

western shield



Activities on threatened species

for years 4 to 6



Department of Biodiversity,
Conservation and Attractions



Nearer to Nature

Acknowledgments

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Front cover

Inset left Parks and Wildlife’s *Western Shield* excursion for schools at the Perth Hills Discovery Centre.

Photo – Jennifer Eliot/Parks and Wildlife

Inset centre and page 58 Juvenile woylie. Photo – Sabrina Trochini

Inset right and page 33 Numbat. Photo – Doug Coughran/Parks and Wildlife

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Page 14 1 – Lightfoot/www.morguefile.com, 3 – Mueller/www.morguefile.com, 5 – Kakisky/www.morguefile.com, 7 – Hotblack/www.morguefile.com, 8 – Sgarton/www.morguefile.com

Page 19 Gilbert’s potoroo – Dick Walker/Gilbert’s Potoroo Action Group

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Page 45 Western Shield sign – Michelle Drew/Parks and Wildlife

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Overview of Action Pack

Outcomes

On completion of these activities students will:

- have an increased awareness of Western Australia's threatened species and the need to conserve biodiversity;
- be familiar with Department of Parks and Wildlife's wildlife recovery program *Western Shield* and the work being done to conserve native animals;
- have an improved understanding of Western Australia's unique ecosystems, and how introduced animals affect food webs; and
- be encouraged to take positive community action to contribute to the protection and conservation of native wildlife.

Phase of Development: Years 4 - 6

The following matrix describes the key curriculum Learning Area outcomes from working with this pack. Many other outcomes, from learning areas, general capabilities and the cross curriculum priority of Sustainability will be achieved whilst using the pack.

This pack is available on the Parks and Wildlife website for teachers who have booked a 'Back from the Brink' excursion and can be used as a pre and post excursion activity manual.

Using the *Western Shield* Action Pack will contribute to the attainment of learning outcomes as indicated in the following table:



Woylie release at Perup



Quokka

Australian Curriculum Links	Year	Outcome
<i>Science</i>		

Science Understanding Biology

<p>Living things, including plants and animals, depend on each other and the environment to survive (ACSSU073)</p> <p>Living things have structural features and adaptations that help them to survive in their environment (ACSSU043)</p> <p>The growth and survival of living things are affected by the physical conditions of their environment (ACSSU094)</p>	4	<ul style="list-style-type: none"> Students understand that the environment provides the resources required for survival. Certain native animals are very vulnerable to predation by foxes and feral cats. The jarrah forest has a very complex food web; the introduction of new predators has a major impact on it. Removal of a species, such as the woylie, from the forest can affect the whole ecosystem, as each organism provides benefits to the whole system (e.g. woylies dig and aerate the soil allowing water to reach roots of trees more easily).
	5	<ul style="list-style-type: none"> Native animals tolerance to 1080, a naturally occurring poison, has helped them survive.
	6	<ul style="list-style-type: none"> The introduction of feral predators has adversely affected the numbers of native animals.

Science as a Human Endeavour

<p>Nature and development of science</p> <p>Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena (ACSHE081)</p>	5	<ul style="list-style-type: none"> Native animals have a tolerance to a naturally occurring poison, 1080. Students understand that monitoring the environment informs the <i>Western Shield</i> program.
<p>Use and influence of science</p> <p>Scientific knowledge helps people to understand the effect of their actions (ACSHE062)</p> <p>Scientific knowledge is used to inform personal and community decisions (ACSHE217)</p> <p>Scientific knowledge is used to inform personal and community decisions (ACSHE220)</p>	4	<ul style="list-style-type: none"> Students realise that the 1080 baiting program is backed by extensive research and good science.
	5	<ul style="list-style-type: none"> Through a scientific understanding of available methods a naturally occurring poison was chosen as the most effective method of feral predator control.
	6	<ul style="list-style-type: none"> Students use knowledge gained from this pack to choose an appropriate action to conserve wildlife.

Geography

Knowledge and Understanding

<p>The types of natural vegetation and the significance of vegetation to the environment and to people (ACHGK021)</p>	4	<ul style="list-style-type: none"> Vegetation provides habitat for native animals and introduced species. Certain native plants contain a poison which can kill introduced species but which native animals are tolerant to.
<p>The importance of environments to animals and people, and different views on how they can be protected (ACHGK022)</p>	4	<ul style="list-style-type: none"> People play a critical role in protecting native wildlife. Students explore strategies for conserving wildlife, both at a large scale (<i>Western Shield</i>) and in their own school grounds / local area.
<p>The natural resources provided by the environment, and different views on how they could be used sustainably (ACHGK024)</p>	4	<ul style="list-style-type: none"> Students consider why it is important to conserve native wildlife.
<p>The influence of people, including Aboriginal and Torres Strait Islander Peoples, on the environmental characteristics of Australian places (ACHGK027)</p>	5	<ul style="list-style-type: none"> The introduction of foxes and cats (by people) have had a major impact on native wildlife and ecosystems.

Planning for using this pack

There are two options for using this pack. First option is using only the information provided in the pack, students complete the activity sheets. Photocopying of resource and activity sheets will be required. Alternatively, a more in-depth approach will require additional resources. These are listed under resources at each stage.

Key aspects of the in-depth approach include:

- developing a working portfolio for the students to share with parents
- encouraging collaborative group work
- focusing on inquiry as a process for learning
- using open-ended tasks
- exploring a variety of learning technologies
- providing opportunities for students to reflect on their learning

This pack is divided into six stages appropriate for students working in small groups. Stages 2 to 5 can be run sequentially by all groups in the class or concurrently with different groups addressing different stages and making a presentation on completion.

Teachers' Notes, Resource Notes for students and an activity sheet to complete for inclusion in the students' portfolios support each stage. For metropolitan schools and schools in the Bunbury area a *Back from the Brink* excursion (see Stage 5 for details) will help to achieve the desired student outcomes. Bookings need to be made well in advance of the required date. To book visit our web site for full details - <http://www.dpaw.wa.gov.au/get-involved/nearer-to-nature/schools/288-how-to-book>

Stage 1: Threatened Species

Immerses students in the theme of threatened species, through a class brainstorm and discussion, investigation, preparation of a glossary and background reading.

Stage 2: Investigate a Species

Through their own investigations of an animal species, students discover the importance of the environment and have a better understanding of the need for biodiversity conservation.

Stage 3: Introduced Predators

Explores and develops students' understanding about foxes and feral cats through reading text and responding to focus questions.

Stage 4: What is Western Shield?

Consolidates students' knowledge of threatened fauna species, *Western Shield* and associated terminology through viewing, listening, speaking, reading and responding to focus questions.

Stage 5: Foxed Food Chains

Examines the detrimental impact of an introduced species on a food chain, food web and ultimately an ecosystem. This stage is supported by a *Back from the Brink* excursion to the jarrah forest.

Stage 6: Act for Conservation

Provides ideas on opportunities for students to contribute to the conservation of threatened species and biodiversity.



Chuditch

Threatened Species
Stage 1

Teachers' Notes

Stage 1 – Threatened Species

This stage immerses students in the theme of threatened species, through a class brainstorm and discussion, investigation, preparation of a glossary and background reading.

Background information

Species extinction is a process that is not new. In the past the most dramatic wave of extinctions that we know of, happened with the disappearance of the dinosaurs from Earth. What is of concern today, is that the rate of extinctions is increasing greatly and is happening on a massive scale. Human activities are responsible.

Worldwide there are many reasons for extinctions including: habitat destruction, hunting and poaching, pollution, disease and introduced species. In Australia one of the main causes of extinctions is the introduction of predators and competitors from overseas.

Over the past 100 years, more mammals have become extinct in Australia than anywhere else in the world. In Western Australia, since European settlement:

- 12 mammal species have become extinct
- 7 have disappeared from the mainland but remain on a few offshore islands
- more than 40 have declined significantly or are threatened with extinction.

The native mammals most at risk are easy prey—small and medium sized animals weighing between 35 grams and 5.5 kilograms. *Western Shield* is the flagship wildlife recovery program of the Department of Parks and Wildlife. It was launched in 1996 and is now one of the biggest wildlife conservation programs ever undertaken in Australia. The aim of the project is to recover native animal populations in the wild through control of foxes and feral cats and to reintroduce native animals to their former habitats.

Definitions (as based on the IUCN Red List of Threatened Species)

Extinct (EX) A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a timeframe appropriate to the taxon's life cycle and life form.

Extinct in the wild (EW) A taxon is Extinct in the Wild when it is known only to survive in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual) and throughout its historic range have failed to record an individual. Surveys should be over a timeframe appropriate to the taxon's life cycle and life form.

Critically endangered (CR) A taxon is Critically Endangered when the best available evidence indicates that it meets any of the set criteria (e.g. small population size, reductions in populations size) and it is therefore considered to be facing an extremely high risk of extinction in the wild.

Endangered (EN) A taxon is Endangered when the best available evidence indicates that it meets any of the set criteria, and it is therefore considered to be facing a very high risk of extinction in the wild.

Vulnerable (VU) A taxon is Vulnerable when the best available evidence indicates that it meets any of the set criteria (e.g. small population size, reductions in populations size), and it is therefore considered to be facing a high risk of extinction in the wild.

Near threatened (NT) A taxon is Near Threatened when it has been evaluated against set criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Threatened A general term covering all categories of animals under threat i.e. critically endangered, endangered and vulnerable.

Teachers' Notes (continued)

Concepts

- Extinction rates today are much higher than natural rates because of human activities.
- A variety of native animals are threatened by foxes and feral cats. This includes small-medium sized mammals, reptiles and ground-nesting birds.

Resources

- Stage 1 Activity sheet 1.1 – Threatened species around the world (1 per student)
- Stage 1 Activity sheet 1.2 – Our local threatened species (1 per student)
- Stage 1 Resource sheet 1.1 – *Western Shield* poster

Additional resources

- Internet sites:
 - The Department of Parks and Wildlife's website: <http://www.dpaw.wa.gov.au>
 - Environment Australia: <http://www.environment.gov.au>
 - Perth Zoo: <http://www.perthzoo.wa.gov.au>
 - International Union for Conservation of Nature website: <http://www.iucn.org/>
- ABC TV report on feral cats in Western Australia <http://www.abc.net.au/7.30/content/2012/s3651580.htm>
- *Before it's too Late* film on 'Mini Marsupials'
- <https://www.youtube.com/watch?v=ombZg1QM-Go>
- Parks and Wildlife *LANDSCOPE* magazines. Contact Perth Hills Discovery Centre (Ph: 9295 6149) for copies of relevant articles. See Reference List at back of this Action Pack.
- Bush book: *Mammals of the South-West* (a valuable and inexpensive resource). Available from Parks and Wildlife, Kensington. Bush Books can be ordered on-line at: <https://shop.dpaw.wa.gov.au/>
- DVD *Deadly Protectors*, which has some great footage of WA's threatened species. Contact Perth Hills Discovery Centre (Ph: 9295 6149) for a loan copy.

Teacher Directions

Note: teachers can skip parts 1 and 2 if you believe the class is sufficiently aware of the concept of extinction (or go through it quickly to set the scene).

