-depp-about-these-five-biosecurity-disasters-20150514-gh1zl8.html>)

- BTN video

<http://www.abc.net.au/btn/story/s4239957.htm> (<http://www.abc.net.au/btn/story/s4239957.htm>)

The <http://www.agriculture.gov.au/travelling> (<http://www.agriculture.gov.au/travelling>) webpage enables anyone to complete a short quiz and find out about Australian quarantine requirements. Use this webpage to review:

Border Security Programme

The following three stories feature on the television series “Border Security”.

<http://www.bing.com/videos/search?q=border+security> (<http://www.bing.com/videos/search?q=border+security+you+tube+soil+australia&view=detail&mid=27C17C9DA192E6BFBAD127C17C9DA192E6BFBAD1&FORM=VIRE2>)

It is suggested to follow one story at a time rather than jump from one story to another as the show normally does. Times to follow each story are indicated below.

Brisbane Airport- undeclared fruit (2.11-3.49 min; 6.12-7.40 min; 13.06-14.06 min; 18.25-20 min)

Sydney Airport- a mysterious item in passenger luggage (3.50-5 min; 7.40-9 min; 14.10-15.36 min)

Perth Airport- confiscated salami (9.10-11.28 min; 15.44-16.45 min)

The following webpage enables anyone to complete a short quiz and find out about Australian quarantine requirements. <http://www.agriculture.gov.au/travelling> (<http://www.agriculture.gov.au/travelling>)

Use this webpage to review:

- The requirements for bringing: pets; items you can eat or drink; and cosmetics, fishing/camping/sporting equipment, souvenirs or items made from wood, leather, fur, feathers, teeth, bones, shells, sand, stone, seeds into Australia.
- The scientific reasons underpinning these quarantine requirements (eg risk of rabies if bringing pets to Australia).

## Equipment

Internet

Poster sized pieces of paper.

## Lesson Steps

### Part 1

- Discuss Australian requirements with the students and encourage a few students to describe what it was like to go through Australian quarantine after their return (or entry) to Australia.
- Brain storm reasons why Australia has quarantine requirements.
- Show the students all or some of the print and video resources and discuss the cases of harmful and potentially harmful introductions.
  - Sydney Morning Herald article
  - BTN video
  - Border Security video

Border security video discussion questions

Of all the packages that arrive in Australia, those that contain food present the most risk to Australia's relative freedom from major animal and plant pest and diseases.

Biosecurity Officers have an important job in helping to protect Australia.

- What are some of the equipment the biosecurity officers use to detect a problem?
- What can't be brought into Australia?

### Part 2

#### Extension - Passenger cards

Some students may have experience travelling internationally so may be familiar with passenger cards. Even if they haven't, it is a good opportunity to introduce this information to enable them to better understand passenger declarations and the reasons they exist for future travel.

This extension activity is concerned about the information relating to pest and disease risk.

Look at some of the information at

<http://www.border.gov.au/Trav/Ente/Goin/passenger-cards>

(<http://www.border.gov.au/Trav/Ente/Goin/passenger-cards>)

Passengers coming into Australia from overseas are required to complete an incoming passenger card. <https://www.border.gov.au/EnteringorleavingAustralia/Documents/english-ipc-sample.pdf>  
(<https://www.border.gov.au/EnteringorleavingAustralia/Documents/english-ipc-sample.pdf>)

Questions 6-11 are the ones that most relate to the risk of bringing pests and disease into the country. This is a declaration. If you tick yes to any of the items it alerts officers to assess the risk of the items a passenger is bringing in to the country.

<http://www.agriculture.gov.au/travelling/arriving-in-australia>

(<http://www.agriculture.gov.au/travelling/arriving-in-australia>)

Give an example of one item from each category that need to be declared on an incoming passenger declaration when arriving in Australia.

<b>Dairy and egg products</b>	
Meat, poultry and seafood	
Seeds and nuts	
Fresh fruit and vegetables	
Plant material	
Live animal and animal products	

Alternatively, divide the class into groups and allocate each group a scenario

For example:

- I am an Englishman and wish to move to Australia with my pet dog
- I am an African family and wish to move to Australia bringing items made of animal fur with me

Ask each group to research the requirement for import and the underlying reasons why the restrictions exist and to prepare a poster summarising their findings.  
Each group should present and discuss their results to the class.

