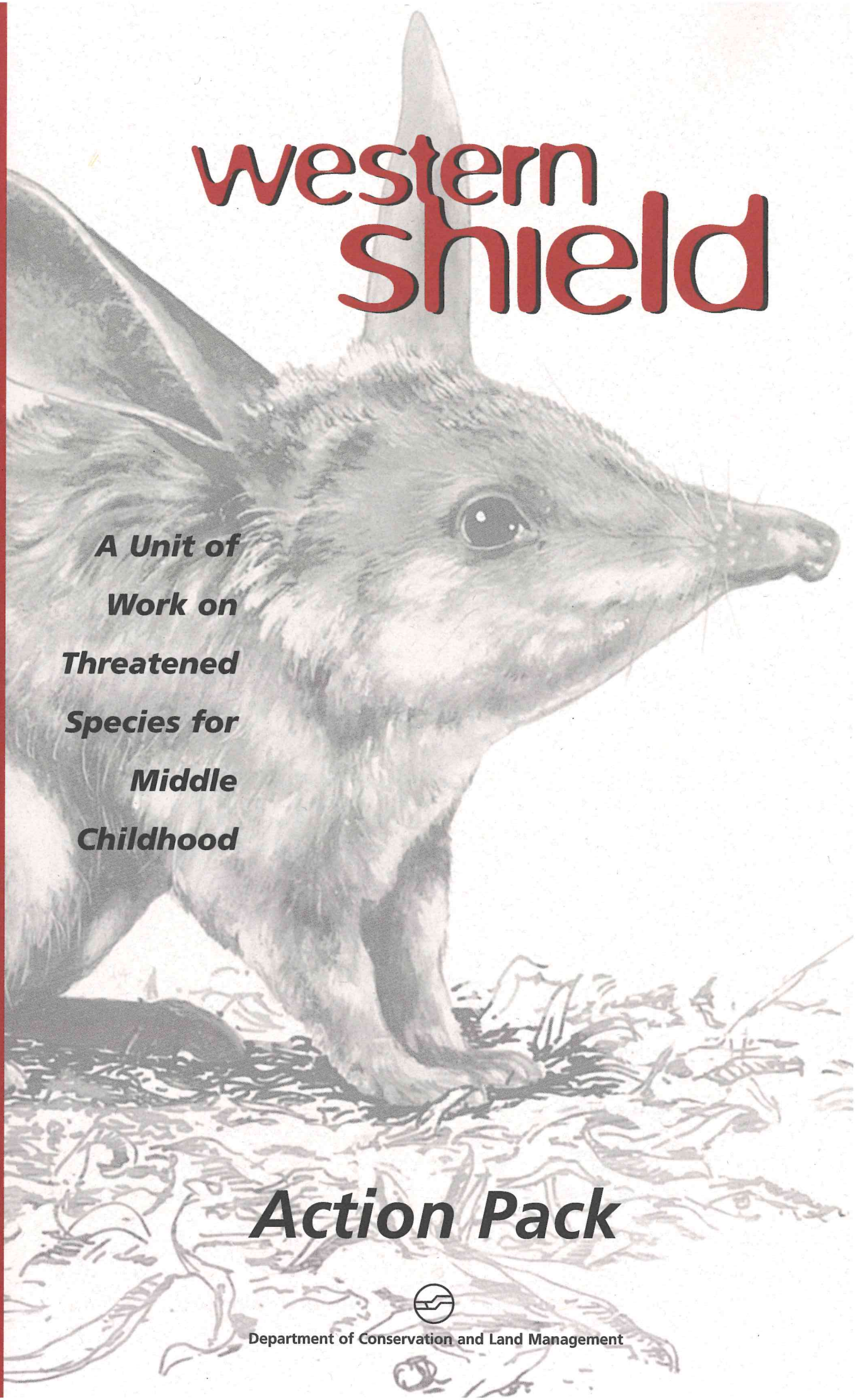
western shield



A Unit of Work on Threatened Species for Middle Childhood

Action Pack

Department of Conservation and Land Management

Publisher
Department of Conservation and Land Management
Technology Park, Western Precinct, Dick Perry Avenue, KENSINGTON WA 6151

Managing Editor
Ron Kawalilak

Project Writer
Elizabeth Moore

Graphic Designer
Tiffany Aberin

Printing
Scott Print

Printed on recycled paper

Contents

Acknowledgments

A number of people have contributed to this resource.
Their assistance and support is gratefully acknowledged.

Eileen Burns	– Willetton Primary School
Kathleen Harvey	– Falls Road Primary School
Ian Preston	– Falls Road Primary School
Stephen Lee	– Middle Swan Primary School
Vic Watson	– Walliston Primary School
Kieran McNamara	– Director, Nature Conservation, Department of Conservation and Land Management
Sue Sneyd	– Curriculum Improvement Officer, Swan Education District Office
Dr Tony Start	– Principal Research Scientist, Department of Conservation and Land Management

Overview of Action Pack

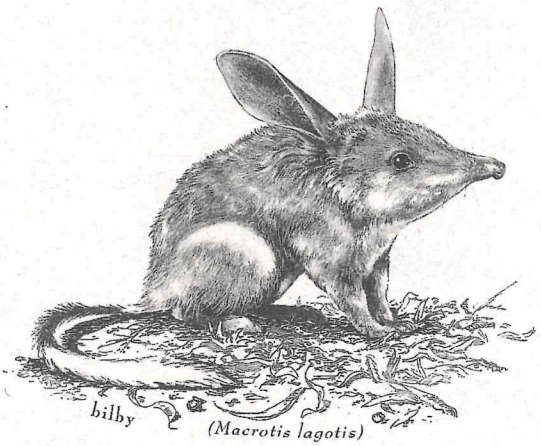
Outcomes

On completion of this unit of work students will:

- have increased awareness of Western Australia's threatened species and the need to conserve biodiversity
- be familiar with current CALM projects aimed at preventing further extinctions eg Project Eden, that come under the umbrella of Western Shield,
- have improved their understanding of Western Australia's unique fauna,
- be encouraged to take positive community action to contribute to the protection and conservation of native wildlife.

