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*Exploring Wheatbelt Woodlands*
Exploring Wheatbelt Woodlands: Teaching Activities for Upper Primary School was developed to help students understand and value the remaining native woodlands in the Western Australian wheatbelt.

Between 1870 and 1970 the extensive wheatbelt woodlands were mostly cleared for agriculture. This was not by accident. European settlers favoured the fertile soils on which most woodlands grow.

Some woodland types, for example those dominated by jam and York gum, have been so extensively cleared and grazed that no pristine areas remain in the wheatbelt. Fortunately, samples of other wheatbelt woodlands do survive in a comparatively natural state. Patches of salmon gum, gimlet and wandoo, along with their wildlife, still occur. However, such areas are usually small and threatened by rising groundwater, weeds, grazing and other factors.

Clearing of woodlands and other wheatbelt habitats has dramatically affected animals as well as plants. Some mammals, such as the crescent nailtail wallaby, disappeared very quickly. Many other animals have followed. Even our mammal emblem, the numbat, a lover of termites for food and hollow logs for protection in wheatbelt woodlands, now only occurs in small patches along the western edge of the wheatbelt and in the jarrah forest. Birds which are relatively common in larger woodlands, such as the rufous tree-creeper and golden whistler, have disappeared from smaller remnants and even whole shires in some cases.

Conservation of our wheatbelt woodlands is an important step towards conserving our native plants and animals, but our woodlands have many other values. They are the places where people stop at the roadside or park for a picnic; they may supply seed necessary for revegetation to combat land degradation; and they contribute in many other ways to land conservation. Conserving our woodland remnants is an important aspect of restoring a resilient landscape.

For Aboriginal people the woodlands provided food, tools, warmth, medicine and building materials. European settlers also realised the economic value of woodlands and utilised trees for building and construction purposes, and for many other items such as firewood, wheels, fence posts, and shingles.

All these values will be lost unless the community understands woodlands and acts to save them. This knowledge must be given to children. They are tomorrow’s decision-makers and parents - we must teach them to make effective and sound land use decisions. There is no better way to learn this than through our immediate environment.
To date there has been little information that allows easy access to our local, wheatbelt habitats. This publication and related materials being prepared are designed to fill this void and introduce people to wheatbelt woodlands, their wildlife, and values.

**Acknowledgments**

The project team thank Barb Kennington for typing text and amendments. They also thank the following people for their helpful advice and ideas: Dr Ray Bailey, Rod Beresford, Dr John Dell, Mike Denby, Dr Tony Friend, Annie Ilett, Lotte Lent, and Fiona Marr.
OVERVIEW

Exploring Wheatbelt Woodlands: Teaching Activities for Upper Primary School includes a wide range of teaching activities and supporting information written by practising teachers. The kit is based closely on the primary school curriculum and supports the aims of Student Outcome Statements.

Subject areas included in the package are:

* science
* mathematics
* language
* art and crafts
* social studies
* health.

The goal of the kit is to significantly improve the conservation of wheatbelt woodlands through community involvement and education.

The kit is specifically designed to:

* increase knowledge of the wildlife, uses, values and management issues of woodlands.
* improve understanding of land management issues.
* enhance personal commitment to the land and its wildlife.
* encourage positive community action to protect and enhance native woodlands.

This kit achieves these goals through the development of four woodland themes:

* What Is a Woodland?
* Woodlands as Homes
* Uses of Woodlands

The focus of learning activities provided in this kit is that they:

* are action-based (hands on).
* involve posing and solving problems, including real life problems.
* encompass the school environs and local bushland.

A glossary of key words (Appendix 2) and a list of relevant videos (Appendix 3) are included for teacher reference.

Exploring Wheatbelt Woodlands
KEY OUTCOMES

Knowledge

Students will understand:

* the diversity of life which depends on woodlands.
* that the life in woodlands is interdependent (basic ecosystem concepts).
* at a general level, key social and economic values of woodlands.
* that decisions made by humans have significant impacts on woodlands.
* that making decisions about woodlands involves choices between a range of options, and that individuals have an important effect on these choices and the management of woodlands.

Skills

Students will:

* develop skills in describing the environment through art, mathematics, and writing.
* be able, at an elementary level, to develop, describe and assess options for land management. (To recognise that a piece of land can be used in different ways, and that this will produce different effects, is crucial to effective land management.)
* develop skills in planning and doing projects.

Values

Students will:

* highly value remnant woodlands and act in ways which enhance and protect their conservation and economic values.
SUMMARY OF ACTIVITIES

This program consists of twenty-seven teaching activities developed specifically for the wheatbelt of Western Australia. Each activity includes objectives, curriculum links, background information, resource sheets, and a wealth of other information.

Individual activities may be used for a 'once off lesson. However, for a more coherent program, select several activities and base them around the school ground or an excursion to a woodland. The activities are aimed at years five, six and seven, but they could readily be adapted for younger classes or junior high school.

The twenty-seven activities are arranged into four themes. While their contents overlap, the themes provide a useful framework for looking at important aspects of woodlands. Following are outlines of each theme, its activities, and the major curriculum links. Those activities which lend themselves to excursions are marked [E]. Note, however, that many of these activities can also be undertaken in the school ground, or, with some adaptation, in the classroom.

What Is a Woodland?

This theme examines different woodland characteristics and introduces some of the woodland plants and animals.

Describing Woodlands [E] includes four hands-on activities to be completed in a woodland. As these activities focus on the characteristics of woodlands, they are an excellent basis for a woodland excursion. [Science]

What Plant Is That? [E] is an activity which allows students to focus on the major characteristics which help us to classify plants. [Science and Art]

Leaf Classification [E] takes the previous activity a step further, and introduces a dichotomous key as a means of identifying leaves collected and described by students. [Science and Language]

Shapes in Natural and Cultural Environments [E] encourages students to look at the structure of the natural environment and compare it with the cultural environment. The differences are fascinating and provide insight into the structure of our surroundings. [Mathematics]

Guess What I Am [E] tests the observation and descriptive skills of students by focusing on a small part of the outdoors. [Art and Language]

Minibeasts and Pit Traps [E] introduces students to the 'minibeasts' of woodlands. Although we tend to see only the larger animals, minibeasts are crucial to a healthy woodland. [Science]
Woodlands as Homes

Woodlands are home to a great diversity of plants and animals. This theme is explored at a number of levels, and looks at some habitats that we don't normally view as important.