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## **Learning Experience 20 - The role of quarantine detector dogs in protecting Australian agricultural industries**

### **Lesson Overview**

This lesson uses video and web-based information to give students an understanding of the work done by quarantine dogs to prevent harm to Australian agricultural industries.

### **Lesson Outcomes**

Students will be able to:

- Develop an understanding of the work done by quarantine dogs
- Give basic reasons why dogs and certain breeds are suitable for biosecurity work

- Describe the similarities and differences between quarantine detector dogs and pet dogs

## Teacher Background Information

Quarantine dogs are one method used to protect Australia's agricultural industries from the introduction of pest and disease. Note that there are other types of detector dogs that are trained to find other things, such as drugs and explosives. Detector dogs have been used in Australia since 1992

## Resources

There are 5 individual resources at this link:

[https://www.dropbox.com/sh/uzxu27pu16ayh88/AACR6yzKozDwZLa\\_TkqF-WU4a?dl=0](https://www.dropbox.com/sh/uzxu27pu16ayh88/AACR6yzKozDwZLa_TkqF-WU4a?dl=0)

([https://www.dropbox.com/sh/uzxu27pu16ayh88/AACR6yzKozDwZLa\\_TkqF-WU4a?dl=0](https://www.dropbox.com/sh/uzxu27pu16ayh88/AACR6yzKozDwZLa_TkqF-WU4a?dl=0))

- The first two videos show footage of a quarantine dog going about its work.

1. One has text and is specific to WA (first dog image)
2. The other is generic (all states, represented by vegetables image)
3. The third video (also dog image) is a Q&A with a biosecurity officer talking about the dogs used in quarantine. Question sheet provided

There are 2 written documents:

4. The first is "A day in the life of George" with details of a typical day
5. A written version of the biosecurity officer Q&A

## Other resources

What makes dogs top smellers?

<http://www.abc.net.au/science/articles/2009/07/02/2614760.htm>

(<http://www.abc.net.au/science/articles/2009/07/02/2614760.htm>)

Facts about detector dogs

<http://www.news.com.au/travel/travel-updates/the-life-of-australias-sniffer-dogs/story-e6frfq80-1226889082147> (<http://www.news.com.au/travel/travel-updates/the-life-of-australias-sniffer-dogs/story-e6frfq80-1226889082147>)

BTN story about detector dogs

<http://www.abc.net.au/btn/story/s3491982.htm> (<http://www.abc.net.au/btn/story/s3491982.htm>)

## Equipment

Internet      Learning Exp 20 Video 3 Questions (pdf/Learning Exp 20 Quarantine dogs video.pdf)

Print

questions for video 3

## Lesson Steps

- Revise the reasons why Australia has quarantine requirements and personal responsibilities when travelling
- Ask students if they have seen quarantine detector dogs when travelling through airports and to share their experience with the class.
- Share some of the video and print resources with students so they can gain an appreciation of the work of quarantine detector dogs.
- Review the “Day in the life of George”. Students could separate out the parts that are “work” and “play” for George, and compare to their own life.
- Students brainstorm the similarities and differences between quarantine detector dogs and pet dogs.
- Students could design a poster to promote biosecurity in airports.
- Remind students when they are developing their ideas:
  - Quarantine dogs are not to be touched
  - International travellers might not speak English
  - Items that should not be brought in
  - How air travel between countries has increased pest and disease importation risk
  - The value of Australia’s agricultural industries and the need to protect them

Table 1: A day in the life of a detector dog.

Time	Description of work
6am:	

Video:

<http://www.abc.net.au/btn/story/s3491982.htm> (<http://www.abc.net.au/btn/story/s3491982.htm>)

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## Learning Experience 21 - How can pests enter and move around Australia?

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## Lesson Overview

This lesson provides an opportunity for students to play and game and learn about how biosecurity prevents the spread of pests.

## Lesson Outcomes

Students will be able to:

- Review the different ways pests can spread
- Understand how biosecurity stops the spread of pests.

## Equipment

Develop some flashcards with the following words with images:

- Natural dispersal
- Vehicles - cars/ships
- Air
- Water
- Soil
- People
- Animals
- Mail

## Lesson Steps

In class discuss how pests can spread – make sure you cover all of the types of dispersal on the flashcards.