Phase of Development: Middle Childhood

The following matrix describes the key curriculum learning area outcomes from this unit of work. Many other outcomes, from these and other learning areas will be achieved whilst using the pack.



This Action Pack is available in the 'For Schools' section of CALM's NatureBase Internet site at:
http://www.calm.wa.gov.au/schools/index.html

Using this pack will contribute to the attainment of the following:

OVERARCHING STATEMENTS *Curriculum Framework*	1, 3, 4, 7,12 and 13
VALUES *Curriculum Framework*	
Students will recognise the need for: **4. Social and Civic Responsibility** 4.1 Participation and citizenship 4.2 Community 4.3 Diversity	Students will recognise the need for: **5. Environmental Responsibility** 5.2 Conservation of the environment 5.4 Diversity of species
LEARNING AREA OUTCOMES *Curriculum Framework*	
SOCIETY AND ENVIRONMENT ***Investigation Communication and Participation*** Students investigate the way in which people interact with each other and with their environments in order to make informed decisions and implement relevant social action. ***Natural and Social Systems*** Students understand that systems provide order to the dynamic natural and social relationships occurring in the world.	
SCIENCE WORKING SCIENTIFICALLY ***1) Investigating*** – Students investigate to answer questions about the natural and technological world using reflection and analysis to prepare a plan; collect, process and interpret data; to communicate conclusions; and to evaluate their plan, procedures and findings. ***2) Acting responsibly*** – Students make decisions that include ethical consideration of the impact of processes and likely products of science on people and the environment. ***3) Science in Society*** – Students understand the nature of science as a human activity. UNDERSTANDING CONCEPTS ***4) Life and Living*** - Students understand their own biology and that of other living things, and recognise the interdependence of life.	
ENGLISH ***Speaking and Listening*** Students speak and listen with purpose, understanding and critical awareness in a wide range of contexts. ***Viewing*** Students view a wide range of visual texts with purpose, understanding and critical awareness. ***Reading*** Students read a wide range of texts with purpose, understanding and critical awareness. ***Writing*** Students write for a range of purposes and in a range of forms using conventions appropriate to audience, purpose and context.	
MATHS ***Chance and Data*** Students use their knowledge of chance and data handling processes in dealing with data and with situations in which uncertainty is involved.	

Planning for this unit of work

There are two options for using this pack. Firstly, using only the information provided in the pack, students complete the Activity Sheets during four lessons. Photocopying of Resource Sheets and Activity Sheets will be required. Alternatively, a more in depth approach, which fulfils the needs of the curriculum framework, 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 unit of work is divided into five 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 4 for details) will help to achieve the desired student outcomes. Bookings need to be made well in advance of the required date.

Stage 1: Threatened Species

Immerses students, through their own investigations using a choice of learning technologies, in the theme of threatened species and biodiversity loss and introduces Western Shield.

Stage 2: 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 3: Investigate a Species

Establishes an understanding of the importance of biodiversity conservation through an investigation of a species.

Stage 4: Foxed Food Chains

Clarifies the interdependence of plants and animals in an ecosystem. This stage is supported by a *Back from the Brink* excursion to the jarrah forest.

Stage 5: Act for conservation

Provides ideas on opportunities for students to contribute to biodiversity conservation.

Stage 1 – Threatened Species

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

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 at least one hundred times above the natural extinction rate and happening on a massive scale. Human activities are directly 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.

Western Shield is CALM's project in WA to expand feral predator control and then reintroduce native animals to former habitats.

Definitions

Presumed extinct	Not collected or otherwise verified in the wild for the past 50 years
Endangered	In serious risk of disappearing from the wild within one or two decades if present landuse and other causal factors continue to operate.
Threatened	Presumed extinct, endangered or vulnerable. ie a general term covering all categories of animals under threat.

Concepts

- Extinction rates today are much higher than natural rates because of human activities.
- In Australia a main cause of extinctions is the introduction of species.
- A variety of native animals are threatened by foxes and cats; medium sized mammals, reptiles and ground-nesting birds.

Resources

- Resource Sheet 1 (1/group), Activity Sheet 1 (1/student)

Additional resources

- Bookmarked Internet sites:
  CALM's NatureBase Internet site: **http://www.calm.wa.gov.au**
  Threatened Species Network: **http://www.nccnsw.org.au/member/tsn**
  Environment Australia:
  http://www.biodiversity.environment.gov.au/threaten/index.htm
  Perth Zoo: **http://www.perthzoo.wa.gov.au**
- Video: *In your Backyard. An environment studies video on the conservation of the Chuditch*. Available from World Wide Fund for Nature, GPO Box 528, Sydney, NSW 2001. Toll free 1800 251 573.
- Books: From school library about threatened species eg *Here Today, Everywhere Tomorrow? The Effects of Introduced Plants and Animals on Australia* by J. Anderson, 1989. Horwitz Grahame Pty Ltd with Ashton Scholastic.
- CALM's *LANDSCOPE* magazines. Ask your school librarian to source these for photographs of threatened species. See Reference List of this Action Pack.

- Bush book: *Mammals of the South-West*. Available from CALM. Tel 9334 0437.
- Western Shield poster/s sent in Action Pack to all schools in 1997.
- Dictionaries.