1. As a class, brainstorm the concept of 'extinct species'. Ask students: *What does the term 'extinct' mean? If we were to search 'extinct species' on the internet, what animals do you think we would find?*
2. You could follow this by searching extinct species on Google Images as a whole class activity and having an open discussion on which species the students can name. Ask students: *What do you know about them? Why did they become extinct?*
You will probably see animals like:
 - Woolly mammoth (extinct due to changing climate)
 - Dinosaurs (possible causes of extinction are change in the climate, and/or catastrophic effects of impact of large meteorite on earth's weather and climate)
 - Dodo (hunting and competition from introduced species)
 - Tasmanian Tiger (hunted as a pest).
3. Conduct a class brainstorm on topic of 'threatened species'. *What do we mean by the words 'threatened species'? What threatened species can you think of?*

Teachers' Notes (continued)

4. Provide students with Stage 1 Activity Sheet – *Threatened species around the world*; they can work in groups or individually to answer questions 1, 2 and 3. They should attempt to answer the questions from their existing knowledge before looking at the prompts over the page.
5. As a follow up discussion you could ask which of these animals are our own 'locals' from WA? (chuditch, numbat, western ground parrot) *Have you heard of them before; what can anyone tell me about any of these local animals?* The main threat to them is 'introduced predators'...*what does the word 'predator' mean? What does 'introduced' mean? Can anyone tell me what animals they think are introduced predators in WA? (foxes and feral cats).*
6. Meet some of our locals who are threatened... give students Stage 1 Activity Sheet – *Our local threatened species*. Students read the introduction to our threatened local species. Students as individuals, groups, or the class could set up a glossary where they list and define the terms in **bold** in the text. Students need to find the names of the animals illustrated (either by reference to the *Western Shield* poster and other resource books that could be set up around the classroom; or by looking through endangered WA animals on Google images). They then are asked if they have seen that animal in the wild. After that students could, in their groups, brainstorm questions they'd like to answer about these animals as they explore this topic. Questions could be anything such as: *Why has it got such a long tail? What does it eat? Why has it got spots on its back? Why is it endangered?* Encourage open-ended questions. At the end of the topic, go back to these questions and see which ones students can answer. Any they can't answer could be done as additional research.

At this point you could watch Part 1 of *Deadly Protectors*, (up to at least 8 minutes), which has some footage of our threatened species in Australia and an indication of what our bush was like before the introduction of foxes and feral cats.

7. You may wish to have a class discussion around 'why should we care?' *After all species have come and gone on this planet long before humans were around; why should people do anything to save these threatened species? Do you think we need to save these species from extinction? Isn't it 'survival of the fittest'?*
8. Our threatened local species. Students could begin a mind map (as individuals, groups, or as a class) which they add to as their understanding develops throughout this topic.



Activity sheet 1.1

Name _____ Date _____

Threatened species around the world

In groups, try to work out:

1. What is the name of each of these threatened species?
2. Where do they live?
3. What has made them threatened?



1. _____
2. _____
3. _____



1. _____
2. _____
3. _____



1. _____
2. _____
3. _____

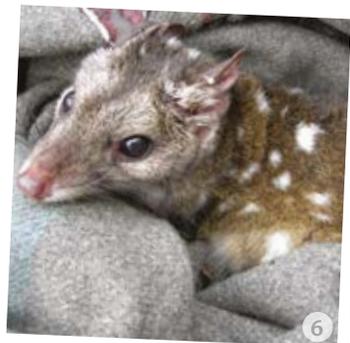


1. _____
2. _____
3. _____



1. _____
2. _____
3. _____

Activity sheet 1.1 (continued)



6

1. _____
2. _____
3. _____



7

1. _____
2. _____
3. _____



8

1. _____
2. _____
3. _____



9

1. _____
2. _____
3. _____

Information to help with questions 1, 2 and 3.

Q1	Giant panda; polar bear; numbat; orangutan; white rhinoceros; western ground parrot; macaw; chuditch; koala
Q2	South-east Asia; Africa; Eastern Australia; South-west Australia; Arctic; South America; China
Q3	Hunted by humans; native habitat destroyed or changed; killed by new (introduced) predators that were not part of their natural habitat

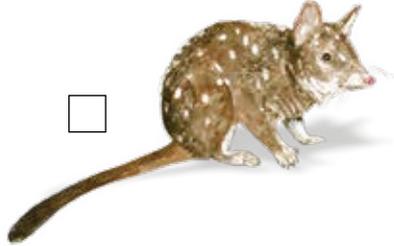
Activity sheet 1.2 (continued)

Meet some of our local threatened species

- Look at the pictures below and do some research to find out their names. Tick the box if you have seen them in the wild.
- In your groups, think of one question you'd like to ask about each animal, write it under the animal's name.



? _____



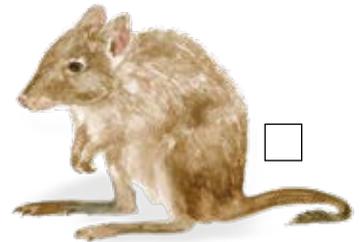
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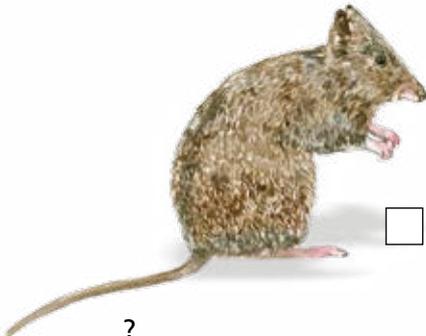
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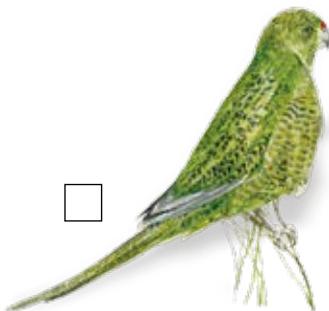
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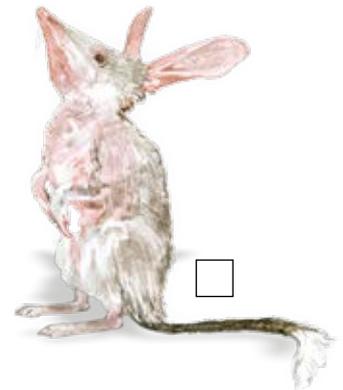
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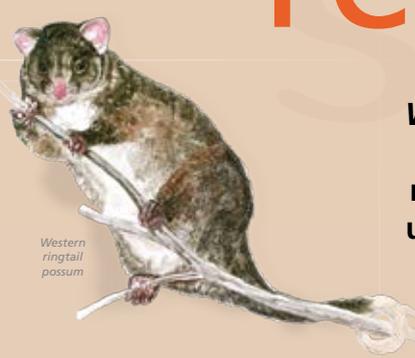
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Resource sheet 1.1

Wildlife recovery



Woylie



Western ringtail possum



Quokka



Chuditch



Poison peas

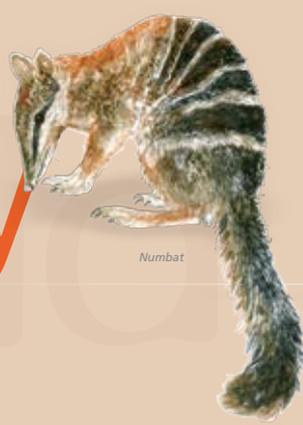
Western Shield is one of the biggest wildlife recovery programs ever undertaken in Australia.

It is working to recover native animal populations in the wild through baiting to reduce the threat of foxes and feral cats across more than 3 million hectares of Parks and Wildlife-managed lands.

The baits used contain a toxin found in native plants from the *Gastrolobium* genus and are commonly known as poison peas. WA's native animals have evolved to have a high tolerance to this toxin but it is lethal to introduced species like the fox and feral cat.




Western swamp tortoise



Numbat



Quenda



Bilby



Western ground parrot



Gilbert's potoroo

For more information about *Western Shield* visit www.dpaw.wa.gov.au/westernshield



Department of Parks and Wildlife




Nearer to Nature



Quokka

Investigate a species

Stage 2

Teachers' Notes

Stage 2 – Investigate a species

Through their own investigations of an animal species, students discover the importance of the environment and have a better understanding of the need for biodiversity conservation.

Students will be able to consider the role humans have in protecting environments that provide habitats for animals. They will be able to understand how people's connections with their environment can also be aesthetic, emotional and spiritual. They can explore strategies and ways of protecting particular environments in order to help the conservation of species.

The importance of species conservation

Many people now see the environment and conservation of biodiversity as the most important issue today and in the history of humankind. Why is this so? The ultimate cost of not conserving wildlife and biological diversity could be the ecological collapse of the planet and human survival being threatened. There are, however, many other reasons for conserving species diversity:

- The aesthetic beauty of a natural environment,
- The economic benefits in areas such as medicine, agriculture (food, clothing and energy production) and industry, and
- The moral obligation of passing on a rich environment to future generations.

We do not know what effect the loss of a particular species will have on the environment, on the natural processes on which plants, animals and humans depend. Any extinction or decline of species is of great concern for a whole range of environmental, moral and aesthetic reasons.

As such, the conservation work undertaken by Parks and Wildlife is critical to the survival of many species. The *Western Shield* program is one of the biggest conservation programs undertaken in Australia and is carried out in many locations across Western Australia, particularly the south west. Having a good understanding of the habitat requirements, distribution, reproductive rates, diet and threats facing native animals is fundamental to the success of any conservation program.

In this stage, students will explore for themselves the features and requirements of a chosen native animal and investigate any threats.

Concepts

- There are significant reasons for biodiversity conservation.
- Western Australia has a unique and diverse fauna. Some species are threatened with extinction.
- Identification of an animal is the first step on the road to understanding and ultimately being able to conserve a species.

Resources

- Stage 2 Resource sheet 2.1 – Investigate a species (1 per group)
- Stage 2 Activity sheet 2.1 – Who am I? (1 per student)

Teachers' Notes (continued)

Additional resources

- Resources used at work stations in Stage 1.
- *LANDSCOPE* articles (see list at end of booklet).
- *Western Shield*: fact sheet available on the Parks and Wildlife website under *Western Shield*.
- Perth zoo website factsheets on native animals.
- See Reference list at the end of this booklet for additional resources.
- Australian Department of Environment: <http://www.environment.gov.au/biodiversity/threatened>.
- "Green Kids Guide to Threatened Species: 9 Ways You Can Help" (www.environment.gov.au).

Teacher directions

1. With reference to the given background information for teachers (above), discuss as a class the importance of biodiversity conservation.
2. *Why bother?* Using the resources you have provided at work stations, students work in their groups and explore the reasons for the need to conserve threatened species and WA's unique biodiversity. Each group is to prepare notes on the reasons.
3. As a class discuss and list the many reasons for conserving biodiversity.
4. Research: Each group then researches a threatened animal species. Species illustrated on Resource Sheet 1.1 can be chosen as well as other Australian native species.
5. Brainstorm as a class the focus questions to be addressed during the investigation:
 - What sort of habitat does the animal require?
 - Is it threatened and why?
 - How have humans contributed to the threatening process?
 - What is its current conservation status in Western Australia (critically endangered, endangered, vulnerable)?
 - What is being done to help save the species?
 - What can we do to help save the species?
6. Each group researches an animal and prepares a presentation for the class using their chosen medium to present the information e.g. text and drawings, a model and signs, a poster, a song or sound recording or a PowerPoint presentation.
7. A report could be prepared using the following headings:

<ul style="list-style-type: none"> • Introduction • Distribution • Feeding Habits • Any major threats to its survival 	<ul style="list-style-type: none"> • Description • Habitat • Reproduction • What can we do?
---	---
8. Those who have completed their presentation may complete Stage 2 Activity Sheet - *Who am I?* using the Stage 2 Resource Sheet - *'Investigate a species'* for reference.
9. At the end of this Stage give students half an hour to reflect on the activities and plan for the next Stage.

Extension Activity

Visit Perth Zoo to view and find out what is being done in collaboration with Parks and Wildlife and other organisations to research and breed threatened species.

Resource sheet 2.1

Investigate a species



Chuditch

Also known as the Western quoll, this small carnivorous, meat eating marsupial is about the size of a small cat. Its fur is mainly brown with white spots and it has a long tail with a brush of long black hairs along it. Although it mainly forages for food on the ground it will climb trees. It hunts at night for animals such as small reptiles, birds, invertebrates and small mammals.