*Five Star Gardens* [E] takes the students out of the classroom and into the gardens of the local community. The focus is to look for 'bird friendly' gardens and to introduce students to the inter-relationships between plant habitats and animals. [Science and Social Studies]

*Our Soils* [E] are the basis of plant life and are home to many animals. [Science]

*One Log for Many* examines the role of hollow logs in the woodland. While often viewed as waste, hollow logs provide a home and living environment for a large community of plants and animals. [Science and Language]

*Investigating Logs* [E] looks more closely at particular animals and their log requirements. Students complete this activity by preparing an advertisement to attract a special tenant. [Mathematics and Language]

*Welcome to Microworld* [E] draws students into the role of the minibeast and provides them with a way of empathising with life in miniature. [Language]

*Catch That Fly* shows that even meat is a home! However, students will enjoy more the challenge of making a fly trap that works. [Science]

*Ochre Trail* introduces students to some of the human uses of woodlands as a home, particularly by Aboriginals. [Language]

Uses of Woodlands

Since their arrival in Australia many thousands of years ago humans have used woodlands as an important resource for food, shelter and recreation. To understand our woodlands and their management it is important to know how they have been used in the past and the current demands on their values. This theme explores some of the uses made of woodlands and examines how these uses interact.

*Timber*[^1], examines the historical and present use of timbers from wheatbelt woodlands. [Social Studies]

*Woodlands in the Old Days*, through student interviews of older people, brings to light the changes which have occurred in woodlands and the ways in which they have been used. [Language and Social Studies]

*Dryandra Deductions* looks at computational aspects of woodland uses. [Mathematics]
Using Our Wheatbelt Woodlands takes a closer look at competing land uses, and encourages debate. [Language]

Wander in the Woodlands encourages students to look closely at the attractions of a local woodland and design a suitable tourist brochure. [Art and Language]

Woodlands through Different Eyes is an awareness raising activity which examines the views of a variety of groups who are keen to look after their, very different, woodland interests. Students play the roles of the different users, and outline their proposed management strategies to Department of Conservation and Land Management (CALM) officers (another student group) who are to assess the best way to manage the woodland. The ability to empathise with the views of others is an important life skill, and it is fundamental to wise decisions about land use. [Language and Social Studies]

Poisonous Plants [E] is a reminder that while many woodland plants are benign, there are also many poisonous plants which the skilled woodland visitor should recognise. [Health]

Woodlands - A Changing Environment

Nothing stays the same - change is inevitable. This theme focuses on some of the many aspects of change occurring in woodlands.

Where Do I Look? [E] encourages students to look at the evidence for change which is all around us in the form of growth, decay, chewed leaves and so on. [Science]

Bushfire! looks at the most rapid environmental change we are likely to experience - the dramatic change wrought by bushfires. [Language]

Let's Have a Bonfire! [E] While we all enjoy a camp fire in the bush, how many of us understand that we are an agent for change? This activity looks at the impact of collecting firewood on the woodland community. [Mathematics]

Feral Animals - Do They Have a Right to Be Here? studies three feral animals that are common in our woodlands - the cat, rabbit and fox. Each has a negative impact on our flora and fauna - do they have a right to be here? [Language]

Tessa the Tammar Wallaby and Billy the Brushtail Possum have been affected by a dramatic change - the introduction of the fox, a new predator. However, baiting the fox with poison may save the day. [Mathematics]

Before and After [E] examines the greatest change in the wheatbelt - that brought about by land clearing. [Social Studies]

Numbat Manoeuvres is a board game designed to place students in the role of a numbat. The game leads players through a range of events encountered by numbats in their woodland habitat. Life and death decisions must be made! The game provides a slice of numbat life, and introduces students to the complex interactions between one animal and its environment. [Mathematics and Language]
## TABLE OF THEMES AND ACTIVITIES

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<td>Leaf Classification (E)</td>
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<td>Shapes in Natural and Cultural Environments (E)</td>
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<td>Woodlands as Homes</td>
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<td>Ochre Trail</td>
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| | Woodlands in the Old Days | * * |
| | Dryandra Deductions | * |
| | Using Our Wheatbelt Woodlands | * |
| | Role Play - Woodlands Through Different Eyes | * * |
| | Poisonous Plants (E) | * |

| WOODLANDS - A CHANGING ENVIRONMENT | WHERE DO I LOOK? (E) | * |
| | Bushfire! | * |
| | Let's Have a Bonfire! (E) | * |
| | Feral Animals - Do They Have a Right to be Here? | * |
| | Tessa the Tammar Wallaby and Billy the Brushtail Possum | * |
| | Before and After (E) | * |
| | Numbat Manoeuvres | * * |

* Science
* Language
* Health
* Visual Arts
* English
What is a Woodland?

What is a Woodland? examines different woodland characteristics and introduces some of the woodland plants and animals.
WHAT IS A WOODLAND?

What Is a Woodland?” examines different woodland characteristics and introduces some of the woodland plants and animals.

The Activities
Each activity in this theme is described. Those activities which lend themselves to an excursion are marked with [E].

Describing Woodlands [E] includes four hands-on activities to be completed in a woodland. As these activities focus on the characteristics of woodlands, they are an excellent basis for a woodland excursion. [Science]

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Activity; Describing Woodlands

ACTIVITY - DESCRIBING WOODLANDS

A collection of four hands-on activities which allow students to focus on characteristics of woodlands. Designed for excursion use.

Concepts

* Trees have well defined trunks or main stems that generally do not branch for at least 0.5 metres above the ground.
* When the canopy cover of a group of trees is between 5% and 30%, it is classified as a woodland.
* There is a diversity of woodlands.

Objectives

To be able to define a woodland.
To be able to distinguish between a woodland and other vegetation communities.
To be able to recognise different woodlands using the senses.

Curriculum Links

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<td>Plants/Animals</td>
<td>Investigating Animal/Plant independence</td>
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PROFILE    STRAND                        LEVEL
Science    Structure and Function        3. Identify external and internal features of living things that work together to form systems with particular functions.
Activity: Describing Woodlands

Background Information

**Trees** have a well defined trunk or main stem which generally does not branch for at least 0.5 metres above the ground.

**Mallees** are a type of eucalypt which sends up many stems from an underground mallee root.

**Shrubs** are formed by a series of branches which divide from the main stem very close to or at ground level.

**Sedges or reeds** are coarse, tough-surfaced grass-like plants growing in a tuft. Both are generally, but not always, associated with areas which are permanently or seasonally damp. Their leaves are often sword-like and may grow over a metre tall.

**Leaf litter** consists of the fallen leaves lying on the ground in an area of bush. Litter as a general term includes fallen leaves, bark, twigs and small branches on the ground in bush. Litter provides a valuable source of shelter and food for a wide range of animals and plants.