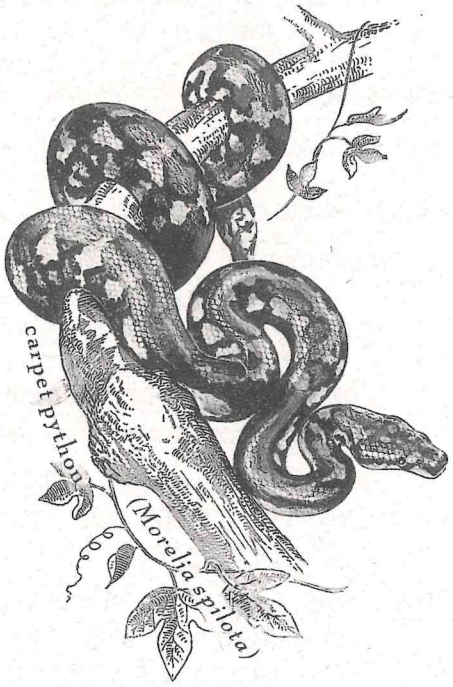
Teacher Directions

1) Establish work stations at which different resources are available prior to the unit of work
2) As a class, brainstorm the subject of threatened species using the background information provided and note on a whiteboard relevant terms to be defined.
3) Assign students to small groups. Each group has access to Resource Sheet 1 and Activity Sheet 1.
4) Allocate approximately four words to be defined by each group. The list should include: bait, biodiversity, biological control, conserve, diversity, ecosystem, endangered, extinction, feral, habitat, mammal, marsupial, native, predators, unique, threatened.
5) Each group retrieves information from the work stations, noting down examples of the use of the words in their context.
6) Combine the work of groups into a glossary for use by the whole class during the unit of work.
7) As a class discuss the definitions of unfamiliar terms.
8) Students study Resource Sheet 1 and feed back their discoveries. The class discussion should include the map showing the extent of Operation Western Shield, the bar graph and threatened species.
9) Working in groups students can complete the questions on Activity Sheet 1.
10) At the end of this Stage give students half an hour to reflect on the activities and plan for the next Stage.

    This reflection can be structured and include the following:

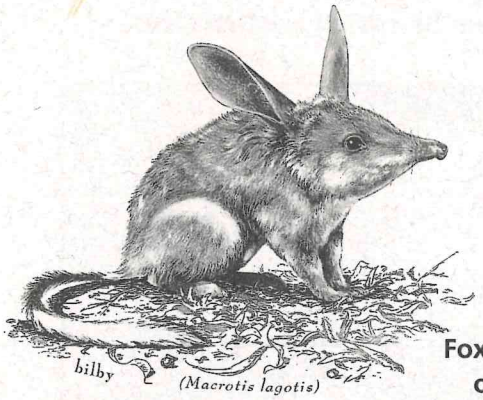
    Students -

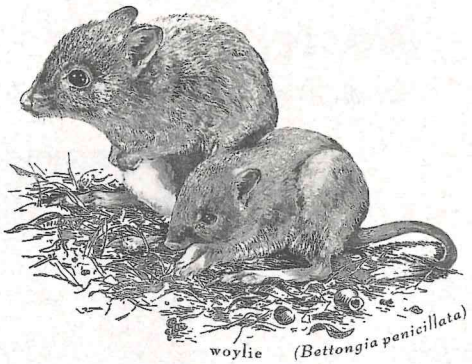
    - comment on their work
    - edit a draft of their writing
    - complete a checklist of tasks
    - review this stage in relation to the planned unit of work



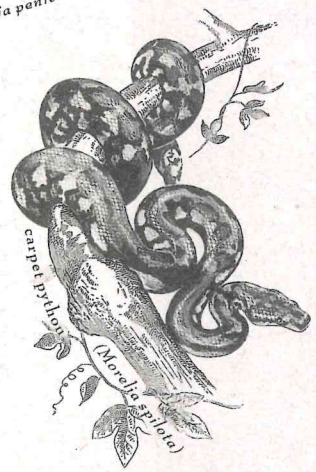
western shield

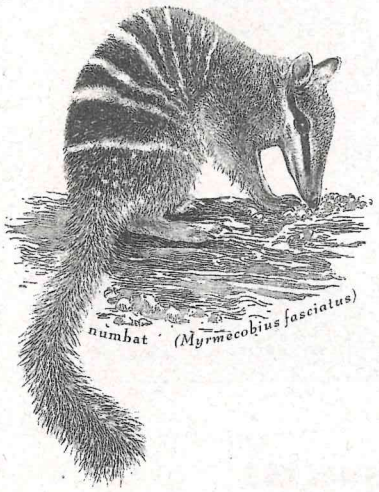
Threatened Species





Foxes and cats are making a meal of Western Australia's native wildlife. These foreign predators have contributed to the extinction of 10 native mammals. Twenty-eight more species are threatened.

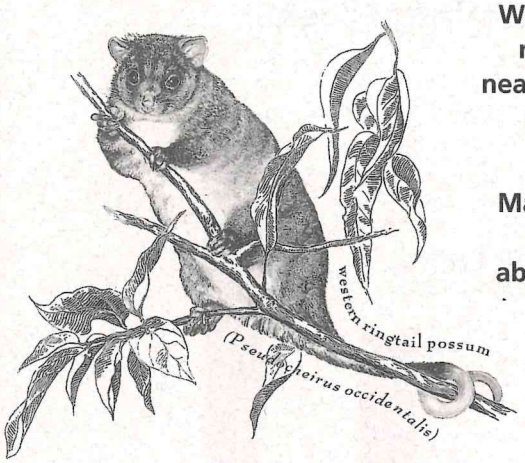


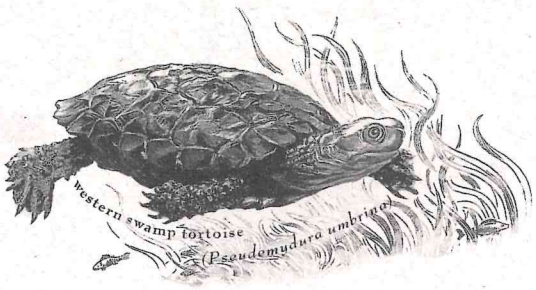


Western Australia has a natural advantage in controlling predators–plants known as poison peas. They contain a poison which is made synthetically under the name 1080. Native animals that evolved with these plants have a natural resistance to the poison, which is lethal to introduced animals.

Western Shield is a program to remove foxes and cats from nearly five million hectares of the State by baiting with 1080 poison.