Gilbert's potoroo

This animal is a primitive relation of kangaroos and wallabies and has a dense coat of soft grey-brown fur. They were thought to be extinct for over 80 years until a small population was rediscovered near Albany in 1994. It is the most endangered animal in Australia and one of the rarest animals in the world. They hop on their hind feet and use their strong forefeet and powerful claws for digging. Underground fungi (truffles) make up 90 per cent of their diet which they forage for at night. They live in dense vegetation that has not been burnt by fire for many years.



Western ringtail possum

This grey possum spends most of its time in the canopy of trees and moves from treetop to treetop. It has a long, white-tipped tail which it wraps around branches as an aid in climbing. Ringtails are active at night and feed mainly on leaves, fruit and flowers. Daytime is spent in the hollows of trees or in a nest called a drey that it builds up in the branches of peppermint trees.



Woylie

A small, energetic, hopping marsupial that looks like a wallaby but is about the size of a rabbit. The fur is a yellowish grey with a black crest on the end of its tail. It lives in forest and woodland areas that give them enough undergrowth to provide cover. It forages at night for underground bulbs, seeds and insects but also spends time digging for underground fungi, called truffles, which make up a large part of its diet. The species helps spread the seeds (spores) of the fungi in their droppings. They nest under fallen logs or under shrubs using bark, twigs and leaves which they carry in their tail.



Numbat

A small reddish-brown marsupial, with a long bushy tail, pointed snout and white stripes across the back. It feeds on ants and termites using its long sticky tongue to get into ant tunnels and termite mounds. Mostly active in the early morning and early evening, numbats nest in and under fallen logs in forest and woodland areas. It is Western Australia's animal emblem.

Western ground parrot

This small parrot is about the same size as a rosella and is mainly green in colour with yellow, brown or black flecks across its body and a red band above its beak. It is critically endangered and is only known from two areas on the south coast of WA. It spends most of its time on the ground and builds its nest under dense patches of vegetation. Ground parrots require long unburnt vegetation for roosting and breeding, but can utilise younger vegetation for feeding. It feeds during the day on seeds, flowers, fruits and leaves. The biggest threats to the western ground parrot are wildfires and predators such as feral cats and foxes.



Activity sheet 2.1

Name _____ Date _____

Who am I?

1. Read Stage 2 Resource Sheet – Investigate a species. This gives information to help you identify some of the threatened species. Discuss with your group.
2. Make your own 'Who am I?' animal clues (see example below). Make sure you use your own words.



I am a small Australian mammal. I have a long bushy tail. Fallen logs are important to me not only as a food source but also as a home. With my sticky tongue I catch ants and termites.

I am a _____



I am a _____



I am a _____



I am a _____



I am a _____



Feral cat

Introduced predators
Stage 3

Teachers' Notes

Stage 3 – Introduced predators

This stage explores and develops students understanding about feral cats and foxes through reading text and responding to focus questions.

Concepts

- Western Australia has many introduced species of animals but the species considered most destructive to a large majority of threatened native animals are the European red fox (fox) and feral cat.
- Without control of foxes and feral cats the number of individuals in a population will continue to decrease.
- If foxes and feral cat numbers can be reduced and kept at a lower level than at present, it may be possible to increase the number of individuals in many threatened native animal populations.

Resources

- ❑ *Either* Stage 3 Resource sheet 3.1 – Foxy facts or Stage 3 Resource sheet 3.2 – Feral cats across Australia (need to have equal numbers of each sheet split between the class).
- ❑ *Either* Stage 3 Activity sheet 3.2 – Foxy questions or Stage 3 Activity sheet 3.4 – Catty questions (need to have equal numbers of each sheet).
- ❑ Stage 3 Activity sheet 3.1 – Fox history.
- ❑ Stage 3 Activity sheet 3.3 – Feral cats and our wildlife.

Background Information

Western Australia has a multitude of introduced animal species. Some are beneficial to humans, such as cattle, chickens and domestic pets. Other introduced animals are causing major problems for our native animals, specifically the fox and feral cat. By understanding these animals, their biology and the issues they cause we may be able to control their distribution and impacts they are causing.

The Stage 3 Resource sheets on foxes and feral cats were derived from the on-line fact sheets listed below. The original sources provide a more complete review of the relevant animal.

Additional resources

- Feral cat fact sheets:
 - <http://www.pestsmart.org.au/feral-cat/>
 - <http://www.environment.gov.au/system/files/resources/43ae02f7-9571-4223-beb0-13547688b07b/files/cat.pdf>
 - https://www.daff.qld.gov.au/__data/assets/pdf_file/0004/61987/IPA-Feral-Cat-Ecology-PA26.pdf
- *Feral Cat* YouTube Videos, a series of videos by Invasive Animals CRC:
 - Part 1 – History and population
<https://www.youtube.com/watch?v=v9LrWvNUT8k&list=PLDE9CC8EB2DA7D779&index=1>
 - Part 2 – Reproduction, Habitat, and Behaviour
<https://www.youtube.com/watch?v=5jqEqPpeaDM&index=2&list=PLDE9CC8EB2DA7D779>
 - Part 3 – Diet
<https://www.youtube.com/watch?v=erddI9YI3Gk&index=3&list=PLDE9CC8EB2DA7D779>

Teachers' Notes (continued)

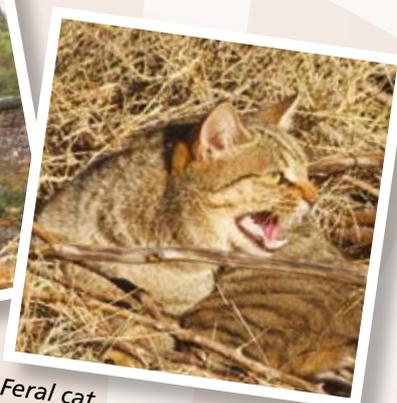
- Part 4 – Ecological Impacts
<https://www.youtube.com/watch?v=gbJRkw-SD5A&index=4&list=PLDE9CC8EB2DA7D779>
- Part 5 – Predator - prey Interactions
<https://www.youtube.com/watch?v=GgsyLBfpCuM&list=PLDE9CC8EB2DA7D779&index=5>
- Part 6 – Why few cat control programs exist
<https://www.youtube.com/watch?v=Hyu6puhkGEU&list=PLDE9CC8EB2DA7D779&index=6>
- Fox fact sheets:
 - <http://www.pestsmart.org.au/pestsmart-factsheet-fox/>
 - <http://environment.gov.au/biodiversity/invasive-species/publications/factsheet-european-red-fox-vulpes-vulpes>
 - https://www.daff.qld.gov.au/__data/assets/pdf_file/0019/73810/IPA-Fox-PA13.pdf

Teacher directions

1. As a class discuss why animals were introduced into Australia, for food (cattle, sheep etc), transport (horses, camel etc), pets (cats, dogs etc), sport (fox, homing pigeon) and assisting with crops (bees and cane toads). Discuss the success or failure of some introductions, and how the environment was altered to suit the introduced animals (clearing of land for grazing or producing food for animals).
2. Discuss which two introduced animals have caused the most direct damage to native animal species in Australia? Answer should be foxes and feral cats, predators that are killing our wildlife.
3. Divide class into two groups, one group researches and takes notes on feral cats, the other group does the same on foxes using the two resource sheets.
4. Students then pair up with someone who studied the other animal. The “feral cat” person asks the fox questions. The “fox” person finds the answer and “feral cat” person writes down the answer. Then swap roles to complete the cat questions.
5. As a class go through each questions sheet and check class has correct answers.
6. As a summary each student completes both cloze exercises.
7. If time permits view the YouTube videos about feral cats.
8. At the end of this Stage give students half an hour to reflect on the activities and what they have learnt. Also remember to update the Glossary.



Fox



Feral cat

Resource sheet 3.1

Fox facts

History

The European red fox was first introduced to Australia in Victoria in 1855 for people to use in sport hunting. The number of foxes steadily grew and by 1901 foxes had spread as far as South Australia. By 1917 foxes had reached Western Australia and were recorded in Perth around 1925. They are now present across 75 per cent of the continent and the only place they do not occur on mainland Australia is in the tropical north.

Behaviour

They are well suited to many environments including deserts, alpine areas and cities. They are mostly nocturnal (hunt at night) and usually rest during the day in some thick bush, a hollow log or an earth den (often an enlarged rabbit burrow). Foxes can survive very well in urban areas and in some Australian cities can reach a density of 16 foxes per square kilometre. Urban foxes can be a pest because they attack poultry (chickens, geese and ducks) in people's yards and raid garbage bins while looking for food.

Feeding habits

Foxes are omnivores (eat meat and plant material), however meat makes up most of their diet. They will eat whatever is available including rabbits, small native animals, frogs, birds, insects and even fruit and vegetables when meat supplies are scarce. They are a pest to farmers and will prey on newborn lambs, kid goats and chickens. They will also scavenge dead animals (carrion).

Breeding

Females are able to produce young at the age of one year and produce around three to four cubs per year. These are born during August and September and the cubs come out of their den in late spring. The cubs then spread out and move away from the family territory in late summer or early autumn.

Impact

This ability to survive in a wide range of areas and have a great variety in their diet means that foxes can have a big impact on many wild and domestic animals. Foxes are considered a major threat to native animals because of their mostly carnivorous diet, and the fact they are efficient hunters and killers.

The fox has played a major role in the decline of ground-nesting birds and small to medium-sized mammals such as the greater bilby. Studies have also shown that rock-wallaby and malleefowl populations are strongly controlled by the number of foxes around them. Foxes pose a risk to 76 native species in Australia (14 birds, 48 mammals, 12 reptiles and 2 amphibians).

Control strategies

Foxes in Australia don't have many natural predators. Birds of prey such as eagles and hawks as well as dingoes and wild dogs can kill foxes, especially the young cubs. In WA, fox control with 1080-poison baits has been used successfully. This has allowed populations of some native mammals to begin to recover and also to return to former habitats. Native animal populations can also be protected by using predator-proof fencing to keep foxes out. Trapping and shooting are also used in targeted areas.



Fox

Resource sheet 3.2

Feral cats across Australia

History

Cats have been in Australia since European settlement, and may have arrived as early as the 17th century with Dutch shipwrecks. By the 1850s, feral cat populations had become established in the wild. Cats were released deliberately in the late 1800s around farms and homesteads in the hope that they would control rabbits, rats and mice. Feral cats are now found in all habitats across Australia except the wettest rainforests and some offshore islands.

Categories

Cats are divided into three categories: domestic, stray and feral. However, these groups are not fixed and cats can move between categories. They are all the same species. The following provides a little more definition to the different categories of cats:

1. **Domestic cats** are owned and cared for.
2. **Stray cats** are those found roaming cities, towns and some farming areas.
3. **Feral cats** are ones that are in the wild and survive without any human contact. These are the main target of programs such as *Western Shield*.

Behaviour

Feral cats are mostly nocturnal (active at night) and they rest during the day in den sites such as hollow logs, thick scrub or rabbit warrens. Rabbits have helped the feral cat population spread across Australia by providing food as well as burrows for the feral cats to shelter in during the day.

Feeding habits

Feral cats are carnivores (meat eaters) and can survive with no access to water, because they get a lot of moisture from their food. They generally eat small mammals, but also catch birds, reptiles, amphibians, fish and insects – hunting animals up to the size of a brushtail possum. In farming areas they feed mostly on young rabbits and mice, but in other areas feral cats prey mainly on native animals. Feral cats use their sense of smell, sight and sound to hunt their prey.

Breeding

From the age of 10 to 12 months feral cats will start to breed and can have a litter of about four kittens. This usually only happens once per year but can be more frequent and is dependent on the length of days and food source availability. The main predators for feral cats are dingoes, foxes and wedge-tailed eagles.