**Canopy cover** is a measure of the density of the foliage of a tree or group of trees. It is equivalent to the shadow cast by plant foliage under direct, overhead sunlight, and is measured as a percentage. For example, an area of trees may cast a shadow under direct sunlight which looks like this:

Each shape represents the foliage of a tree. In this case the area of tree canopies is about 20% of the total area within the dotted line. Therefore the canopy cover for trees in this specific area is 20%, and the area is a woodland. The canopy cover of shrubs and ground covers is calculated in the same way.
**Activity: Describing Woodlands**

*Table: A Simplified Classification of Vegetation Types Based on Life Form (Tree, Shrub, etc.) and Canopy Cover.*

<table>
<thead>
<tr>
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<th>CANOPY COVER</th>
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<tr>
<td></td>
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<tr>
<td></td>
<td>SPARSE (less than 30% canopy cover)</td>
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<td>Trees - taller than 5 metres</td>
<td>Forest</td>
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<td>Trees - shorter than 5 metres</td>
<td>Low Forest</td>
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<td>Sedges and Reeds</td>
<td>Sedgeland</td>
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<td>Other ground layer plants</td>
<td>Herbland</td>
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<td></td>
<td>Woodland</td>
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<tr>
<td></td>
<td>Low Woodland</td>
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<td></td>
<td>Open Mallee</td>
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<tr>
<td></td>
<td>Scrub (shrubland)</td>
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<td></td>
<td>Open Heath (shrubland)</td>
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<td>Open Grassland</td>
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<td></td>
<td>Open Sedgeland</td>
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<td>Open Herbland</td>
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</tbody>
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**Key Words**
Canopy, leaf litter, mallee, transect.

**Resources/References**
Teacher Directions

Materials

* Trundle wheels and/or large measuring tapes
* String (five metres per group)
* Overlay photocopies of grid
* 1 mirror per group with a grid overlay attached to it with Blutak™
* 1 'Mirror Exercise' resource sheet per group
  » 1 plastic carrybag per group
* 1 'Woodland Through Your Senses' resource sheet per student
* 1 artist's palette per student (see template)
* Hoops.

1. Arrange an excursion to a local woodland. Ideally, it should contain at least two different types of woodland. For example, two or more of sheoak, jam, wandoo or salmon gum woodlands. Students may work in pairs or in groups.

2. Before the excursion, ask students to define a tree, mallee and shrub. Points that should be raised are contained in the background notes for this activity. Once satisfactory definitions have been agreed, ask students to go into the school grounds and classify different plants using their definitions. Discuss results.

3. Explain to students that:
   i. there are many different types of native vegetation communities (see table in background information), and they will be visiting a woodland, which is one type;
   ii. a woodland must contain trees and have between 5% and 30% canopy cover of trees;
   iii. there are different types of woodlands. Common examples are sheoak, wandoo, jam and salmon gum. Students will be looking for differences between each type.

4. Provide students with materials for the excursion. Emphasise that they will benefit much more from the excursion if they complete activities and move around the woodlands quietly. For example, they will have more chance of seeing native wildlife.

Artist's Palette

1. Using the resource sheet as a stencil, copy onto plain contact and cut out palettes. Leave contact attached to the backing paper and give one to each student.
2. Explain to students that they are looking for examples of colour that reflect this particular environment.
3. Students collect a few small samples - for example, blossom, soil, leaves - looking for unique and unusual colours that to them best represent that environment.
4. Students then remove the backing from the artists' palette (dispose of backing thoughtfully) and stick their samples onto the palette.

NOTE: This activity should be repeated in a different type of woodland and the results compared.
Activity: Describing Woodlands

Mirror Exercise

1. Students mark a five metre piece of string at one metre intervals. The marks can be made by tying a piece of wool at each one metre point. In a woodland, the string is stretched along the ground from a central point.

2. They then take a mirror reading at one, two, three, four, and five metres along the transect. To do this students put the mirror, complete with grid overlay (see resource sheet), on the ground in front of them and observe the canopy through it. Students tally how many grid squares are covered (estimate by counting as 'one' each square which is more than half covered by foliage, and counting as 'zero' each square which is less than half covered) by the canopy and keep a tally on their resource sheet.

3. At the end of the five metre transect, students add together their total number of squares covered to give a percentage. For example \( (4 + 5 + 3 + 1 + 7 + 5) = 25\% \). From this percentage, students can ascertain whether or not they are in a woodland. Where the tree foliage cover is between 5 and 30\%, the students are in a woodland. (Note that the grid overlay has 20 squares, therefore given that there are five counts, a total of 100 squares are available to be covered by foliage.)

4. This exercise should be repeated in a different type of woodland so that the results can be compared. For example, students will find that sheoak woodlands have greater foliage cover than wandoo woodlands and make a pronounced 'sighing' sound in the wind.

Woodlands Through the Senses

Using the five metre transects already marked in the Mirror Exercise, students stop one, two, three, four, and five metres along and record what they can smell and hear, and the type and quantity of leaf litter. Information is recorded on the resource sheet provided.
Activity: Describing Woodlands

Barking Up the Right Tree

1. Read the resource sheet and discuss the information with students.
2. Using paper, crayons or pencils, students do a bark rubbing.
3. Instructions for making a bark cast with clay and plaster of Paris are included as a resource sheet.

After completing this exercise in at least two different types of woodlands, have a class discussion about the differences between woodlands.

Evaluation

* Were students able to identify a woodland?
* Were they able to estimate canopy cover?
* Were students able to complete the resource sheets and describe the differences between woodland types?

Complementary Activities

* Students can compare tree girths in different woodlands. They may do this using arbitrary units, for example their arms, or a measuring tape. See also 'Investigating Logs' from 'Woodlands as Homes' (page number 67).

* The blindfold game. In pairs, one student leads a blindfolded partner to a tree with interesting bark. After feeling the bark, they return to a central place. Spin the blindfolded partner, then remove the blindfold. The partner must locate the tree.
MIRROR EXERCISE - ARE YOU IN A WOODLAND?

Note: trees which provide 5% - 30% canopy cover make a woodland. Anything greater would be classified as a forest.

Instructions

1. Using a trundle wheel and a piece of string, mark out a five metre transect or line along the ground starting from a central point.
2. Stop at the one, two, three, four, and five metre marks along the transect and take a 'mirror reading' at each.
3. To take a mirror reading, you will need to do the following:
   i. place the mirror with grid overlay on the ground in front of you. Look at it and observe the tree canopy reflected in the mirror;
   ii. count how many grid squares on your mirror are covered by a reflection of the canopy. To do this, count all squares that are more than half covered with foliage and branches as 'one'. Record as 'zero' squares which are less than half covered;
   iii. record the amount of covered squares on the tally sheet below. Repeat this process at each of the stops along the transect. At the end of your transect, add together the total number of squares covered. You now have the percentage of canopy cover. Once you have this, you will be able to work out whether or not you are in a woodland.

Later on you may like to take a transect in a different area of trees and compare your results. For example, compare a wandoo or salmon gum woodland with a sheoak or mallet woodland.