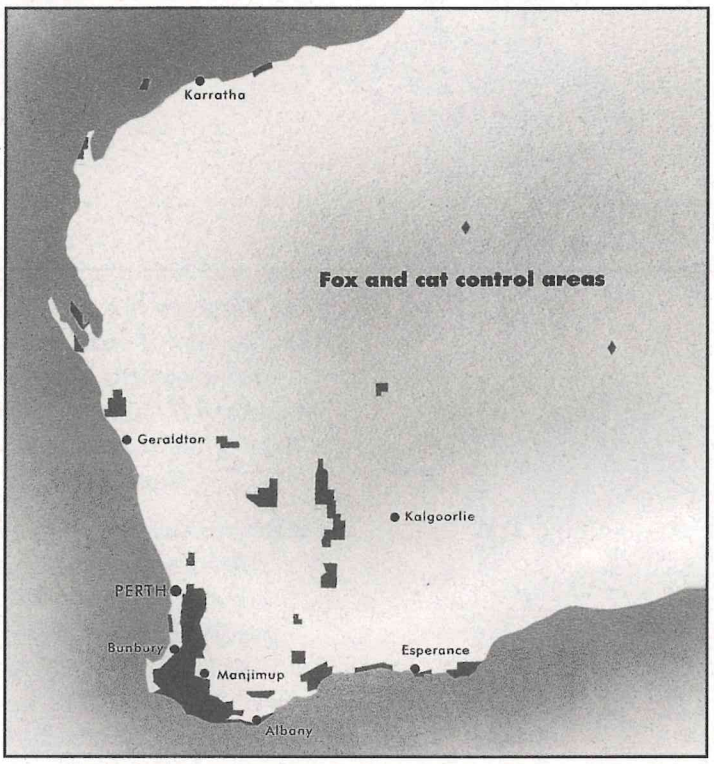
Many native animals like those pictured here will become abundant in our bushland once again.

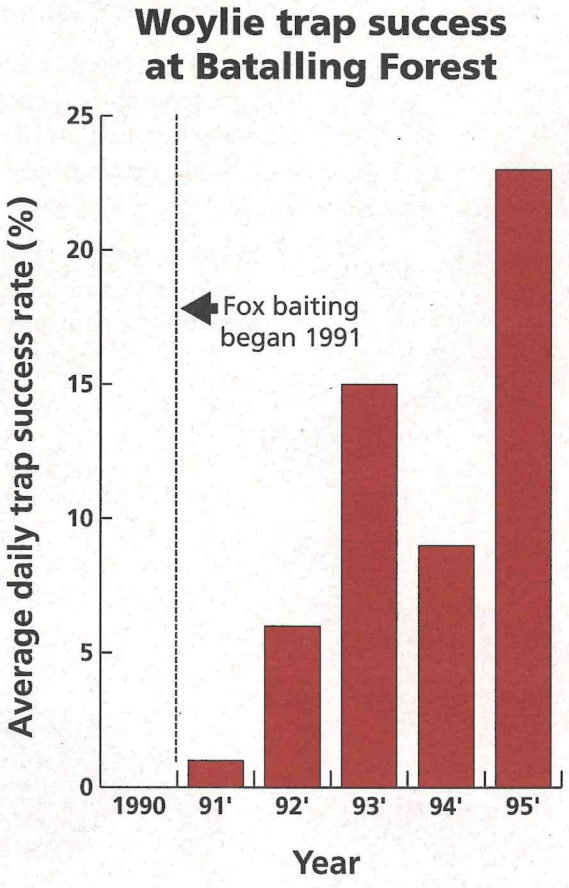




Western Shield

–bringing wildlife back from the brink of extinction





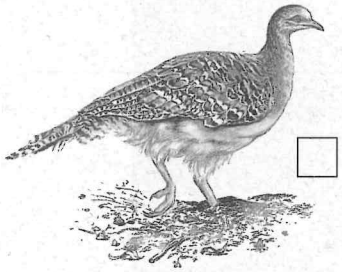
western shield

Threatened Species

Name: _____

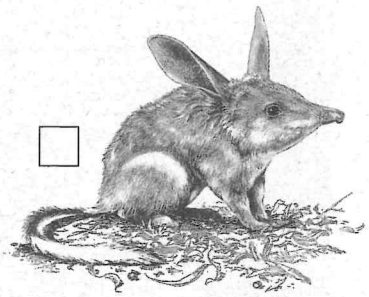
1) Study Resource Sheet 1. Read and discuss with your group. Write in the name of the animals.

2) How many of these animals have you seen in the wild? Tick the boxes.