Impact

There is clear evidence that the feral cat has a big impact across Australia and is a real threat to native animals. Feral cats have probably contributed to the extinction of many small to medium-sized mammals and ground-nesting birds in the arid areas of Australia. They are a major threat to native animals because of the fact that they are efficient, meat-eating hunters. They also carry diseases that can be transferred across to native animals, domestic animals and humans.



Feral cat

Resource sheet 3.2 (continued)

Control strategies

There are a few ways the impact of feral cats can be reduced. One way is to protect our native animals with a predator-proof fence which aims to stop the feral cats getting in to a native animal sanctuary and these can range in size from a few hectares (roughly equivalent to one football oval to some being more than 7,000ha (roughly equivalent to 400 football ovals). Fenced areas are costly to erect and maintain and there is still a need to remove all introduced predators within and keep them out. Shooting and trapping feral cats does work but is expensive, time consuming and there are usually limitations due to vehicle access. Using 1080 poison baits has proved to be the most effective and efficient way of controlling feral cats on a broadscale level in Western Australia. Some areas baited in Western Australia as part of *Western Shield* span over several hundred thousand hectares (roughly equivalent to over 100,000 football ovals).

Eradicat® is a specially designed bait that has been developed by Parks and Wildlife scientists that targets feral cats. It has been trialled in the arid, semi-arid and south-coast regions and is proving successful at reducing feral cat numbers to promote fauna recovery.



Predator-proof fence



Loading sausage baits for aerial drop

1. Football field is based on MCG which is 173.6 long x 148.3 metres wide, from fence to fence, therefore 25,744m² or ~2.5ha

Activity sheet 3.1

Name _____ Date _____

Fox History

The European Red Fox originated from _____ but is now found in most countries around the world that are not tropical. Red Foxes can be red, silver or black, in Australia the _____ colour is the most common.

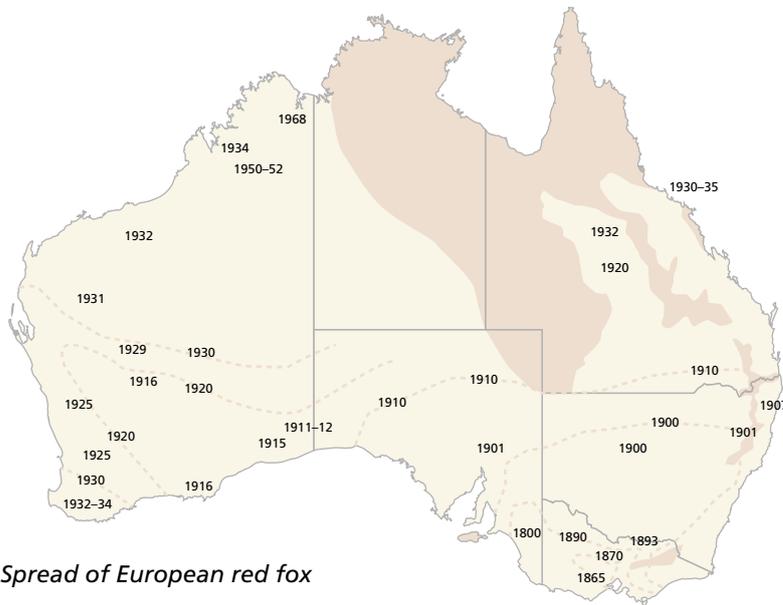
Foxes were brought from England to _____ for recreational hunting in 1855. Unfortunately the foxes did not sit around waiting to be hunted, they began to spread and breed up. It is thought that the spread of foxes was greatly helped by the presence of _____, another introduced animal, and their spread across Australia.

As foxes spread both north and _____ they began to eat our native wildlife. By the early 1900's foxes were in South Australia and as far north as the _____ / New South Wales border! All the time they were munching away on our unique wildlife. By about 1925 foxes had reached Perth. Somehow the fox had survived the harsh _____ Plain and reached the west coast. Foxes survive by eating almost anything from birds to insects, small native mammals, lizards, fruits and even _____ animals.

Currently the fox inhabits most areas of Australia except for tropical areas in the north.

There is debate whether foxes are in Tasmania but a fox control program is underway to try and _____ them.

As for Australia's _____ animals, many are under threat. Some have become _____. Foxes are believed to be a threat to 14 species of bird, 48 mammals, 2 amphibians and 12 reptiles and people no longer hunt foxes for _____!



European red fox

Map 1 – Spread of European red fox

Word bank

Extinct	Eradicate	Victoria	Queensland
West	Sport	rabbits	Europe
unique	Red	Nullarbor	dead

Activity sheet 3.2

Name _____ Date _____

Foxy questions

After reading both the Fox resource sheet and the fox cloze exercise answer the following:

1. What time of day are foxes most active?

2. When were foxes introduced into Australia and why?

3. Where are foxes found in Australia?

4. At what age can foxes start to breed?

5. How many litters can a fox have per year and how many cubs per litter?

6. What does a fox diet consist of?

7. Foxes pose a risk to how many Australian listed threatened animal species?
Group the animals according to the type of animal – birds, small mammal species, etc.

8. Why are foxes considered a major threat to native animals?

9. Which animals prey on fox cubs?

Activity sheet 3.3

Name _____ Date _____

Cats and our wildlife

Most people believe cats first arrived in Australia with the early settlers. However sailing ships had cats on board to help control mice and rats, a constant problem on ships carrying supplies. Unfortunately many Dutch and Portuguese ships, with _____ on board, ran aground off the Western Australian coast and sunk. The sailors tried to swim to shore, and so did the cats! Some Aboriginal artworks in Western Australia show animals that may be cats. Cats were most probably in some parts of Western Australia well before the European colonisation of Australia.

All cats came from wild cats, so they still have hunting instincts, even if they enjoy being patted and cuddled by humans. Many cats enjoy _____, not because they are hungry but because of their primitive instincts to hunt. Domestic cats living in suburbs can be seen hunting birds and lizards.

In Australia there are three classes of cats: domestic, stray and feral. _____ cats live with humans and are fed and cared for by humans. _____ cats are cats that roam around human settlements, sometimes getting food and shelter from humans but also living free and hunting. Feral cats have little or no contact with humans and hunt for all their food. The most destructive cat is the _____ cat.

Feral cats can be found across most of Australia except for the wettest areas. When food is plentiful their numbers build up and they have small territories, but in areas where food is limited they have low numbers and have large _____. When available, feral cats eat another introduced animal, the rabbit. Feral cats are also known to kill native animals and not eat them.

Our native animals are used to predators that hunt mainly by sight, so camouflage is very important. Cats hunt using sight, sound and smell. So feral cats can still find their prey by _____ even if the native animal is well _____!

Researchers have found that feral cats kill and eat large numbers of small animals but will also eat animals up to large possum size. It is easier to hunt for lizards, birds and even insects compared to a larger animal that may fight back and move faster. Native animals from mouse size (about 35 grams) up to medium size (about 5.5 kilograms) are _____ on by feral cats. Native animals this size are called critical weight range animals.

Most extinct and threatened animals, including marsupials, birds and reptiles, are in this _____ range.

Cats around the home can make good pets if well fed and kept _____ at night. However when they go feral they are a major _____ of our native animals.



Feral cat

Word bank

critical weight	smell	Stray	indoors
domestic	hunting	cats	killer
preyed	territories	camouflaged	feral

Activity sheet 3.4

Name _____ Date _____

Catty questions

After reading both the Cat resource sheet and Cat cloze activity answer the following questions:

1. Name and describe the three categories of cats in Australia.

2. When are cats most active?

3. At what age can feral cats start to breed?

4. How many kittens per litter can they have and how many litters per year?

5. How did cats arrive in Australia?

6. What senses do cats use to hunt with?

7. Feral cats pose a risk to what Australian listed threatened animal species? Group the animals according to the type of animal – birds, small mammal species, etc.

8. Where are feral cats found in Australia?

9. What do feral cats eat?

10. Do feral cats need human contact to survive?

11. Why are feral cats considered a major threat to native animals?



Setting sheffield trap

What is *Western Shield*?

Stage 4

Teachers' Notes

Stage 4 – What is Western Shield?

This stage introduces students to *Western Shield* and what it is designed to achieve.

Concepts

- *Western Shield* is the Department of Parks and Wildlife's leading animal conservation program. The purpose of *Western Shield* is to protect wild populations of Western Australia's threatened native animals through the control of foxes and feral cats.
- The control of introduced species to conserve native animals is a community concern requiring a landscape scale operation.
- Success can be achieved only after years of careful research and pioneer programs to test methods.
- We can all help in bringing wildlife back from the brink of extinction.

Resources

- Stage 4 Resource sheet 4.1 – What is *Western Shield* (1 per group)
 - Stage 4 Activity sheet 4.1 – *What is Western Shield?* Test your knowledge (1 per student)
 - Stage 4 Activity sheet 4.2 – *Western Shield* story board
- If time permits –
- Stage 4 Activity sheet extension 4.3 – Trap success (for more advanced students)

Background information

Below is an expanded version of the Stage 4 Resource Sheet students will use. These additional details should help in answering student questions.

What's all the fuss about?

Over the past 100 years, more mammals have become extinct in Australia than anywhere else in the world. In Western Australia, since European settlement:

- 12 mammal species have become extinct
- Seven species have disappeared from the mainland but remain on a few offshore islands
- more than 40 species have declined significantly or are threatened with extinction.

The native mammals most at risk are small and medium sized animals weighing between 35 grams and 5.5 kilograms. This size animal is called a 'critical weight range' animal. Roughly, that equates to mouse size up to about medium sized cat size. Mammals are not the only animals under threat, birds and reptiles are under threat as well!

That's not all—we don't know what effect the loss of particular species will have on our environment, on the natural processes on which plants, animals and humans depend. The extinction or decline of any species is of great concern for a whole range of environmental, moral and aesthetic reasons.

Teachers' Notes (continued)

Is the problem real?

Some people would argue that the decline and disappearance of some animals from the bush isn't real, that they are still out there just more secretive. Is this true?

Many methods can be used to determine what animals live in an area – trapping, sand pads, motion sensor camera, scat counts, spotlighting and burrow activity are some of the more common methods.

Researchers have found that the population size and extent of occurrence for a number of species has decreased, particularly since European settlement. In many cases, species are no longer present in areas where they were known to once exist and their range has contracted to small pockets of remnant bushland. The decline in population size and occurrence of some species is not confined to particular areas but instead this has been the case for some animal species across the whole of Western Australia, and even Australia.

Researchers and most casual observers agree the decline is real and, for some animals, becoming critical. There is data to support the decline of many native species over time. Furthermore, the extinction of some animals from the wild since European settlement is undeniable truth that there is an issue for wildlife in Australia.

What is being done to halt the decline?

Research has identified many causes for the decline, some are easy to control, and other causes are much more difficult to control. One of the major causes of the decline in native animals is feral cats and foxes. Department of Parks and Wildlife (Parks and Wildlife) developed the *Western Shield* program to tackle these two introduced predators. Scientists observed that once introduced predator numbers were reduced, native animals then had a chance of increasing in numbers. Fail to control feral cats and foxes, and many threatened native animals are not able to build back up in number or extend to their former range!

What is *Western Shield*?

Western Shield is the Department of Parks and Wildlife's leading animal conservation program. The purpose of *Western Shield* is to protect wild populations of Western Australia's threatened native animals through the control of foxes and feral cats. The aim is to bring threatened native animal wildlife back from the brink of extinction.

How does *Western Shield* work?

The first step of *Western Shield* is to monitor the ecosystem to determine what animals are present, both native and introduced, and at what numbers. A range of monitoring techniques can be used, dependent upon the habitat and level of information required. One commonly used measure is trapping success rate, which is essentially the number of traps that catch animals as a percentage of traps set. We monitor how this changes over time to get a trend for the population and this gives us an idea of whether the population is increasing, stable or declining. There is an extension activity available in this pack on trapping success rates for more able students.