<table>
<thead>
<tr>
<th>TRANSECT 1</th>
<th>TRANSECT 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Squares Covered</strong></td>
<td><strong>Number of Squares Covered</strong></td>
</tr>
<tr>
<td>STOP 1</td>
<td>STOP 1</td>
</tr>
<tr>
<td>STOP 2</td>
<td>STOP 2</td>
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<td>STOP 3</td>
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<td>STOP 4</td>
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<td>STOP 5</td>
<td>STOP 5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>TOTAL</td>
</tr>
</tbody>
</table>

Therefore, there is _________% canopy cover.

This means that Transect 1 is/is not in a woodland

Therefore, there is _________% canopy cover.

This means that Transect 2 is/is not in a woodland
Resource Sheet: Describing Woodlands

Artist's Palette

Exploring Yiheatbel Woodlands
Resource Sheet: Describing Woodlands

Grid Overlay to be reduced or enlarged according to size of mirror used, then photocopied onto overhead transparencies.
WOODLANDS THOUGH THE SENSES

Using your senses, you are going to discover as much as you can about a particular area within a woodland. *Remember - the quieter you are the more you will discover.*

Measure a five metre transect or line along the ground. At one metre intervals along the transect, stop and complete the following activities. Record your information in the table below.

1. Close your eyes for about one minute and concentrate on what you can smell. Write your observations into the table.
2. Close your eyes for another minute and concentrate on what you can hear. Write your observations into the table.
3. Look on the ground around you. Throw down a hoop and estimate how much of the ground is covered by leaf litter. Shade in the appropriate fraction in the table.
4. What sort of things make up the leaf litter around you? For example bark, sticks, or leaves. Write your observations into the table.

<table>
<thead>
<tr>
<th>STOP 1</th>
<th>STOP 2</th>
<th>STOP 3</th>
<th>STOP 4</th>
<th>STOP 5</th>
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<tbody>
<tr>
<td><img src="image1" alt="Circle" /></td>
<td><img src="image2" alt="Circle" /></td>
<td><img src="image3" alt="Circle" /></td>
<td><img src="image4" alt="Circle" /></td>
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<td><img src="image12" alt="Circle" /></td>
<td><img src="image13" alt="Circle" /></td>
<td><img src="image14" alt="Circle" /></td>
<td><img src="image15" alt="Circle" /></td>
</tr>
</tbody>
</table>
BARKING UP THE RIGHT TREE


Immediately underneath the bark of trees lie important living tissues. The bark protects these tissues which are vital to the health of trees.

One method of killing trees for land clearing was to cut a ring around the trunk of a tree removing the protective bark and the thin, underlying tissues. This simple task, known as ‘ring-barking’, killed the tree which could then be burnt down after it had dried.

While not effective against a sharp axe, bark does provide valuable protection against plant-eating animals and, in those trees with thick bark, against fire. It is also believed that bark may provide protection against drought, for example by decreasing water loss.

Bark is used by many animals. Lizards, spiders, insects and other small animals hide in the crevices formed by rough or peeling bark, and some birds use bark in their nests. Aboriginal people used fibrous barks to make string for binding, net-making and bags. Sometimes, they also used bark slabs for shields and larger sheets for shelters. In Western Australia, bark was stripped from brown mallet and exported because of its very high tannin concentration. Tannin was extracted from the bark and used to tan leather.

Bark Rubbing

1. Select a tree with interesting bark.

2. Place paper over the bark and make a rubbing using crayons or pencils. Give your tree a suitable name and write it on your paper.

3. Compare the patterns in your bark rubbing with that of your friends. Is there a special pattern for particular types of trees?
MAKE A PLASTER CAST OF BARK

You will need:
* plaster of Paris
* clay
* cooking oil
* small brush for oil
* paint brush
* water paints
* ten centimetres of thin wire.

1. Firmly press a handful of clay onto the bark. Make sure the clay is pressed between the cracks in the bark.

2. Carefully lift the clay without disturbing the impression.

3. Using extra clay, build a raised edge around the impression as a 'dam' to hold the plaster of Paris.

4. Brush a layer of cooking oil over the impression - this will help the plaster to lift away without sticking to the clay.

5. Make a smooth mixture of plaster of Paris and pour it onto the impression. Gently tap the sides to remove air bubbles. A small loop of wire pushed into the back of the plaster before it sets will provide a hanging hook.

6. When the plaster has set, remove the cast from the clay. Rinse oil from the cast using warm water and detergent.

Paint the cast with water paints. Use natural colours and do not apply paint thickly. Lacquer if desired.
Activity: What Plant Is That?

**ACTIVITY - WHAT PLANT IS THAT?**

A lesson requiring students to use their senses to describe the characteristics of native plants.

**Concepts**

* The senses can be used to identify different characteristics of plants.

**Objectives**

* To develop students' skills in using their sight, smell and touch to identify characteristic features of different plants.
* To accurately describe the observed features.

**Curriculum Links**

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<td>Observing stages of reproduction in flowering plants.</td>
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<td>5/6/7</td>
<td>Line (ii)</td>
<td>Drawing</td>
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**Profile**

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<tr>
<th>STRAND</th>
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</thead>
<tbody>
<tr>
<td>Science</td>
<td>2. Link observable features to their functions in living things familiar to them.</td>
</tr>
</tbody>
</table>

**Background Information**

The following information is taken from *Native Trees of Dryandra and Nearby Districts*. Definitions of plant forms are given below. Note that the definition of a mallee has also been included in case students come across them.

A **shrub** is formed by a series of branches which divide from the main stem very close to or at ground level.

A **tree** has a well defined trunk or main stem which generally does not branch for at least 0.5 metres above the ground.

A **mallee** is a type of eucalypt which sends up many stems from an underground mallee root. The mallee root is, in fact, a specialised part of the stem called a lignotuber.
Activity: What Plant Is That?

Rough barked trees have rough, fibrous or flaky bark completely covering the stem between the ground and the first branches. Some trees have rough bark extending all along the branches to the foliage. Morrels and York gums are examples of trees with rough bark.

Smooth barked trees, like salmon gums or mature wandoo (white gum), may have some flaky bark along the stem, but mostly the stem is smooth to touch. In many cases it is the fruit (which contain seed) or the flower buds which help to identify a tree. If the fruit and buds are too high to see, then look on the ground for old ones which have dropped. Be careful if there are two or more different types of trees occurring together - you may mismatch trees, fruit and flower buds.

The smell of freshly crushed leaves is also an important characteristic. If leaves are out of reach, look for fresh ones which have fallen onto the ground. Even old leaves retain some odour, but the smell may be weak. If you have not experienced the smell of eucalyptus oil, it is often used in cough lollies and mixtures, and some disinfectants. Ensure that students do not taste poisonous leaves (see warning on page 29).

Flower buds may be very useful for identifying trees, particularly eucalypts. Several types of eucalyptus flower buds are shown below.

Key Words
Casuarina (sheoak), cylindrical, eucalyptus, globular, melaleuca, serrated, foliage.