Print and discuss the following biosecurity processes

- Road checkpoint [Learning Experience 21 - Biosecurity processes \(pdf/Learning Exp 21.pdf\)](#)
- Detector Dogs
- Handwashing
- Foot baths
- Vaccination of farm animals/pets
- Fruit bins at airports
- Rabbit proof fence
- Passenger travel card

Divide the class into groups and play the game by holding up a pest spread flashcard and asking students which type of biosecurity has a role in preventing the spread of pests.

## Game:

Describe the natural and human-assisted transport pathways pests can be moved or transferred around the country using a set of flashcards.

Print flashcards of each of the following risk pathways which allow pest to be moved around the world:

- Natural dispersal
- Vehicles - cars/ships
- Air
- Water
- Soil
- People
- Animals
- Mail

Explain what each of the following pictures represents in relation to biosecurity (write the answers on the back of each card).

- Road checkpoint
- Detector dogs
- Handwashing
- Foot baths
- Vaccination of farm animals/pets
- Fruit bins at airports
- Rabbit proof fence
- Passenger travel card

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## **Learning Experience 22**

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### **Lesson Overview**

This lesson provides students with an opportunity to examine how research has mitigated the harm caused by a pest.

### **Lesson Outcomes**

Students will be able to:

- Review how researchers have worked to reduce the harm caused by a pest
- Prepare a poster summarising their research

## Teacher Background Information

### Case study 1: Wheat stem rust (fungal disease) – Ug99

<http://www.fao.org/agriculture/crops/rust/stem/rust-report/stem-ug99racettksk/en/>

(<http://www.fao.org/agriculture/crops/rust/stem/rust-report/stem-ug99racettksk/en/>)

[http://www.agriculture.com/news/crops/wheat-researcher-says-stemrust-disease\\_2-ar52642](http://www.agriculture.com/news/crops/wheat-researcher-says-stemrust-disease_2-ar52642)

([http://www.agriculture.com/news/crops/wheat-researcher-says-stemrust-disease\\_2-ar52642](http://www.agriculture.com/news/crops/wheat-researcher-says-stemrust-disease_2-ar52642))

The problem....a new virulent strain of stem rust was identified from wheat fields in Uganda in 1999. Ug99 is a cause for concern as it has the capacity to turn a healthy looking crop, only weeks away from harvest, into nothing more than a tangle of black stems and shrivelled grains at harvest.

What researchers are doing....designing resistance genes, mapping rusts and tracking the situation across the globe by a global network of rust workers.

This video talks about how research is helping by breeding resistant wheats.

<http://www.abc.net.au/catalyst/stories/3285577.htm>

(<http://www.abc.net.au/catalyst/stories/3285577.htm>)

### Case study 2: Foot and mouth disease

<http://www.agriculture.gov.au/pests-diseases-weeds/animal/fmd> (<http://www.agriculture.gov.au/pests-diseases-weeds/animal/fmd>)

<http://www.bbc.com/news/magazine-35581830> (<http://www.bbc.com/news/magazine-35581830>)

The problem - Foot-and-mouth disease (FMD) is a highly contagious animal disease that would have severe consequences were it to be introduced into Australia. There have been a number of outbreaks in FMD-free countries that have had large socio-economic impacts. The 2001 outbreak in the United Kingdom caused losses of more than 8 billion pounds (approximately \$AUD 19 billion)

Researchers have developed a vaccine to help protect out cloven hooved animals from foot and mouth disease

<https://www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/foot-and-mouth-disease-vaccine-management/>

## Equipment

Internet

## Lesson Steps

- In class review Ugg99 and Foot and Mouth disease discuss how each pest damages our food.

Remind students that these pests are kept out of Australia by quarantine.

- Ask students to research recent developments in the management of these pests and to deliver a report on their findings (framework for the report –Why, How, What, So What).



## Learning Experience 23

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### Lesson Overview

This lesson provides an opportunity for students to examine how they can make biosecurity their responsibility and help protect our food.

### Lesson Outcomes

Students will be able to:

- Review the key processes of biosecurity
- Develop a biosecurity plan that is relevant to their own situation.

### Teacher Background Information

Everybody has a role to play in protecting our food and environment from harmful pests. While we tend to think that biosecurity is something that only farmers need to worry about this is not correct.

Everybody can make a difference in biosecurity and protecting our food and environment. People living near ports and transport corridors have a special role to play as any hitchhiking pests and diseases are likely to appear near ports and transport corridors first.