If feral cats and foxes are present then controlling their numbers may be required. A range of factors need to be considered before a control method can be chosen. What geographical area is involved? What is the level of human use in the area? What natural features (vegetation, streams, and rocky outcrops) occur in the area? Who are the neighbours and what is their livelihood? Which native animals are being affected? How critical is the drop in numbers?



Numbat

Teachers' Notes (continued)

Conservation managers develop an appropriate control strategy for the area and its specific features based on research findings and advice.

One of the main control methods is the use of poison baits targeted at feral cats and foxes. Research revealed a poison that readily controls feral cats and foxes but posed a very low threat to our native animals. The poison, 1080 (pronounced ten-eighty) occurs naturally in the south-west of Western Australia so native animals have a high tolerance to 1080. A small sausage like meat bait, called Pro bait®, is injected with 1080. These are readily eaten by foxes but cats are more cautious and usually only eat them when food is scarce. A specific cat bait, called Eradicat®, is currently being used for feral cat control. Both baits have been developed and are made by the Department of Parks and Wildlife.

For some species which are prone to predation by foxes and feral cats, captive breeding is used but this is usually as a last resort. This could be done for a few reasons including to increase numbers of a species which might have suffered a significant decline as well as to preserve genetics of the existing population or populations. We need to deal with all threatening processes at a site including the possibility of fox and feral cat predation before captive bred animals are released back into the wild.

For all ecosystems long term monitoring is required to look for changes in populations over time. However, trapping success rates are influenced by more than just introduced predators. A corresponding record of weather, fire and other disturbances at a site needs to be made to check for other contributing factors to changes in trapping success rates.

Using nature to conserve nature

How can you use poison without harming our native animals? The answer lays in our natural advantage, *Gastrolobium* spp, also known as poison peas. *Gastrolobium* spp contain fluoroacetate in the leaves, flowers and seeds. This same toxin can be synthetically produced and is known as 1080. Most *Gastrolobium* spp are found in the south-west of Western Australia. Over millions of years our native animals have been exposed to this chemical and have developed a tolerance to fluoroacetate. Using research, the WA Government has developed Pro bait® 1080 fox bait and Eradicat® 1080 feral cat bait, which are sausage-like baits into which 1080 is injected. Both Pro bait® and Eradicat® have enough 1080 to be deadly to foxes and feral cats but under normal conditions these baits are harmless to our native animals here in Western Australia.

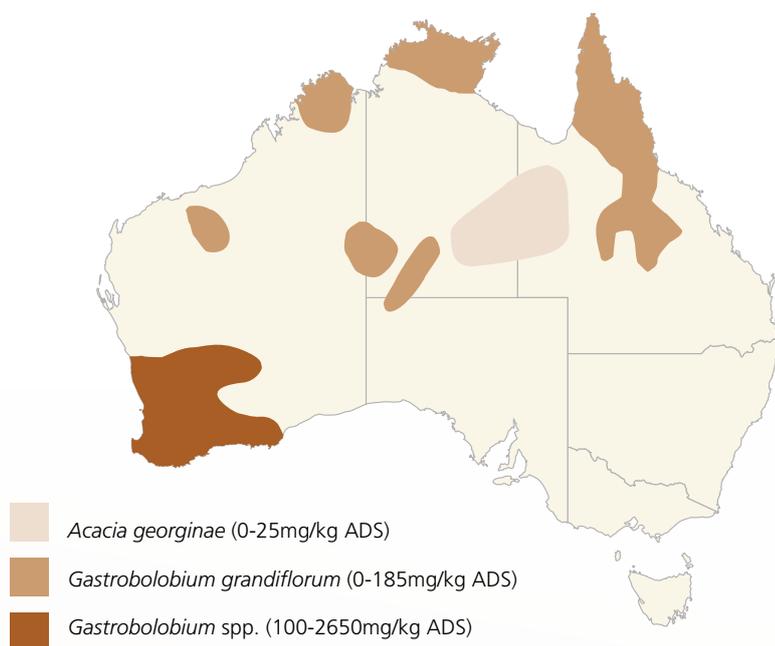


Poison pea



Eradicat® - used for feral cats

Teachers' Notes (continued)



Map 2 – Distribution of Poison pea plants and the concentration level of monofluoroacetate (ADS = air dry sample)

Tolerance (mg poison/Kg body weight)		
Animal	Western Australia	Eastern States
Bobtail lizard	500 - 800	206
Bandicoot	20	7
Brush-tail Possum	125	0.8
Chuditch/quoll	7.5	3.7
Bush rat	20-80	1.1
Grey kangaroo	40	0.3
Red kangaroo	2.5	2.5
Wedge-tailed eagle	9.5	9.5
Fox	0.13	0.13
Cat	0.35	0.35

Table 1 – 1080 Tolerance in Australian animals

The 1080 baits have proven to be the most effective and appropriate management action to deal with foxes and feral cats at a landscape scale in Western Australia. Other toxins are being trialled for use in

Teachers' Notes (continued)

bates in Eastern Australia (e.g. PAPP or para-aminopropiophenome).

Are there alternatives to poisoning? (for class discussion if required and /or appropriate)

A range of other techniques can be used to control feral cats and foxes including shooting and trapping. Shooting by licenced hunters requires a large amount of hours, mainly at night and is restricted to where shooters can reach by vehicle. The natural vegetation in some parts of the state, particularly the south west, is not well suited to shooting with vision restricted due to the density of plants. Using guns also has potentially deadly risks for humans as well. Animals also get wary near tracks and lights at night, so over time the effectiveness of shooting may decrease.

In some situations there is merit in shooting and trapping if it is done correctly and humanely. For the vast areas of Western Australia, 1080 has proven to be the most effective and appropriate management action to deal with foxes and feral cats at a landscape scale in Western Australia.

Is *Western Shield* working?

Western Shield aims to recover native animal populations in the wild through broad scale control of foxes and feral cats. Here are some of the key successes and actions of the program to achieve fauna recovery:

Species saved in the wild

- Baiting of introduced predators has seen dramatic increases in population and distribution of priority species including the quokka, western brush wallaby and chuditch among others.
- Populations of the quenda and tammar wallaby have recovered as a result of fox control and both species have been removed from the threatened species list.
- Populations of at least 53 threatened mammal and bird species remain in existence in *Western Shield* baited areas. At least 29 of these species show improvements in population size and distribution.

Translocations

- Since 1996, 140 translocations have been undertaken for 27 native animal species, including 20 mammal and five bird species.

Fighting predators

- The main weapon in the fight against foxes and feral cats is the use of the poison 1080 (sodium fluoroacetate) found in native plant species.
- Many native animals have evolved with these plants and have a high tolerance to the poison, whereas introduced animals do not.

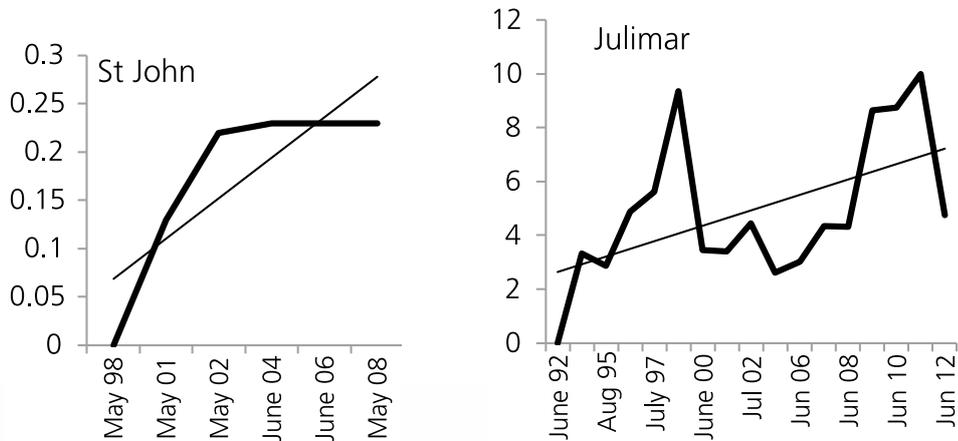
Scientific breakthrough

- New Eradicat® feral cat bait has been developed by Parks and Wildlife and successfully trialled in Western Australia's arid, semi-arid and south coast regions.
- Eradicat® has been registered for operational use, paving the way for landscape-scale feral cat control in targeted areas across the State for the first time.

Unfortunately we have little confirmed data of pre European or early European native animal densities. Some data has been captured for a number of species at select sites prior to animal monitoring under *Western Shield*. The main data source we now have is trapping record sheets used when trapping animals. This generally started when fox baiting commenced.

As an example of the results of *Western Shield* in recovering fauna, chuditch occur in 21 of the 36 active monitoring sites where baiting occurs. Chuditch have shown sustained recovery at five of these sites and stable populations at five sites. In six sites, capture rates initially increased and then started to decline between 2000 and 2003. Only two sites have shown consistently decreasing capture rates since

Teachers' Notes (continued)



1996. Inconsistent detection has been demonstrated for chuditch at four sites. On the following page is the trapping success rate at three sites.

For some sites the trapping success rate is quite low, see example above of St John compared to Julimar. This is not always a concern. Due to a range of factors some species naturally occur in low densities in certain areas. While the trapping rates are much lower for St John compared to Julimar, the trend over time is increasing with almost a tripling of the trapping success rate, a positive sign of recovery.

It also needs to be remembered that introduced predators are only one threat to our native animals, other factors may be holding back their recovery even when feral cat and fox numbers are reduced.

Know your enemy!

Feral cats and foxes are introduced predators; they are both known to eat mammals, birds, reptiles and insects. However, how they hunt is slightly different, so knowing the enemy is important!

Foxes are generalists; they eat anything edible they find, even some plants when times are tough. They also normally scavenge for food, an important key to helping control their numbers. Foxes will also store (cache) excess food. Foxes have territories they defend. Foxes may move to other areas temporarily when an abundant food supply exists.

Feral cats however, normally only eat animals they have just killed; caching food is not generally practiced by cats. Scavenging is also not a normal habit, however during tough times it may occur. Recent research shows that cats may travel over 10 kilometres to hunt in areas affected by high intensity fires in order to hunt along the edge of the fire scar.



Fercal cat with a phascogale

Teachers' Notes (continued)

As we better understand how feral cats and foxes use the environment we can then develop more effective techniques to suit each animal and its habits.

Additional resources

- DVD - *Deadly Protectors*. 60 minute DVD
- DVD - *Mission Wild*. This is a good resource (DVD) about threatened species and *Western Shield* although there are limited copies and it may be difficult to obtain.

Teacher directions

1. View each of the three sections of the video, *Deadly Protectors*, and discuss as a class:
 - What sort of animals did early settlers encounter?
 - How did they first discover the impact foxes were making?
 - What are some of the things shown in the DVD that were used to aid our native animals?
2. Divide class into groups of three, these will be the sharing groups.
3. One person from each sharing group goes to an expert group. Expert groups will investigate a particular section of the Resource Sheet, make notes about the topic, and then report back to the sharing group.
 - Expert group 1 will study - "What's all the fuss about?" plus "What is *Western Shield*?".
 - Expert group 2 will study - "How does *Western Shield* work?".
 - Expert group three will study - "Using nature to conserve nature?".

Back in sharing groups, each student will add their expertise to complete the Stage 3 Activity Sheet - Test your knowledge. At the end of the activity sheet are some graph interpretation questions designed for students to apply their knowledge.