Resources/References
Activity: What Plant Is That?

Teacher Directions

This activity is designed for use with native plants, however, the concept may also be applied to introduced plants.

1. Note the differences between shrubs, trees and mallees.
2. Ask students how they would identify different plants. You may be able to have cuttings or pictures of plants in the class with you, or take the students out into the yard. Discuss and introduce sight, smell and touch (also sound, for example in the case of wind whistling through the leaves of sheoaks), if students have not raised these.
3. Students take resource sheets and clipboards to an area of native vegetation, select a plant and complete the work sheet. Remind students to look for unique characteristics that may help to identify the plant.
4. Students may collect fallen fruit, flowers and leaves to take back to class to draw. If considered necessary, one example of each could be carefully removed from the plant to take back to class. However, collection of living material from plants should be avoided as much as possible.
5. Students can add colour and labels to their diagrams to aid in clarification of characteristics.
6. Students can then share their work in small groups or as a whole class focusing on the unique characteristic of their plant. This may help to provide some unknown names. If this is not the case, students may wish to consult relatives, community members or reference books to find the information. The publication *Native Trees of Dryandra and Nearby Districts* (see References) is very useful for identifying native trees within the central western wheatbelt.

Evaluation

* Did students adequately describe plants using important characteristics?
* Were students able to accurately draw plant characteristics?

Complementary Activities

* If students are interested in this activity and plants are named, all sheets can be collated and made into a book for the class library.
* If a success, this book could be drafted, added to and refined, published and distributed within the community as a guide to identifying local plants.
# Resource Sheet: What Plant Is That?

## WHAT PLANT IS THAT ?

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE COLLECTED</td>
<td></td>
</tr>
</tbody>
</table>

- Is the plant (circle the correct one) a tree? a shrub? grass? something else?
- Is the bark rough or smooth?
- What colour is the bark?
- Describe the smell of a crushed leaf

The words next to each of the boxes will help you to draw and label your plant.

### A leaf
- colour
- shiny
- dull
- needle-like
- rigid
- jointed
- serrated
- smooth
- size
- pointed
- underneath
- vein patterns
- thickness

### A fruit
- rounded
- bell-shaped
- woody
- wing-shaped
- cone like
- cylindrical
- globular
- pear shaped
- texture
- papery wings

### A flower
- colour
- shape
- size
- hairy
- petals
- spikes
- hairless

### The arrangement of leaves along a stem
- right angle to branches
- opposite each other

### A flower bud
- pointed
- rounded
- star-shaped
Activity: Leaf Classification

ACTIVITY - LEAF CLASSIFICATION
A lesson that involves collecting and classifying leaves using a dichotomous key.

Concepts
* Although living things differ, they can be grouped by common characteristics.
* The identity of things can be communicated through effective classification systems.

Objectives
* To observe a leaf and effectively describe it in writing.
* To classify leaves according to their characteristics.
* To record the classification system using a dichotomous key.

Curriculum Links

<table>
<thead>
<tr>
<th>CURRICULUM AREAS</th>
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<th>NUMBER/STRANDS</th>
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<tr>
<td>Science (Transition)</td>
<td>7</td>
<td>page 68</td>
<td>Classifying leaves.</td>
</tr>
<tr>
<td>Language</td>
<td>5/6/7</td>
<td>3.2.2 B</td>
<td>Descriptions.</td>
</tr>
</tbody>
</table>

PROFILE STRAND LEVEL
Science Conducting Investigations 3. Collect and record information which reflects accuracy appropriate to the equipment and purposes of the investigation.
Science Processing Data 2. Identify patterns and groupings in information to draw conclusions.
Science Bio-diversity, Classification, Change and Continuity 2. Compare and contrast similarities and differences within and between groups of living things familiar to them.

Background Information
Clear descriptions of leaf characteristics will make leaf classification easier. The clearer the descriptions are, the easier it will be to make the key and help others to identify leaves. The dichotomous key is used as a means of grouping and categorising differences in a collection of leaves. It is important to ensure that only one characteristic is used at a time to divide a group of leaves.
Activity: Leaf Classification

Some characteristics that students may look for are leaf length, type of leaf edge, leaf surfaces (top and bottom) for example shiny or dull, and leaf veins.

Note that there is no one, correct way of organising a key. A single group of leaves may be classified in a number of ways.

**WARNING:** in wheatbelt woodlands there are some leaves which are poisonous. These will not cause any difficulty provided they are not tasted, or rubbed between fingers which are then rubbed onto sensitive skin or licked. If the activity is being conducted in the school grounds, **then it is important** to talk to your gardener to ensure that none of the leaves are poisonous or likely to cause skin irritations.

**Key Words**
Characteristics, description, dichotomous, classification.

**Resources/References**
**Activity: Leaf Classification**

**Teacher Directions**

1. Students select a leaf from the school grounds that interests them. They draw it and describe its characteristics on the resource sheet provided.
2. Using their descriptions as a basis, each student invents a descriptive name for their leaf. For example, 'brown spotted, yellow spear leaf.'
3. Divide students into groups of about eight and pool leaves in each group. Students discuss similarities and differences between leaves.
4. Each group creates a classification key for their leaves using the key on the resource sheet as a guide (either glue leaves on or draw them, depending on the size of paper available).
5. Groups come together and explain their keys to the class.
6. Display keys.

Below is an example of a completed dichotomous key. There will be many variations.

---

### Evaluation

* Were students able to classify the leaves?
* Were students able to construct and use a dichotomous key to record their classification?
* Did the students describe the important details of their leaf?
* Did the students use comparisons to clarify meaning?
* Did the students adequately convey meaning?

### Complementary Activities

* Groups could exchange keys together with one of their leaves to see if others may successfully use their key.
* This activity can also be undertaken in areas of remnant native vegetation.
PRESENTING!

Leaf Name:

Draw and describe your leaf below, then give it a descriptive name.

Instructions

1. Put all of the leaves in your group together and look at their similarities and differences.

2. Separate the pile of leaves into two piles according to one characteristic.

3. Keep separating the piles according to one characteristic until there is only one leaf in each pile.

4. Record what you have done on a dichotomous key like the one below. Yours may be bigger than this one.
ACTIVITY - SHAPES IN NATURAL AND CULTURAL ENVIRONMENTS

An outdoor activity which requires students to examine symmetry, and to classify two dimensional (2-D) and three dimensional (3-D) shapes in both natural and cultural environments.

Concepts

* Regular shapes and symmetry may be found in both natural and cultural environments.
* Nature's structures are generally rounded and cylindrical while cultural structures are more often straight edged and angular.

Objectives

* To identify regular shapes in both natural and cultural environments.
* To identify examples of symmetry in both natural and cultural environments.
* To compare the amount of regular and symmetrical shapes in each environment.