☐

_____



☐

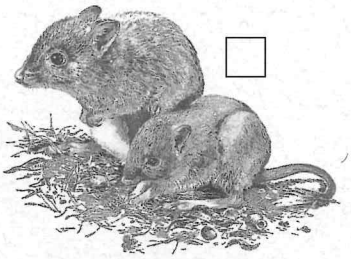
_____

☐

_____

☐

_____

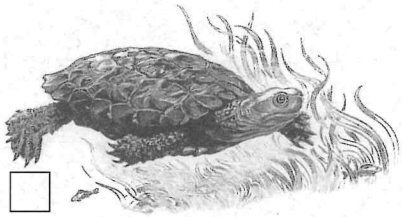


☐

_____

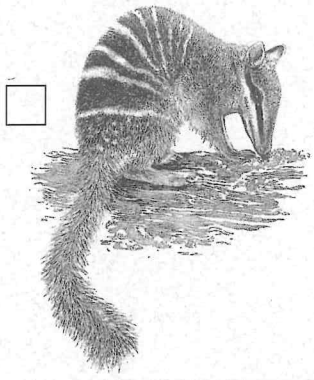
☐

_____



☐

_____



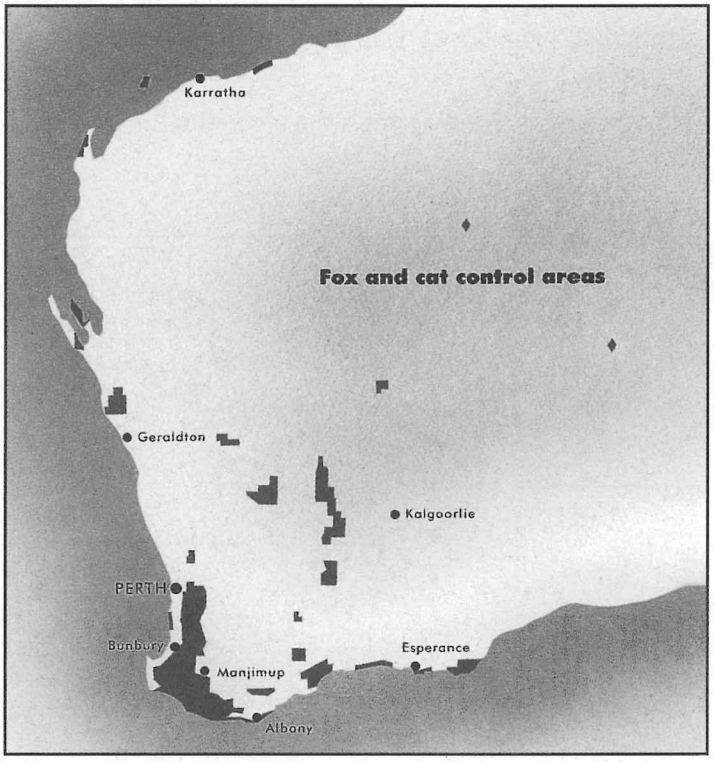
☐

_____

☐

_____

Threatened Species



3) What does the bar graph tell you about the effects of fox baiting?

_____

_____

4) Look at the map and then circle on this sheet the area Western Shield operates closest to you.

5) Look closely. Find the hidden animal. What is it? _____

Stage 2 – What is Western Shield?

This stage consolidates students' knowledge of threatened fauna and Western Shield through either viewing a video or listening to a reading of text, reading text and responding to focus questions.

Concepts

- The control of introduced species is a community concern requiring a Statewide 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

- Resource Sheet 2 (1/group), Activity Sheet 2 (1/student)

Additional resources

- Video - *Deadly Protectors*. 60 minute video available for loan from the Fremantle, Perth or Swan Education District Offices.

Teacher directions

1) View each of the three sections of the video, *Deadly Protectors*, and discuss as a class.
2) Speakers from selected groups read aloud paragraphs of Resource Sheet 2. Follow with a class discussion on key words: baiting, brink, endangered, extinct, feral, native, pioneer, threatened. Students may wish to add some words to the class glossary.
3) Each student group using available resources prepares a response to the focus question, *What is Western Shield*, for their group's portfolio. This can be in the form of a report, poem or artwork eg a poster.
4) Students may complete the Puzzle Page, working in groups or alone.
5) Early finishers may answer the puzzle below and prepare other puzzles to challenge the class.

   A numbat eats 20,000 termites a day. Four numbats live in an area of wandoo woodland. A fox catches and kills one of these numbats. This fox then eats a poison bait put out during Western Shield and dies. Three more numbats then enter the area.

   How many termites will be required in the area per week to feed all the resident numbats?
6) At the end of this Stage give students half an hour to reflect on the activities and plan for the next Stage.

What is Western Shield?

What's all the fuss about?

In Western Australia over the past 100 years 10 native mammals have become extinct. Twenty eight more species are threatened and only survive in low numbers. Why? Hungry foxes and cats, introduced from overseas, are a main cause of our wildlife's decline.

There is hope!

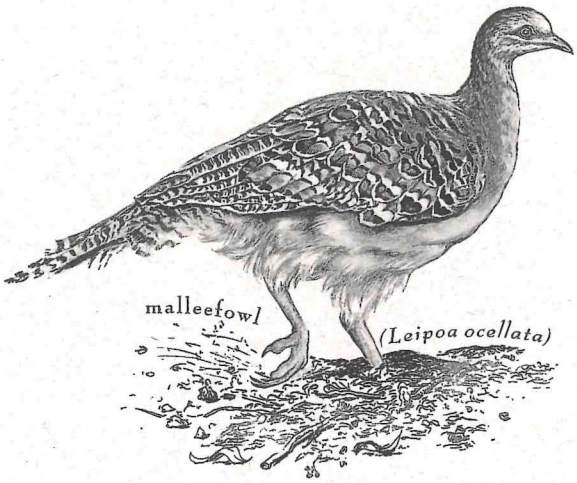
Western Shield has shown an increase in numbers of native animals in the Jarrah forest. Take a look at Resource Sheet 1 and see how woylie (a small relative of the kangaroo) numbers have increased in the Batalling Forest after fox baiting began in 1991. Woylies are now no longer an endangered species.

Using nature to conserve nature

So, how are fox numbers controlled? Western Australia has a natural advantage - a group of plants called poison peas. These plants contain a poison which is made synthetically under the name 1080 (pronounced ten-eighty). Native animals have developed a high tolerance to this poison over hundreds of years, but introduced animals, such as the European fox and feral cat, die quickly after eating tiny amounts.

Western Shield - a statewide operation

Western Shield is the name given to CALM's expanded operation to remove foxes and cats from nearly five million hectares of the State by regular baiting with 1080 poison. Many native animals will be saved from extinction and you will be able to find them in bushland once again.



What is Western Shield?

Name: _____

1) Giant Western Shield Sleuth

As you find the words in the sleuth, colour them in and cross them off on the list. The letters that are left uncoloured spell out the beginning of a phrase. Can you solve the sleuth?

T	A	E	E	T	H	P	Y	T	H	O	N	Y	W
E	S	L	X	E	C	T	E	B	R	A	E	N	L
S	H	A	T	N	T	H	S	R	T	R	I	W	E
L	A	H	I	E	I	D	A	I	P	F	O	X	D
W	R	T	N	I	D	I	V	N	B	F	R	D	F
O	E	E	C	G	U	E	E	K	E	I	N	E	O
Y	T	L	T	H	H	G	D	E	I	N	N	R	X
L	W	I	G	T	C	B	L	N	W	O	E	E	G
I	A	I	A	Y	L	L	C	A	T	S	N	G	L
E	L	D	L	B	A	I	F	E	I	I	A	N	O
S	L	N	U	M	B	A	T	O	B	O	T	A	V
M	A	M	M	A	L	S	T	A	E	P	U	D	E
A	B	C	K	F	E	R	A	L	F	R	R	N	O
M	Y	T	H	C	O	N	S	E	R	V	E	E	E
R	I	N	G	T	A	I	L	P	O	S	S	U	M

List

Bait,	Brink,	Cat,	Conserve,	Chuditch,	Die
Eat	Endangered,	Extinct,	Feral,	Fox,	Foxglove,
Malleefowl,	Mammals,	Native,	Nature,	Hare wallaby,	Numbat,
Lethal,	Prey,	Poison pea,	Python,	Ringtail possum,	
Saved,	Ten eighty,	Tortoise,	Woylies.		