4. Story Board: 'Stage 4 Activity sheet- *Western Shield* Story Board', can be handed out to each student. They are to make up two story lines based on what they know about the *Western Shield* using the photographs. A blank sheet of A3 paper folded lengthwise would be ideal for students to glue their story line on to. For younger students the whole activity sheet can be used with the arrows and captions provided. For more able students the teacher may like to simply provide the photographs and have the students make their own captions and add their own arrows and descriptions.
5. If suitable for the class, the Stage 4 Extension Activity sheet can be attempted. At the end of the session: Come together as a whole class and discuss "Is the *Western Shield* program important for Western Australia and Australia?".
6. At the end of this Stage give students half an hour to reflect on the activities and plan for the next Stage.

Resource sheet 4.1

What is *Western Shield*?

What's all the fuss about?

Over the past 100 years, more mammals have become extinct in Australia than anywhere else in the world. In Western Australia, since European settlement:

- 12 mammal species have become extinct
- 7 species have disappeared from the mainland but remain on a few offshore islands
- more than 40 species have declined significantly or are threatened with extinction.

The native mammals most at risk are small and medium sized animals weighing between 35 grams and 5.5 kilograms. This size animal is called a 'critical weight range' animal. Roughly, that equates to an animal from the size of a mouse up to the size of a medium sized cat. Mammals are not the only animals under threat, birds and reptiles are under threat as well!

That's not all—we don't know what effect the loss of particular species will have on our environment or on the natural processes on which plants, animals and humans depend. The extinction or decline of any species is of great concern for a whole range of environmental, moral and aesthetic reasons.

What is Western Shield?

Western Shield is the leading animal conservation program that is carried out by the Department of Parks and Wildlife. The purpose of *Western Shield* is to protect wild populations of Western Australia's threatened native animals through the control of foxes and feral cats. The aim is to bring wildlife back from the brink of extinction.

How does Western Shield work?

The first step of *Western Shield* is to monitor the ecosystem to see what animals are present, both native and introduced, and at what numbers. There are quite a few ways in which we can monitor animal populations.

One way is to use camera traps – where an infra-red motion sensing camera is left out in the bush for a period of time to film what animals are active. Sand pads can also be used – basically a pad of sand that is swept clean and used to record animal footprints. Animals can also be captured in a cage trap (eg. Sheffield trap) so they can be weighed and measured before being released.

If scientists find our native animal populations are being impacted by introduced predators (foxes and feral cats) they may target that area with poison meat baits injected with 1080 (pronounced ten-eighty). These baits are often dropped from a plane so a large area can be covered. These baits are effective at reducing the numbers of foxes and feral cats.



A Sheffield Trap



A camera trap



A camera trap photo of a bilby

Resource sheet 4.1 (continued)



Probait® and dried meat bait used for fox control

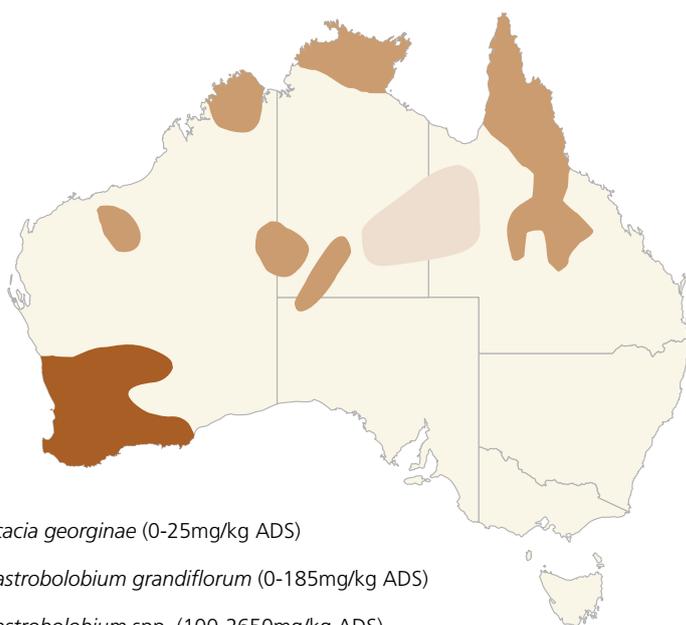


Eradicat® - used for feral cat control

For some species which are prone to predation by foxes and feral cats, captive breeding is used but this is usually as a last resort. This could be done for a few reasons including to increase numbers of a species which might have suffered a significant decline as well as to preserve genetics of the existing population or populations. We need to deal with all threatening processes at a site including the possibility of fox and feral cat predation before captive bred animals are released back into the wild.

Using nature to conserve nature

How can you use poison without harming our native animals? The answer lies in our natural advantage – a group of plants which contain the toxin sodium monofluoroacetate. Most of these plants are in the *Gastrolobium* genus and are commonly known as poison peas. These plants have a chemical in their leaves, flowers and seeds that early settlers found were toxic to any introduced animals such as sheep, cattle etc.. Many of these poison pea plants are found in the south-west of Western Australia. This means that native animals in Western Australia have been exposed to these plants so they have a very high tolerance to the poison. Scientists have made a chemical copy of the poison which is called 1080. This chemical is injected into baits in enough concentration to be toxic to foxes and feral cats but not for our native animals.



Poison pea

Map 2 – Distribution of Poison pea plants and the concentration level of monofluoroacetate (ADS = air dry sample)

Activity sheet 4.1

Name _____ Date _____

What is *Western Shield*? Test your knowledge

1. Giant *Western Shield* Search: as you find the words in the sleuth, colour them in and cross them off on the list.

h	l	c	f	m	l	a	m	m	a	m	b	w	t	o
o	p	l	p	h	w	o	u	r	a	t	y	a	a	t
o	o	r	o	t	o	p	s	t	r	e	b	l	i	g
f	e	i	i	t	f	e	s	y	s	m	a	s	u	t
y	c	r	s	o	e	n	o	i	u	e	l	t	l	f
e	h	e	o	s	e	l	p	n	e	i	l	y	o	w
X	u	o	n	o	l	o	l	l	a	y	a	x	r	l
t	d	m	p	d	l	c	i	i	a	t	w	m	m	t
i	i	l	e	e	a	o	a	a	e	h	i	e	s	h
n	t	a	a	t	m	n	t	g	e	g	t	v	t	t
c	c	d	y	d	i	s	g	e	e	i	f	e	e	t
t	h	r	e	a	t	e	n	e	d	e	h	i	l	a
a	t	a	g	p	i	r	i	d	r	n	d	i	v	l
o	e	t	l	a	e	v	r	a	d	e	v	a	s	a
n	n	a	t	u	r	e	l	a	r	t	d	g	i	e

- | | | | |
|---------------|-------------------|-------------------------|------------------------|
| <i>Bait</i> | <i>Cat</i> | <i>Conserve</i> | <i>Chuditch</i> |
| <i>Die</i> | <i>Eat</i> | <i>Endangered</i> | <i>Extinct</i> |
| <i>Feral</i> | <i>Fox</i> | <i>Gilberts potoroo</i> | <i>Malleefowl</i> |
| <i>Mammal</i> | <i>Native</i> | <i>Nature</i> | <i>Numbat</i> |
| <i>Lethal</i> | <i>Prey</i> | <i>Poison pea</i> | <i>Ringtail possum</i> |
| <i>Saved</i> | <i>Ten eighty</i> | <i>Threatened</i> | <i>Wallaby</i> |
| <i>Woylie</i> | | | |

2. In your own words explain what *Western Shield* is trying to achieve?

Activity sheet 4.1 (continued)

Name _____ Date _____

3. How many words can you make in 10 minutes from the letters below:
(Score: 15 – good; 25 – very good; 35 – excellent!)

W E S T E R N S H I E L D

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

4. Out of the fox and feral cat, which introduced predator is the most difficult to control and why?

5. *Western Shield* Word match: draw a link between the word and its definition:

Word	Definition
Trap success rate	An animal that is at high risk of disappearing from the wild in the near future.
Predator	No individuals remaining, a population of zero.
1080	A general term covering all categories of animals under threat – includes endangered or vulnerable.
Recovery	A naturally occurring poison found in poison pea plants.
Threatened	The percentage of traps that catch animals.
Extinct	The ability to cope with a poison without ill effects.
Tolerance	An animal that hunts, kills and eats another animal.
Critically endangered	An animal that is at extreme risk of disappearing from the wild in the short term.
Vulnerable	The process of building up a population after a disaster.

6. Chuditch are carnivores and don't eat plants. How have they developed a tolerance to 1080 poison?

Activity sheet 4.1 (continued)

Name _____ Date _____

7. Unscramble these words and find out what animals will benefit from *Western Shield*?

owiely

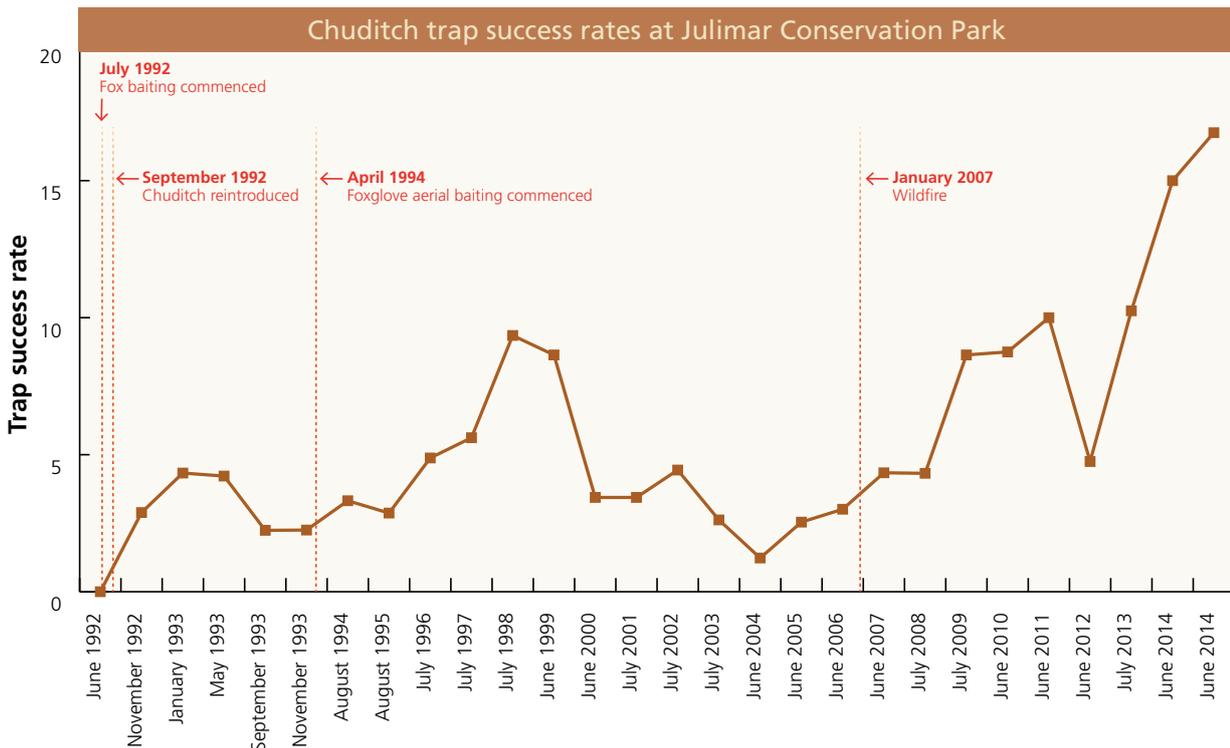
bumtan

daueqn

iblyb

chciduth

8. Look at the line graph below. At Julimar Conservation Park fox baiting began in 1992.



- Did the number of chuditch increase or decrease after baiting started? _____
- Does the graph give you enough information to explain the June 2004 results? _____
- What are some reasons to explain the variation in chuditch numbers over time?

- What additional information might help explain the June 2004 result?