Curriculum Links

<table>
<thead>
<tr>
<th>CURRICULUM AREAS</th>
<th>STAGE/YEAR</th>
<th>NUMBER/STRANDS</th>
<th>UNDERSTANDINGS/TOPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>5/6/7</td>
<td>S:P3.5, N2.1b</td>
<td>Investigate the features and functions of shape in the environment. Carry out activities in which attributes of shape are investigated symmetry.</td>
</tr>
</tbody>
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<tr>
<th>PROFILE</th>
<th>STRAND</th>
<th>LEVEL</th>
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</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>C3.2, 3.4</td>
<td>Classify, sequence and tabulate data to answer particular questions.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>S3.4</td>
<td>Select, describe and compare figures and objects on the basis of spatial features, using conventional geometric criteria.</td>
</tr>
</tbody>
</table>
Activity: Shapes in Natural and Cultural Environments

Background Information

Two-Dimensional (2-D) shapes have length and width.

Three-Dimensional (3-D) shapes have length, width and height.

Concentric Circles - having a common centre, as may occur with several circles or spheres. Examples include tree growth rings and some lichens.

The natural environment is that part of the environment which is not formed by humans and their activities. This includes rocks, bush which has not been disturbed by humans, and so on.

The cultural environment is that part of the environment which is formed by humans and their activities. This includes buildings, roads, cars, farm paddocks, domesticated stock, books and so on.

Key Words
Concentric, environment, symmetry, cultural.

Resources/References

Teacher Directions

1. This activity requires access to both a natural and cultural environment.
2. Before sending students on this task, discuss what makes up a 'natural' and 'cultural' environment. Go through the resource sheet with the students, explaining any concepts that are unclear. Explain that students will be looking for differences between the shapes found in natural and cultural environments.
3. After students have completed the resource sheet, divide them into small groups to discuss their findings.
4. Share group findings with the class.

Evaluation
* Did students discover that most shapes in the natural environment are rounded and cylindrical as opposed to those found in cultural environments, which are straight and angular?
* Were students able to develop reasonable (not necessarily correct) explanations, based on relationships of structure and function, of differences between the cultural and natural environments?
Activity: Shapes in Natural and Cultural Environments

Complementary Activities

* Group students to investigate the question 'Why are there so many cylindrical and rounded shapes in the natural environment?' Points that may be considered are:
  i. the strongest shape for its weight is a hollow cylinder;
  ii. domes are strong because there are no corners which are weak parts;
  iii. trunks may be streamlined for airflow around the tree. This may help prevent them being blown over;
  iv. rocks are rounded because of the forces of erosion including wind and water.

* While shapes in our cultural environment tend to be straight edged and angular, this may or may not be so for other cultures. This question could be discussed with students during a social studies class.
CAN YOU FIND REGULAR SHAPES IN NATURAL AND CULTURAL ENVIRONMENTS?

Find an example of the 2-D and 3-D shapes listed below in both a natural and cultural environment. Draw and label the shape in the appropriate box. Keep a tally of shapes as they are discovered.

If you are unable to find an example of the exact shape in either environment, draw and label the closest shape that you can find.

1. **Rectangle** - four straight sides joined at right angles to each other.

<table>
<thead>
<tr>
<th>Natural</th>
<th>Cultural</th>
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<tbody>
<tr>
<td>Tally</td>
<td>Tally</td>
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</table>

2. **Triangle** - a figure with three sides and three angles.

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<th>Natural</th>
<th>Cultural</th>
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<td>Tally</td>
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</table>

3. **Circle**

   **Cylinder** - a 3-D shape with 2 circular faces at right angles to a curved surface.

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<thead>
<tr>
<th>Natural</th>
<th>Cultural</th>
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4. **Sphere** - a 3-D shape like a round ball.

<table>
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<tr>
<th>Natural</th>
<th>Cultural</th>
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<tr>
<td>Tally</td>
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</table>
Resource Sheet: Shapes in Natural and Cultural Environments

6. **Rectangular Prism** - a prism shape like a shoe box. It has 12 edges, 6 faces and 8 corners. The opposite faces are the same shape and size.

| Tally | Tally |

If you see examples of any other regular shapes whilst you are investigating, draw and label them below. Remember to note whether they are natural or cultural. Examples of shapes that you may find are:

- cones
- pentagons
- ovals
- hexagons

<table>
<thead>
<tr>
<th>Shape</th>
<th>Natural Environment</th>
<th>Cultural Environment</th>
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<tbody>
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CAN YOU FIND SYMMETRY IN NATURAL AND CULTURAL ENVIRONMENTS?

Symmetry - a shape is symmetrical when one half of it can fit exactly into the other half.

1. Look for examples of symmetry in both natural and cultural environments. Draw what you have found below and note whether the example is natural or cultural.
Resource Sheet: Shapes in Natural and Cultural Environments

2. Look for the longest continuous line in either the natural or cultural environment (it does not have to be straight). Where is it and how long is it?

3. Look for an example of concentric circles (circles or spheres which have the same centre). Where did you find them?

In a small group, discuss what you have discovered from your investigations.

1. What shape was most common in cultural environments? ____________
2. Can you think of a reason for this? ____________

3. What shape was most common in natural environments? ____________
4. Can you think of a reason for this? ____________

5. List any examples of symmetry you found ________

6. Where were these found?
ACTIVITY - GUESS WHAT I AM

A drawing activity which encourages students to focus on a piece of the natural environment.

Concepts

* All things have characteristics that allow them to be identified.
  Description of characteristics helps with identification.

Objectives

* To observe details of natural things.
* To describe the characteristics of a natural thing so that an audience may identify it.
* To draw an accurate representation of what is seen.

Curriculum Links

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<td>Line (ii)</td>
<td>Drawing</td>
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PROFILE STRAND LEVEL

Arts Creating, Making, Presenting 3.3,3.8,3.13,3.18. Plans and presents art works for a familiar audience.

Background Information

Key Words
Description, magnify, texture.

Resources/References
Activity: **Guess What I Am**

**Teacher Directions**

This activity is designed to help students look closely at the natural environment and to describe what they see.

**Materials**

- Magnifying glasses
- Half an A4 template sheet per student.

1. Provide students with magnifying glasses and explain that they are going to look closely at a small piece of the environment and describe it without giving it a name. Using their descriptions, someone else will then identify what has been described.

2. Students go into the school grounds, or a woodland, and choose something that they think is interesting, but not too obvious. They then place their template over the item they chose.

3. Students observe it closely and draw on to their resource sheet a part of it within the window frame. They must include as much detail as possible.

4. Students then write three or four descriptive hints that help to identify the item. These can be related to physical characteristics or functions. Leave the frame on the ground.