Which animal pictured on Resource Sheet 1 is not listed above? _____

Complete the phrase: W_ _ _ _ _ _ _ _ _ _ _ _

B_ _ _ _ _ _ _ W_ _ _ _ _ _ _ _ _ _ _ F_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ E_ _ _ _ _ _ _ _ _

2) How many words . . . can you make in 10 minutes from the letters in:

WESTERN SHIELD

15 - good; 25 - very good; 35 - excellent!

3) Unscramble these words — who will benefit from Western Shield?

abednd raeh aabwlyl rewenst pwsam ortiseo acrept tyohpn

_____ _____ _____

Stage 3 – Investigate a Species

Through their own investigations and presentation about a species students discover the reasons for biodiversity conservation.

Background information

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 is the ecological collapse of the planet and our own survival being threatened. There are, however, many other reasons in the interim 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 we have of passing on a rich environment to future generations.

We do not know what effect the loss of a particular species will have on our 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.

This is why CALM places so much importance on Operation Western Shield which has an annual budget of $1.4 million and covers an area of nearly 5 million hectares.

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

- Resource Sheet 3 (1/group), Activity Sheet 3 (1/student)

Additional resources

- Resources at work stations provided for Stage 1
- Threatened Species Network:
  http://www.nccnsw.org.au/member/tsn/context/why.html

Teacher directions

1) With reference to the given background information for teachers, discuss as a class the importance of biodiversity conservation.
2) Using the Resources at work stations students in their groups explore reasons for the need to conserve threatened species and biodiversity. Direct students to the Threatened Species Network website and the section on *Why save threatened species?* Each group prepares notes on the reasons.
3) As a class discuss and list the many reasons for conserving biodiversity.

4) Each group then researches a threatened fauna species. Species illustrated on Resource Sheet 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 species require?
   - What are the main reasons for the species becoming threatened?
   - How have humans contributed to the threatening process?
   - What is its current status?
   - What is CALM doing to 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 on their species using their chosen medium to present the information eg text and drawings, a model and signs, a poster, a song or tape recording or a PowerPoint presentation.

7) A report could be prepared using the First Steps headings:

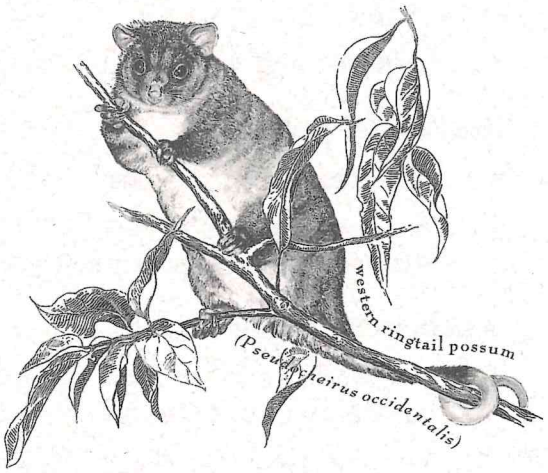
Introduction	Description	Distribution	Habitat	Feeding Habits
Reproduction	Other Interesting Points		Ending	

8) Those who have completed their presentation may complete Activity Sheet 3 using Resource Sheet 3 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 other agencies to research and breed threatened species.



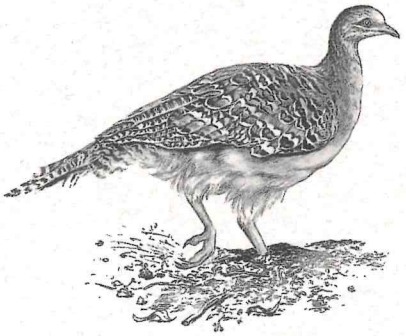
Investigate a Species

Chuditch:

Also known as a quoll. A small carnivorous marsupial about the size of a small cat. Its fur is mainly brown with white spots. It has a long tail and a brush of long black hairs. Although it mainly forages for food on the ground it will climb trees while hunting at night for animals such as insects, birds, frogs and lizards.

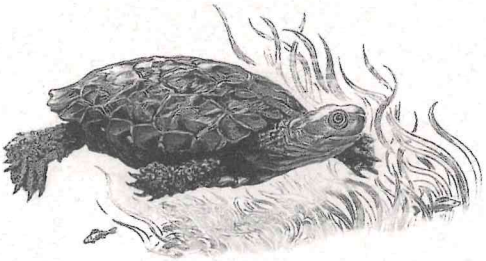
Numbat:

A small reddish-brown marsupial, with a long bushy tail, pointed snout and white stripes across the back. Feeds on termites using its long sticky tongue. Active in the early morning and early evening. Nests in and under fallen logs in forest and woodland. Western Australia's animal emblem.



Malleefowl:

A greyish-brown, spotted bird found mainly in dry inland scrub areas. It builds a large mound of soil and litter into which the eggs are laid and incubated by the heat generated by the composting process. The male bird builds and looks after the mound, keeping it at the correct temperature by opening or closing the centre.



Western swamp tortoise:

A short-necked tortoise with a dark yellow and brown to black shell. Lives in swamps that fill with water only during the winter and spring and are dry during summer and autumn. When the swamps are dry it aestivates (sleeps deeply) in holes in the ground or under leaf litter. Feeds on insects, tadpoles, small crustaceans.

Western ringtail possum:

This grey possum lives in and moves between trees. 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.

Investigate a Species

Name: _____

What to do

1) Read Resource Sheet 3. This gives information to help you identify some of the threatened species shown on Resource Sheet 1. Does Resource Sheet 1 give a hint at their habitat? Discuss with your group.

2) Fill in the answers on this sheet.

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

  I am a _____

- I help to keep a natural balance in the forest by eating other animals. I am nocturnal and well camouflaged by my dappled appearance.