One of the cornerstones of effective biosecurity is the concept of 'come in clean and leave clean'.

Come in clean means your body and vehicle should be free of plant, insect or animal material (and any associated diseases) that could potentially start to grow and become a pest if you accidentally drop it in a new area. Leaving clean means, not taking any plant, insect or animal material from the area and transporting it into a new area.

See these examples of how humans have spread unwanted pests and diseases:

Dieback Working Group (<https://www.dwg.org.au/what-is-phytophthora-dieback>);

Stop the Spread (<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/no-space/stop-the-spread>),

Cane Toads in OZ (<http://www.canetoadsinoz.com/>)

### Equipment

Worksheet [Worksheet: My biosecurity plan \(pdf/Biosecurity resource - My biosecurity plan.pdf\)](#)

– my

biosecurity plan. Note: you may need to adjust this plan to ensure it is relevant to your students.

## Lesson Steps

- Discuss what you have learned about biosecurity and brainstorm how you can make a difference to protecting our food and environment from harmful pests. Consider:
  - What does 'come in clean and go out clean' mean?
  - Why should you report any pests you find using MyPestGuide Reporter?
  - Why should you not dump garden waste in bushland?
  - Why should you not release aquarium fish or plants into waterways?
- Brainstorm how pests could harm your family, pets and plants.
- Review how your own behaviour can help keep your home and pets safe from harmful pests.
- Watch one or more of the Farm Biosecurity videos (<http://www.farmbiosecurity.com.au/videos/>)
- As a class read the Kids make great pest detectives (<https://www.agric.wa.gov.au/pest-insects/kids-make-great-pest-detectives?nopaging=1>) article
- In groups, discuss how the recommended farm biosecurity practices are similar to how you could protect your home and property from pests.
- Provide students with a copy of the worksheet and ask students to work in groups to fill in the checklist for their house or property.
- As a class discuss the completed biosecurity plans, any barriers to carrying out the required actions and how having a biosecurity plan will help protect student's family and possessions from harmful pests.
- Students should take their biosecurity plans home to discuss these with their families.

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## Other resources

This section includes other biosecurity of biodiversity resources that teachers might find useful. Most of these resources include background information and 'hands on' activities.

Discovery Circle (<http://www.discoverycircle.org.au/>) is a South Australian project that includes a range of citizen science projects including Cat Tracker, a little Corellas survey and a goanna survey. The site also provides information on upcoming South Australian bioblitzs.

Inspiring Australia (<http://inspiringaustralia.net.au/>) is an Australian Government website aimed at increasing engagement and interest in sciences. The website contains information on Citizen Science projects and links to state activities.

Invasive Animals Cooperative Research Centre resources:

Feral Focus (<http://www.feralfocus.org.au/index.html>) contains resources for teachers and students

including a list of activities, interactive scenarios and detailed research projects.

Feral Scan (<http://www.feralscan.org.au/>) invites all to look for and send in reports of feral animals.

Pest Tales (<http://www.pestales.org.au/>) contains Pest Tales provides primary teachers with a complete and up to date resource which highlights pest animal species in Australia, their impact and current ways of managing the damage they inflict on the environment, economy and people.

The Plant Biosecurity Cooperative Research Centre (<http://www.pbcrc.com.au/>) website contains a link to the Pest Investigators book which contains information and activities aimed at raising the awareness of 5 to 8 year olds about plants, pests and diseases. Teachers can look at the book online or email the Plant Biosecurity Cooperative Research Centre to receive a hard copy of the book.

The Weeds Australia website (<http://www.weeds.org.au/>) contains an 80 page long booklet Weedbusters (<http://www.weeds.org.au/docs/weedbst.pdf>) that is a wonderful resource for understanding weeds and it includes weed-related activities.

The Dieback Working Group (<https://www.dwg.org.au/>) is a Western Australian not for profit group focused on encouraging the awareness, education, management and treatment of the plant disease, Phytophthora Dieback. This group have prepared a education resource, that take one term to deliver, for Upper Primary Students. Contact the Dieback Working Group Coordinator at [info@dwg.org.au](mailto:info@dwg.org.au) (<mailto:info@dwg.org.au>)

Create a creature web activity (<http://www.scootle.edu.au/ec/viewing/L755/index.html>) which is quite fun. Located on Scootle when you log in type in 'create a creature'

