5. Students then swap descriptions with a partner. The partner must then locate the correct frame.

**Evaluation**

* Were students able to describe important details of the object?
* Were students able to use comparisons, metaphors or similes in their descriptions?
* Did the descriptions make sense to the reader?
* Were partners able to identify their 'mystery' frames?
* Were students able to use lines that:
  i. represented those seen in the natural environment?
  ii. implied texture?
  iii. appeared hard or soft edged (Year 7 only)?
  iv. gave roundness to a flat shape by showing where light falls and shadows appear (Year 7 only)?

**Complementary Activities**

* If the Informazing Big Book *What Is It?* is available, it could be used to increase students' interest in this activity.
* It is also possible for students to rule and cut out a 120 mm square frame (or use the ones provided), draw their mystery object onto this and then glue it onto a piece of card. The hints are then printed below the drawing and the answer is written upside down at the bottom of the page or on the back. All of the cards can then be collated and made into a book for the class or school library.
* 'Mystery Tree' activity on page 17 in *Discovering the Hills Forest* CALM (1993) could be interchanged or used in conjunction with this activity.
GUESS WHAT I AM

1. Choose and then carefully examine a small part of the natural environment that interests you.

2. Magnify this and draw it into the frame below so that part of it fills the whole frame.

3. Now write three or four clues that will help a partner to guess what it is.

4. Once you have finished this and proofed it, swap with a partner.

5. See if they can 'Guess What It Is' and then.....FIND IT!!! (you may need to give them the general area to look in).
Activity: Minibeasts and Pit Traps

ACTIVITY - MINIBEASTS AND PIT TRAPS

The students set pit traps and describe, classify and draw a minibeast from a trap.

Concepts

* We rarely see many of the wide variety of animals that live around us.
* Most of these animals are nocturnal.

Objectives

* To trap and describe a variety of animals.
* To compare characteristics of different animals found in traps.
* To compare the number of animals trapped at night and during the day.

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<tr>
<td>Science</td>
<td>Conducting investigations.</td>
<td>2, 3, 4. Use equipment to conduct tests to gather information.</td>
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</table>

Background Information

We don't see many of the numerous animals that live around us. This is because they are small, secretive, and often nocturnal. These animals include spiders, insects, worms and a host of other minibeasts. Many of them may be caught in simple pit traps.
Activity: Minibeasts and Pit Traps

The number and type of animals found in each pit trap you set will vary according to:
* whether it is set during the day or overnight;
* the season (late spring is preferable, autumn and summer are second best);
* the habitat or place;
* day to day weather.

In winter, the pits may fill with water and it is often too cold for many animals to be moving. Also, flying insects will not normally be found in pit traps.

For those wanting to identify their animals, a key for woodland minibeasts is provided in Appendix 1.

Key Words
Characteristics, habitat, nocturnal, secretive.

Resources/References

Teacher Directions

For each trap, you will need a receptacle with steep, slippery sides. For example, a glass jar or a plastic cup. Glass jars with a metal, screw-top lid are best.

1. Direct the students, in groups of four, to set pit traps by digging the receptacles into a hole within bush or a garden (two jars per group, set in the same area as each other). The sides of the trap must be flush with the ground. For example:

2. Each group should set one trap during the day [A] and the other overnight [B]. Animals caught in [A] should be kept overnight in containers with air holes.
3. Ask students to predict what they will find in their traps. Flying insects could be discussed at this point.

WARNING: it is very important to discuss with students those animals which are poisonous. No animal should be handled unless the teacher is confident that it is safe to do so.
Activity: Minibeasts and Pit Traps

4. Compare how many insects were trapped in [A] and [B]. Ask students to think of reasons for their results.
5. Students use hand lenses to examine the animals that they have found. The safest way to do this is through the glass of a jar.
6. Complete resource sheets and discuss. (Minibeast sheet).

Evaluation

* Were students able to describe the important details of animals found?
* Were students able to identify similarities and differences between animals found?
+ Could students develop an hypothesis as to why less animals were trapped during the day compared to the night? (Note that under some circumstances, for example when the night has been very cold and wet, the reverse could apply.)
* Were students able to complete a drawing of their minibeast to scale and then enlarge it?

Complementary Activities

* Compare the contents of pit traps set:
  i. in different seasons;
  ii. in different habitats or places;
  iii. in different weather conditions.
* Can students find any adaptations on the minibeasts and suggest reasons for them? Note: an adaptation is any feature or behaviour that assists an animal to survive in its environment - for example the flat shape of cockroaches, the hard, waterproof covering of slaters and the colouring of grasshoppers. Coloration in Nature is a Year 7 Science topic in the turquoise Doing and Thinking text, pages 27-30.
* Use the key in Appendix 1 to identify your minibeasts.
* Discuss poisonous minibeasts - most school or local libraries will have relevant information.
MINIBEASTS

1. From the contents of your pit trap choose a minibeast that interests you.

2. Examine it closely through a hand lens. Do not touch the minibeast unless your teacher tells you that it is safe to do so. Some minibeasts are very poisonous.

3. Describe the 'beasty' below. If you don't know the name for it, make one up.

Name:

Description:

Now draw your minibeast on the small grid below. Don't forget to include, as accurately as you can, all of the important details. Then enlarge it onto the big grid. Use a scale (for example 0.5mm = 1.0cm)
4. Compare this minibeast with another from your pit trap. Write the similarities and differences of the two below.

Name of Beast 'A': _____________________________________________

Name of Beast 'B':

Similarities: __________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

Differences: _____________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________
Woodlands as Homes

This theme is explored at a number of levels, and looks at some habitats that we don’t normally view as important.
ACTIVITY - FIVE STAR GARDENS

Using a checklist, students will examine gardens in a street and evaluate their suitability as homes, feeding grounds and watering points for birds.

Concepts

* Generally, the greater the diversity of plants, the greater the range of habitats available for animals.
* Animals depend on their environment for survival.

Objectives

* To use objective criteria for rating.
* To interpret data and draw conclusions.
* To raise awareness of local environments and factors affecting animal diversity.

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<td>7</td>
<td>Plants/Animals</td>
<td>Investigating animal/plant interdependence.</td>
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<td>4.17. Translates information from one form to another.</td>
</tr>
<tr>
<td>Science</td>
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<td>4. Collects and records information which reflects accuracy appropriate to the equipment and purposes of the investigation.</td>
</tr>
<tr>
<td>English</td>
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<td>4.10. Adjusts writing to take account of aspects of context, purpose and audience.</td>
</tr>
</tbody>
</table>
Activity: Five Star Gardens

Background Information

A **tree** has a well defined trunk or main stem which generally does not branch for at least 0.5m above the ground.

A **shrub** is formed by a series of branches which divide from the main stem very close to or at ground level.

Students need to be encouraged to investigate their own environment. Their explorations will show that the natural environment is all around them and is home to a wide variety of plants and animals whose lives are interdependent. By providing a wide range of plants in home gardens we can encourage a variety of birds to feed, to forage and to find homes within this environment.