  I am a _____

Complete clues for the other three animals:

- _____
  _____
  _____
  _____

  I am a _____

- _____
  _____
  _____
  _____

  I am a _____

- _____
  _____
  _____
  _____

  I am a _____

Stage 4 – 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 prior to 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 an equalibrium over long periods of time.
- The introduction of a species with no predators can imbalance the ecosystem and threaten many species.

Resources/Excursion

- Resource Sheet 4 (1/group), Activity Sheet 4 (1/student), blank sheet of paper, scissors and glue (1/group).

Additional resources

- References for teacher:
  - Book. From your school library - Anderson, J.1989. *Here Today, Everywhere Tomorrow? The Effects of Introduced Plants and Animals on Australia*. Horwitz Grahame Pty Ltd with Ashton Scholastic.
  - A resource pack for secondary schools available on the Internet: *Bugs, Beasts and Biodiversity, Exploring Biodiversity in the South-west of Western Australia*: **http://members.iinet.au/~aaee/bbb/index.html**
  - Resource package. *Living with our Forests*. Forest Industries Federation. Ask your school librarian. Section on Science for ecology students has information on forest food webs.
- *Back from the Brink* Excursion for metropolitan schools and for schools in the Bunbury area.

  For Years 5, 6 and 7
  A one-day field trip which includes:
  - A hands-on session participating in CALM's research methods.
  - A tour of The Hills Forest's animal habitat project, a walk looking for signs of animals.
  - A close encounter with threatened forest fauna (The Hills Forest).

  Student numbers: Minimum: 25 students per class, one or two classes

  Time: 10.00 am to 2.00 pm

  When: Weekdays

  Bookings and Enquiries:
  For metropolitan schools – Phone: (08) 9295 6149, Fax: (08) 9295 3247
  For Bunbury area schools – Phone: (08) 9734 1988, Fax: (08) 9734 4539

Teacher Directions

1) Attend a *Back from the Brink* excursion at The Hills Forest 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 Resource Sheet 4.

4) Discuss the links between the elements of the jarrah forest, both living and non-living. Add to the list in Resource Sheet 4 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 in pictures in the circles provided (Activity Sheet 4). Members of each group must have different food chains, but can assist each other in the process.

6) On completion students cut out the box (along dotted line) containing their food chain. The group's food chains are then glued onto a blank piece of paper. Groups discuss and insert lines and arrows to show links between elements of the chains thus creating a food web.

7) With reference to Resource Sheet 4 students write an F in the boxes against each element on which the fox will have an impact.

8) Students then answer questions posed on Activity Sheet 4.

9) At the end of this Stage give students half an hour to reflect on the activities and plan for the next Stage.

Foxed Food Chains

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

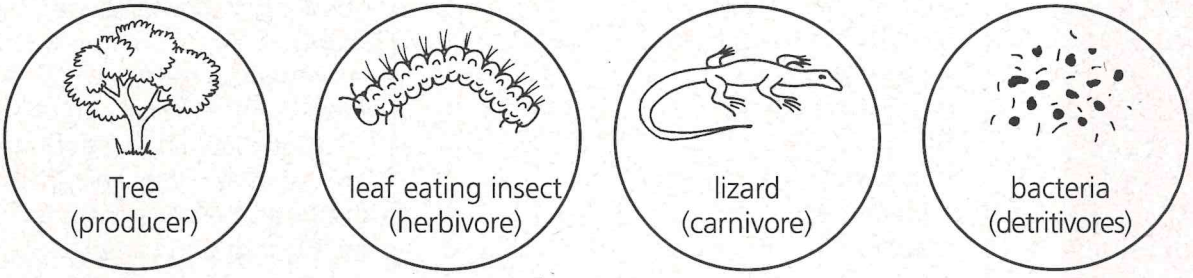
Other living organisms feed on plants. They are called 'herbivores' or 'primary consumers' such as **insects**, **possums**, **wallabies** and **woylies**.

Animals that feed on other animals are called 'carnivores' or 'secondary consumers'. Examples are **chuditch**, **numbats** and **reptiles** eg **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.

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 skilful 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. In the longer term species can become endangered or even extinct.

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 eg caterpillar

Secondary consumers

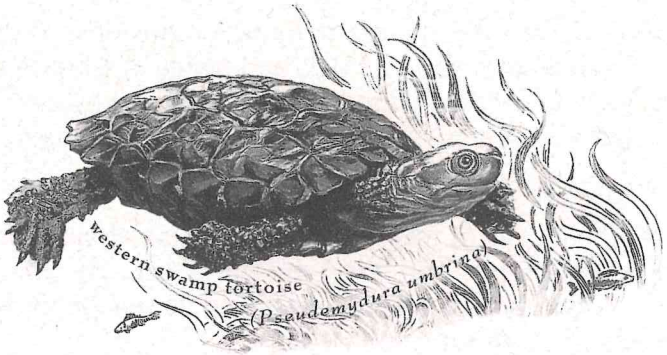
insect-eating bird, numbat, echidna, frog, dugite, death adder, skink, goanna, wedge-tailed eagle

Decomposers and recyclers

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

The following table will help to create a food web.

Animals of the jarrah forest	Feeds on
centipede	Small to medium invertebrates
mite	Some eat leaf litter/some invertebrates
termite	wood
millipede	dead plant material
woodlouse (slater)	dead plant material
scorpion	small to medium invertebrates
banjo frog	invertebrates slugs and snails
tiger snakes	lizards and especially frogs
magpie	insect, fruit and carrion
bobtail lizard	plants, insects, fruit and spiders
woylie	roots and other plant material, fungi
spider	insects
western spinebill (bird)	nectar
western grey kangaroo	plants
kookaburra	small mammals, lizards and snakes
brushtailed possum	insects, fruits and seeds
tawny frogmouth	mice and insects



western shield

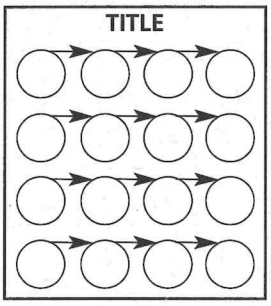
Foxed Food Chains

Name: _____

What to do

1) Using the information on Resource Sheet 4 and the list produced by the class, each person in your group draws pictures of species (in the circles below) to make a simple food chain in the jarrah forest. Each member of your group should have different elements in their chain.