9. Can you explain why baiting with 1080 helps our native animals?

Activity sheet 4.2

Name _____ Date _____

Western Shield story board

Below and over are various images. All of them have something to do with the *Western Shield* program.

1. Do parts one and two on separate sheets of paper.
2. For each part: cut out the pictures, arrows and name labels and arrange them on a separate blank sheet of paper (A3 folded lengthways works well). Arrange the pictures in a sequence of steps to show the stages of the *Western Shield* program and use the arrows between the pictures.
3. Add the correct name label to each picture. Glue everything down once you have them arranged correctly. See example below:

Chemical in plant similar to that used in poison baits



Poison pea plant



1080 Baits

Part One: Controlling the feral predators

Cut out each name label box

Plane to drop baits

1080 Baits

Poison pea plant

European red fox

Feral cat

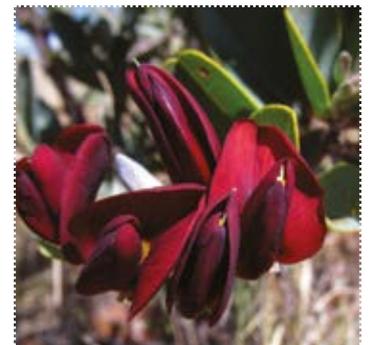
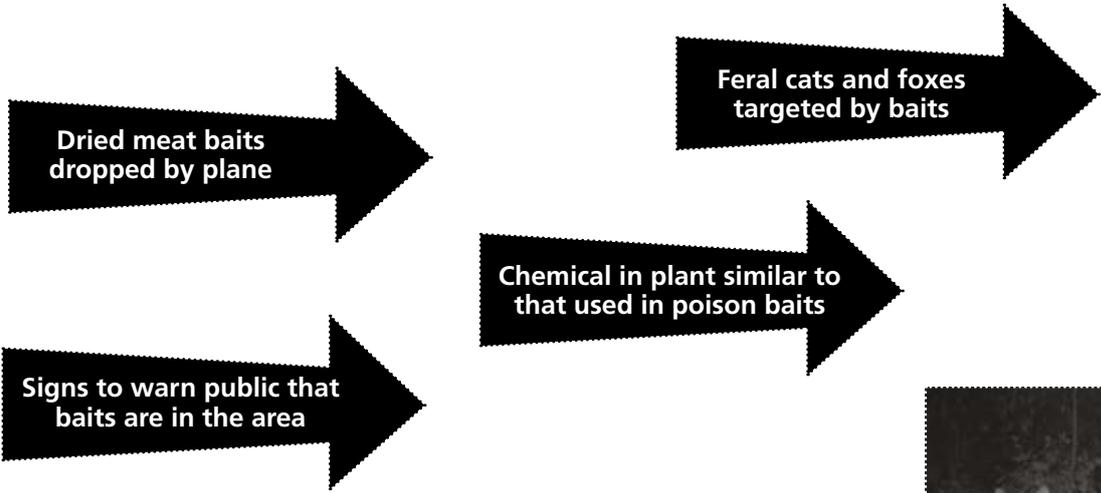
1080 sign

Activity sheet 4.2 (continued)

Name _____ Date _____

Part One: Controlling the feral predators

Cut out each arrow and picture box✂️



Activity sheet 4.2 (continued)

Name _____ Date _____

Part Two: Monitoring and managing our native wildlife

Cut out each arrow and picture box<

Animal in trap

Predator proof fence

Phascogale released

Small cage trap

Weighing the animal

Measuring head length of a phascogale

Native animal released after being measured

Predator proof fences to protect native animals

Animal being measured

Animal being weighed

Animal is caught in trap during the night



Activity sheet 4.3

Name _____ Date _____

Extension – Trap success rates

Background

Trapping success rate: is essentially the number of traps that catch animals as a percentage of traps set. We monitor how this changes over time to get a trend for the population and this gives us an idea of whether the population is increasing, whether it is stable or whether it is declining.

Trap success rates are measured to determine the relative abundance of species both within a location, across locations, and over time. The measure does however have its limitations. Some species of animals can become “trap happy”, others “trap shy”. Trap happy animals have little hesitation in entering a trap for the free food, they tend to naturally be curious animals. Trap shy animals however can be hard to catch and avoid, or shy away, from traps. The trap shy animal may be abundant in the area but difficult to monitor through trapping techniques. Trap happy animals can also obscure the results for more shy animals – for example chuditch are more shy than woylies so have lower trapping success rates even if they are in good number in the area.

To calculate the trapping success rate the following formula is used –

$$\% \text{ trap success} = \frac{\text{Number of captures}}{\text{Trap nights}} \times 100$$

A trap night is one trap set for one night, so if 50 traps are set for 3 nights, that equals 150 trap nights.

See example below:

50 cage traps are set for 4 nights and 5 woylies are captured:

- Trap nights: $50 \times 4 = 200$
- Trap success rate: $\frac{5}{200} \times 100 = 2.5\%$

Analyse the following data

The target species for this monitoring transect were native marsupials. The data given is for one transect over a period of four years.

Year	Number of traps	Number of nights per year	Animals captured			
2011	20	10	7	-	-	-
2012	20	10	14	-	1	1
2013	20	10	15	2	-	6
2014	20	10	5	2	3	-
			<i>Trichosurus vulpecula hypoleucus</i>	<i>Phascogale tapoatafa wambenger</i>	<i>Antechinus flavipes leucogaster</i>	<i>Rattus rattus</i>

Activity sheet 4.3 (continued)

Name _____ Date _____

1. Find the common name of the animals captured and write them in the table below:

Scientific Name	Common Name	Scientific Name	Common Name
<i>Trichosurus vulpecula hypoleucus</i>		<i>Phascogale tapoatafa wambenger</i>	
<i>Antechinus flavipes leucogaster</i>		<i>Rattus rattus</i>	

2. In the table above circle any introduced animals.

3. Calculate the trap success rates for each species, as well as overall trap success rate. (Show your workings)

Species name:	Working:

4. Using this data alone are there any trends? Explain

5. What additional information would you need to help explain the success rates?



Fox

Foxed food chains

Stage 5

Teachers' Notes

Stage 5 – Foxed Food Chains

Students learn about the detrimental impact of an introduced species on a food chain, food web and ultimately an ecosystem. An excursion to the jarrah forest as part of this activity would be of considerable value in understanding the interacting elements of the ecosystem.

Concepts

- Food chains and food webs are diagrams which represent the feeding relationships between living organisms within an ecosystem.
- A stable ecosystem is one in which relationships between organisms and the non-living components have evolved to equilibrium over long periods of time.
- The introduction of a species with no predators can imbalance the ecosystem and threaten many species.

Resources

- Stage 5 Student resource sheet 5.1 – Food Chains (1 per group)
- Stage 5 Activity sheet 5.1 – Forest Life cards (1 set per group)
- Stage 5 Activity sheet 5.2 – Foxed food chains (1 per student)
- Blank sheet of paper, scissors and glue (1 per group)

Additional resources

For teachers:

- DVD *Deadly Protectors* by Department of Environment and Conservation / *Western Shield*, which has some great footage of our threatened species. Contact Perth Hills Discovery Centre (Ph: 9295 6149) for a loan copy.
- A resource pack for secondary schools available on the Internet: *Bugs, Beasts and Biodiversity, Exploring Biodiversity in the South-west of Western Australia*: <http://www.aae.org.au/docs/WAbugs/bugsbeasts.htm>
- *Back from the Brink* excursion for metropolitan schools (Perth Hills Discovery Centre) and for schools in the Bunbury area (Wellington Discovery Forest).

For Years 4, 5, and 6:

- A one-day field trip which includes:
 - A hands-on session participating in the Department of Parks and Wildlife's research methods.
 - A tour of Perth Hills Discovery Centre: a walk looking for signs of animals.
 - A close encounter with threatened forest fauna (Perth Hills Discovery Centre).

Student numbers: Minimum of 20 students per class, one or two classes

Time: 10.00 am to 2.00 pm

When: Weekdays

Bookings and Enquiries:

For metropolitan schools – Ph: (08) 9295 6149, email: n2n@dpaw.wa.gov.au

For Bunbury area schools – Ph: (08) 9725 4300, email: swecoed@dpaw.wa.gov.au

Teachers' Notes (continued)

Teacher Directions

1. Attend a *Back from the Brink* excursion at Perth Hills Discovery Centre or Wellington Discovery Forest
2. Brainstorm with students the concepts of food chains, food webs and ecosystems.
3. Ask students in their groups to read Stage 5 Resource sheet – Food Chains.
4. Discuss the links between the elements of the jarrah forest, both living and non-living. Add to the list in Resource Sheet 5 and examine the source of food (nutrients) for each element. Discuss the feeding habits of the fox. Students can also refer to information gathered for previous activities in this pack.
5. Students each construct a food chain using the Stage 5 Activity sheet – Forest life cards. Each student makes a food chain with four links in it by cutting out the cards and forming a chain. Make sure students do not use the fox or feral cat pictures yet. Members of each group must have different food chains, but can assist each other in the process.
6. On completion students glue their food chains onto a large blank piece of paper. Groups discuss and insert lines and arrows between the different chains to show links between elements of the chains thus creating a food web. If you wish students could label elements of the food web with the terms producers; **primary consumers; secondary consumers; decomposers and recyclers.**
7. Students then add the introduced predators foxes and feral cats to their food web. Draw lines connecting those predators with their prey.
8. Students then answer questions posed on Stage 5 Activity sheet – Foxed food chains.
9. At the end of this Stage give students half an hour to reflect on the activities and plan for the next Stage.



Fox



Western Shield excursion

Resource sheet 5.1

Foxed food chains

An ecosystem can be defined as a community of living plants and animals interacting with each other and with their non-living surroundings (air, water, soil, sunlight) in a defined space (e.g. in a forest).

The interaction between different organisms within a community of different plants and animals is quite varied. An example is the feeding relationship.

In a jarrah forest there are the plants that produce their own food through photosynthesis. These are called the 'primary producers' which include the **trees, understorey plants** and **herbaceous ground cover plants** eg **grasses**.

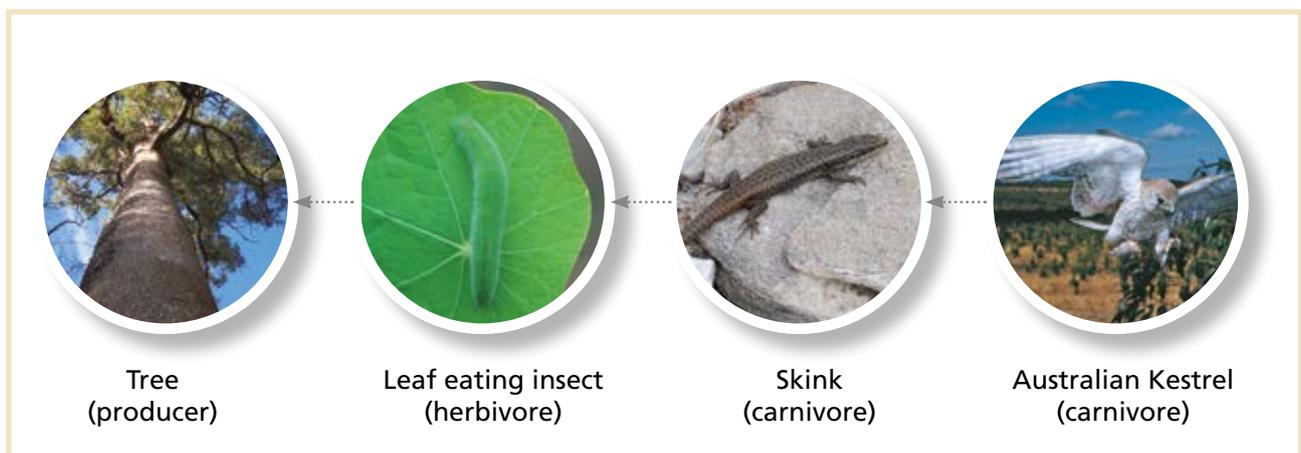
Other living organisms feed on plants. They are called 'herbivores' or 'primary consumers' such as **insects, possums, wallabies** and **woylies**.