2) Cut out your food chain and paste it onto the blank piece of paper together with the food chains of your group. eg →



3) Insert lines and arrows to create a jarrah forest food web.

4) Write an **F** in each box where foxes could have an impact.

5) Discuss and write in a title at the top of your group's foodweb.

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

_____

_____

_____

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

_____

_____

_____

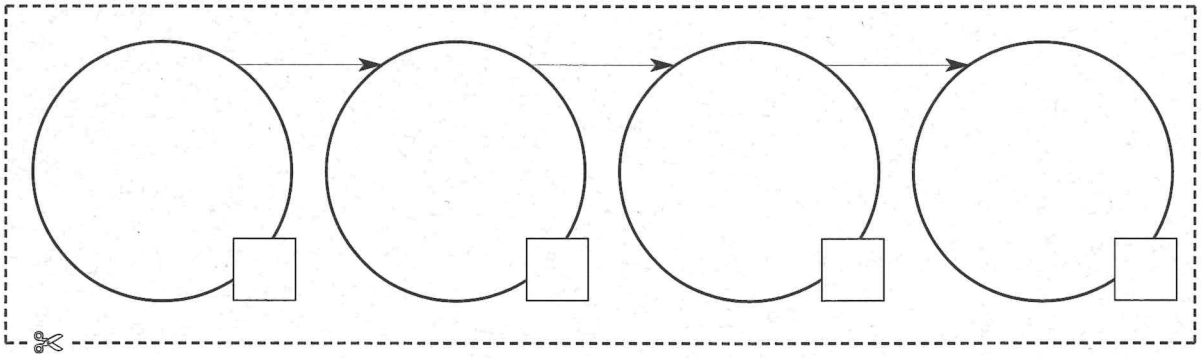
- What procedure could we follow to restore that area of jarrah forest back to its natural balance of species?

_____

_____

_____

Draw a food chain



Stage 5 – 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.biodiversity.environment.gov.au/plants/threaten/

Teacher Directions

1) Refer to Environment Australia's Internet site. Order copies of the *Green Kids guide to threatened species*. Ask students whether there are realistic ways they would like to contribute to saving threatened species.
2) Students design an Internet Web Page about Western Shield and their activities resulting from this unit of work. Link it with your school's Web Page. Students can refer to Riverside Primary School's Web Page for ideas:
   http://www.southwest.com.au/~rps/enviro2.htm
3) Students, in groups, design a poster advertising the importance of Western Shield and feral animal control. Display these around the school or in your local library to spread the word.
4) 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.
5) Encourage students at home to control their pet cats and dogs, have them de-sexed, keep them in at night and never dump their unwanted pets in the bush.
6) Discuss the principle of the 4 Rs, Reduce, Reuse, Repair and Recycle.
7) Encourage your students to participate in one or more of the following activities at school:
   - Read CALM's *LANDSCOPE* magazines (See Reference List) and spread its conservation message to the school community by setting up a display in your school library.
   - Become actively involved in a revegetation program in your school grounds to create natural habitats for native fauna and flora.
   - Contact your local CALM office to find out more. They may need volunteers.
   - Start a class compost bin and encourage the whole school to save food scraps and paper to turn into rich soil for the school garden.
   - Help sort rubbish so that some things can be recycled and reused.
   - Fundraise for The Hills Forest threatened species program and Kanyana's Wildlife Rehabilitation Centre, which is breeding threatened species including bilbies.
8) At the end of this Stage give students half an hour to reflect on the activities and decide on an ongoing commitment to conserving biodiversity.

Reference List

Department of Conservation and Land Management. *The Marvellous Malleefowl: It's Gnow or Never*. A leaflet.*

Department of Conservation and Land Management, 1989. *Western Swamp Tortoise*. Resource Notes, Number 13.*

Department of Conservation and Land Management, 1994. *The Reasons for Rarity*. Resource Notes, Number 10.*

Department of Conservation and Land Management, 1994. *Exploring Wheatbelt Woodlands: Teaching Activities for Upper Primary Schools.**

Department of Conservation and Land Management *LANDSCOPE* magazine articles about threatened species:

- Winter 1990 – *Numbat Dawn*
- Winter 1994 – *Bountiful Batalling*
- Summer 1994-95 – *Hunting the Hunter*
- Autumn 1995 – *Lost & Found: Gilbert's Potoroo*
- Autumn 1996 – *It's back: the Return of the Woylie*
  – *Working Together*
- Winter 1996 – *Western Shield: Bringing Wildlife Back from the Brink of Extinction*
  – *A Haven for the Lost and Found*
- Summer 1996-97 – *Montebello Renewal*
- Summer 1997-98 – *Endangered; Western Ringtail Possum*
  – *Karakamia Sanctuary*
  – *Quokkas and Easter Bilbies*
- Winter 199 – *Conserving the Western Ringtail Possum*
  – *Endangered: Biodiversity in Miniature – The Threatened Wildlife of Caves*
  – *Two more Threatened Mammals off the Threatened List*

Endangered Wildlife of the World (11 Vol. Encyclopaedia set) 1993. New York: Marshall Cavendish.

Fitter, R. 1986. *Wildlife for man: How and Why we should Conserve our Species*. London: Collins.

Image Bank, 1988. *Endangered Species*. Sydney: Bay Books.

Kennedy, M. (Ed.) 1990. *Australia's Endangered Species: The Extinction Dilemma*. Sydney: Simon Schuster.

Nilsson, G. 1983. *The Endangered Species Handbook*. Washington: Animal Welfare Institute.

Royal Australian Ornithologists Union 1992. *Threatened and Extinct Birds of Australia*. York Press, Richmond.

Video

Australian National Parks and Wildlife Service (1992). *Australia's Endangered Wildlife*.

* Can be obtained from CALM's Enquiries Office, Dick Perry Avenue, Kensington WA 6151 or phone (08) 9334 0437.