Animals that feed on other animals are called 'carnivores' or 'secondary consumers'. Examples are **chuditch, numbats** and **reptiles** e.g. **snakes, lizards** and **skinks**. Some animals feed on both plants and animals and are referred to as 'omnivores'.

Finally there is a whole range of other organisms, both plant and animal, which break down dead organic matter. These are called 'detritivores' or 'decomposers' and 'recyclers' of food (nutrients) including **bacteria, fungi** and **insects** such as **termites**.

A single chain of organisms feeding one on another is called a food chain.

Here is an example of a forest food chain:



In reality consumer organisms (herbivores, carnivores and detritivores) feed on several different food sources. A network diagram showing feeding relationships in an ecosystem is called a **food web**.

Entering this relatively stable forest ecosystem came the fox, a very adaptable animal, capable of living in many different conditions. Foxes were deliberately released near Melbourne in the 1860s so that people could hunt them for sport and they soon spread to the south-west of Western Australia.



Fox

Resource sheet 5.1 (continued)

The fox in a forest ecosystem is not a fussy eater. It will take live mammals, reptiles, birds, reptile and bird eggs, lizards, frogs, and plants. It will scavenge dead, decaying animals and when hungry will feed on insects and other invertebrates. The fox is a skillful killer, hunting at night, relying on sound and smell more than sight to find its prey.

This cunning killer, however, has no real predators to keep its numbers down.

Consider the impact of foxes on the food chain above. They could affect, or even destroy, at least one level of the chain, the lizards. Scientists are not always sure what will happen when an entire level of a food chain is destroyed but due to the complexity with other levels it will likely impact on other levels in a negative manner e.g. less food for native higher level predators. In the longer term species can become endangered or even extinct.

Also, some species play roles that may benefit other species. The woylie, for example, digs in the forest soil for underground fungi. By digging the hard forest soil, woylies loosen it, allowing water to more easily get to the roots of trees and understory plants. As a result, losing woylies from an area may harm the overall health of the forest.

Some living elements of the jarrah forest ecosystem

Primary producers :

marri tree, jarrah tree, banksia, wattle, balga, zamia, bracken, poison pea.

Primary consumers :

parrot, possum, wallaby, woylie, kangaroo, leaf-eating insect e.g. caterpillar.

Secondary consumers:

insect-eating bird, numbat, echidna, frog, dugite, death adder, skink, goanna, wedge-tailed eagle.

Decomposers and recyclers:

bacteria, earthworm, fungus, millipede, mite, springtail and other tiny insect species, termite.

Activity sheet 5.1

Name _____ Date _____

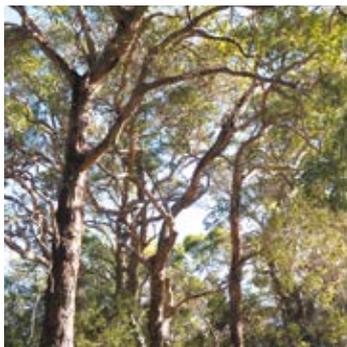
Forest life cards

Cut out each picture box

Here are some of the plants and animals found in the jarrah forest ecosystem. What the animals eat is listed in italics under the name.



Jarrah trees



Marri trees



Balga



Zamia



Cockatoo

Nuts from Jarrah and Marri trees



Possum

Insects, fruits, seeds, leaves



Termites

Wood



Woylie

Fungi, roots and other plant material



Frog

Insects, spiders

Activity sheet 5.1 (continued)

Name _____ Date _____

Forest life cards Cut out each picture box ✂

Here are some of the plants and animals found in the jarrah forest ecosystem. What the animals eat is listed in italics under the name.



Millipede
Dead plant material



Honey eater
Nectar



Numbat
Termites and other invertebrates



Southern death adder
Small mammals, birds



Bob tailed lizard
Plants, insects, fruit and spiders



Wedge-tailed eagle
*Mammals, lizards, birds.
Carrion (dead animals)*



Chuditch
Large invertebrates, small mammals, birds, lizards



Quenda
Underground invertebrates, roots, fungi



Kangaroo
Grasses, shrubs

Activity sheet 5.1 (continued)

Name _____ Date _____

Forest life cards Cut out each picture box

Here are some of the plants and animals found in the jarrah forest ecosystem. What the animals eat is listed in italics under the name.



Fungi



Fox

*Small mammals
(and the young of large ones),
ground nesting birds,
lizards, frogs, insects*



Feral Cat

*Small mammals, birds,
reptiles, frogs*



Woodlouse (Slater)



Dead leaves, sticks



Roots of plants

Activity sheet 5.2

Name _____ Date _____

Foxed food chains

Working in groups:

1. Using the information on Resource Sheet 5 – Foxed food chains and the Activity Sheet – Forest Life cards, each person in your group cuts out four Forest Life Cards to make a simple food chain in the Jarrah forest. Do not use the fox and feral cat pictures yet. Each member of your group should have different elements in their chain.
2. Paste your chain onto the blank piece of paper together with the food chains of your group. Begin with the **Primary producers** at the bottom of the page, then work upwards.
3. Insert lines and arrows, showing which creature consumes what, to create a jarrah forest food web. The lines and arrows can go across food chains to link different chains.
4. Now add the pictures of the fox and feral cat to the page; draw lines connecting them to their prey.
5. Discuss and write in a title at the top of your group’s food web.

Discuss in your group then write answers below:

- a. Describe how foxes and feral cats affect your forest food web:

- b. What other animals would be likely to die in the forest if foxes ate all the small ground-dwelling herbivores?

- c. If all ground-dwelling herbivores were killed by foxes in an area of forest how would the plant life be affected?

- d. What steps could we follow to restore that area of Jarrah forest back to its natural balance of species?



Juvenile woylie

Act for conservation

Stage 6

Teachers' Notes

Stage 6 – Act for Conservation

Students are given a choice of ideas and opportunities to contribute towards the conservation of threatened species and biodiversity.

Concept

- We can all help in bringing wildlife back from the brink of extinction.

Resources

- ❑ Environment Australia, Biodiversity Group. Pamphlet, *Green Kids guide to threatened species*. Internet site: <http://www.environment.gov.au/biodiversity/threatened/publications/factsheet-green-kids-guide-threatened-species-9-ways>
- ❑ YouTube video: Today Tonight on Woylies: <https://www.youtube.com/watch?v=FyxpFivnE3c>

Additional Resources

For teachers:

- Sustainable Schools WA website has case studies on schools who have done practical projects to help their local wildlife: <http://www.det.wa.edu.au/curriculumsupport/sustainableschools/detcms/navigation/action-learning-areas/biodiversity/#toc2>

Teacher Directions

1. To recap on what has been covered so far watching a short video such as the Today Tonight YouTube film on woylies could help focus discussion. You may begin discussion with something like: We know scientists and conservationists are working to save threatened species; how can **we** help our wildlife?
2. Refer to Environment Australia's Internet site. Either in groups or as a class look at *Green Kids guide to threatened species*. Ask students whether there are realistic ways they would like to contribute to saving threatened species. There are several options with local support available:

Volunteer with Parks and Wildlife or with a conservation group:

- <http://www.dpaw.wa.gov.au/get-involved/volunteering-opportunities>

Educating others:

- Design posters for library / school website on *Western Shield*, endangered species and feral animal control.
- Research how to control pets so they don't affect wildlife and look into how to best educate the school community (students and their families) about it.
- Organise a pet cat debate. Students research and write a Persuasive Exposition on the topic "Do introduced animals destroy our native wildlife?" Follow this with a class debate 'for' or 'against' pet cats. Invite another class to attend the debate and in this way spread the word for control of feral animals. See <http://www.abc.net.au/radionational/programs/backgroundbriefing/feral-cats-summer-version/5954116>



Woylie release at Perup

Teachers' Notes (continued)

Help local wildlife (they may not be endangered species, but local birds, frogs, reptiles and invertebrates are all important parts of the ecosystem). For ideas on how to encourage wildlife in your school grounds or household gardens see:

- <http://www.backyardbuddies.net.au/build-buddy-habitats> (has mainly Eastern States species but lots of great ideas)
- <http://www.sercul.org.au/docs/Gardens%20for%20Frogs%20in%20Perth.pdf>

Practising the 3R's (Reduce, Reuse, Recycle) and cleaning up litter also helps wildlife:

- <http://www.wasteauthority.wa.gov.au/programs/waste-wise-schools/>
- <http://www.kabc.wa.gov.au/>

Growing a native garden of local plants:

- <http://www.thegreeningproject.org/pages/nursery-in-a-box>

Learning about, and caring for your local birds; see:

- <http://www.birdlife.org.au/locations/birdlife-western-australia>

Assisting with a community vegetation project, such as helping the 'Friends of ' group at a local bush land reserve with tree planting or other jobs that may need doing. For information on local environment groups, contact your local council.

3. After looking into some possibilities the class decides on a project they would like to undertake to help our wildlife. This could follow the Action Learning Cycle process of Plan, Act, Observe, and Reflect (and celebrate!).
4. Encourage students to decide what they can do personally in their own lives to help wildlife; whether its controlling their pet cats and dogs, (have them de-sexed, keep them in at night and never dump their unwanted pets in the bush); following the 3R's, visiting national parks, environment centres or zoo's to experience more of our wildlife and their habitat, volunteering at environment centres or wildlife refuges. The possibilities are endless!
5. At the end of this Stage give students half an hour to reflect on the activities and decide on an on-going commitment to conserving biodiversity.
6. They could complete the mind map started in Stage 1 on page 10.



Spectacled hare-wallaby



Western ringtail possum

Additional Resources

A list of relevant resources has been provided in each Stage throughout this booklet. Below is a list of additional resources that may be useful to any research projects.

- Department of Parks and Wildlife *LANDSCOPE* magazine: articles about threatened species. Your local library may stock the more recent issues of this magazine. Current issues of the magazine are also available for purchase at some newsagencies and from the Department of Parks and Wildlife, Kensington Branch, 17 Dick Perry Avenue, Kensington, Perth (08) 9219 9000.

For any of the older issues contact N2N Schools, Perth Hills Discovery Centre (08) 9295 6149 and a copy of any articles can be emailed on request.

- Spring 2011: *Back from the brink: 50 years of conservation at Two Peoples Bay*
- Summer 2011-12: *Five-star dining for Carnaby's Cockatoo (A threatened species)*
- Autumn 2012: *A new threat posed by foxes*
- Winter 2012: *Western Shield: protecting our native fauna*
- Autumn 2013: *Controlling cats: the work continues*
- Summer 2013-14: *Kyloring, cats and conservation: The race to save the western ground parrot*

- Fauna profile sheets are available on the Parks and Wildlife website:
<http://www.dpaw.wa.gov.au/plants-and-animals/animals/animal-species-profiles>

These would be great for students to use when researching a West Australian threatened species. A list of relevant sheets is provided below. If they are not available on the website please contact N2N Schools, Perth Hills Discovery Centre (08) 9295 6149 and a copy of any articles can be emailed on request. Fauna profiles exist for the following species:

- Bilby
- Black-flanked rock-wallaby
- Boodie
- Chuditch
- Dibbler
- Gilbert's potoroo
- Greater stick-nest rat
- Mala
- Numbat
- Quenda
- Quokka
- Red-tailed phascogale
- Shark Bay mouse
- Tammar wallaby
- Western barred bandicoot
- Western ringtail possum
- Woylie

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