**Key Words**
Environment, foraging, introduced plants, litter, native plants, roosting, shrubs.

**Resources/References**
There are many field guides for birds and at least some of these will be found in either your school or local authority library. Those written by Slater, Pizzey, Storr, or Simpson and Day are all useful. If you prefer photographs, then the *Complete Book of Australian Birds* published by Reader's Digest is useful.


Australian Insects Science Pictures. Jacaranda. (Study Prints.)

**Teacher Directions**

1. Distribute a letter to street residents stating what your class are doing and when the activity will occur.

2. In class discuss the role of plants in attracting bird life. For example, special foods produced by plants such as pollen, nectar, seeds and fruit; special protection for nesting as in thick bushes, tall trees; and special material for nests such as that provided by the 'woolly' parts of banksia flowers. The difference between native and introduced plants should also be shown through examples. It may prove helpful to investigate the school grounds first, pointing out the various plants. Working either individually or in groups, go to a previously selected street and complete the resource sheet. Once completed, do a class tally of the 'starring gardens' in order to identify the bird friendly gardens.

3. Take care to point out that the gardens are only being assessed from a bird's point of view. If we were to do the same activity from the viewpoint of a lizard, earthworm, child or adult we would have different elements to look for.
Activity: Five Star Gardens

Evaluation

* Were the students able to transfer the visual information into a written form?
* Were students able to interpret and analyse the data they collected?
* Did students increase their understanding of the habitat requirements of birds?

Complementary Activities

* Draw up awards for the most 'bird-friendly' gardens.
* Students assess their own gardens and suggest ways to improve them to attract more birds.
* Make up a check list which would reflect the needs of a family pet.
* Map the street and mark in the analysis of each garden.
FIVE STAR GARDENS!

Many gardens are ideal for attracting native birds. These visiting birds will stay for long periods if there is sufficient shelter, food and suitable breeding places in the garden.

Does your street have bird-attractive gardens? One way to measure this is to give a star * for each attractive feature.

<table>
<thead>
<tr>
<th>Type of Habitat</th>
<th>Resources Provided</th>
<th>Birds Using the Habitat (Examples)</th>
<th>Picture of Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>A large area of grass.</td>
<td>insects, worms</td>
<td>magpies, mudlarks, willie wagtails</td>
<td></td>
</tr>
<tr>
<td>Three or more kinds of large, flowering shrubs.</td>
<td>pollen, nectar, insects, spiders,</td>
<td>honeyeaters, wrens, thornbills, silvereyes</td>
<td></td>
</tr>
<tr>
<td>At least one tall tree above the roof line.</td>
<td>roosting, foraging and nesting</td>
<td>magpies, mudlarks, butcherbirds, hawks, rosellas</td>
<td></td>
</tr>
<tr>
<td>A visible watering place.</td>
<td>bathing, drinking</td>
<td>honeyeaters, willie wagtails, silvereyes</td>
<td></td>
</tr>
<tr>
<td>An area with rocks or deep leaf litter among trees or tall shrubs.</td>
<td>insects, spiders and other litter animals</td>
<td>rufous whistlers, golden whistlers, thornbills</td>
<td></td>
</tr>
</tbody>
</table>
### Resource Sheet: Five Star Gardens

**FIVE STARS**

- - - - -

**Street**

by

<table>
<thead>
<tr>
<th>House No.</th>
<th>Grass</th>
<th>Variety of Shrubs</th>
<th>Tall Tree</th>
<th>Water</th>
<th>Rocks/leaf litter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>
Activity: Our Soils

ACTIVITY - OUR SOILS

Students dig up a section of soil and, using hand lenses, examine the soil profile in detail. Observations are recorded.

Concepts

* Soils consist of a variety of substances including broken rocks and decayed plant and animal matter.
* Soils provide a special environment suitable for particular animals.

Objectives

* To record observations about the soil and describe its components.

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<td>Matter</td>
<td>Comparing soils</td>
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<td>Animals, Matter</td>
<td>Investigating the responses of animals to their environment. Investigating rocks and crystals.</td>
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<tr>
<td>Science</td>
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<td>4.10. Adjusts writing to take account of aspects of context, purpose and audience.</td>
</tr>
</tbody>
</table>
Activity: Our Soils

Background Information

Soil is made up of weathered rock and a small, but crucial, organic content. Soil is formed by the weathering of parent rock by climate, plants, animals, physical erosion (for example running water) and chemical erosion (for example, mild acids in water). The type of soil which results depends on how these environmental elements interact and on the soil's organic component. The organic part of soil, called humus, is derived from decayed plant and animal matter. It is a rich source of nutrients. Humus is concentrated at the soil surface giving the surface layers a distinctive brown to black layer.

The formation of deep, mature soil from a bare rock surface may take from 10 000 years to a million years depending on the climate and rock type. Soil formation may be as slow as one centimetre (depth) in 100 000 years in arid Australia.

There are basically three types of soils:

i. sandy soil (in the wheatbelt, this is usually formed by the breakdown of quartz in granite. These soils are generally low in organic matter);

ii. clay (derived from the breakdown of feldspars in granites, dolerite and other rocks. They contain variable amounts of organic matter);

iii. loam (a mixture of sand, silt and clay, often high in organic matter).

The characteristics of these soils when they are moist include:

i. sandy soil feels gritty, doesn't retain water well, soil particles are loose;

ii. clay feels smooth and sticky, is often red or grey in colour, holds moisture so well it often becomes waterlogged. Heavy clays are like plasticine;

iii. loam is generally the best soil for agriculture. Its colour ranges from brown to black depending on the amount of organic matter present. It is sticky with a slightly gritty feel.

Soils may look the same on the surface but by going down a few centimetres much variation can be seen. The top few centimetres (topsoil) will usually differ greatly from the subsoil. This topsoil is usually richer in humus, or organic matter, than the layers further down.

Key Words
Clay, humus (organic matter), loam, soil.

Resources/References
WA Gould League. *Day of Insects.* (Activity pack.)
WA Gould League. *Common Insects of Australia,* (Chart.)
Activity: Our Soils

Teacher Directions

Materials
* Spades
* Magnifying glasses
* Rulers
* Sticks
* Newspaper.

1. The students will see that soil is made up of decaying plant matter (leaves, roots, twigs, bark), sand and small pieces of rock. They can investigate the 'feel' of the soil and decide whether it is gritty, smooth, damp, or sticky. Also, they may describe the colour variation within and between soil samples.

2. The animals found in the soil sample can be examined and recorded.

3. Ask the students if they have ever looked at soil closely. Brainstorm with students what they think soil is made of. Lead the students to include the small animals that live in the soil.

4. To test their predictions students will need access to soil where they can dig. This can be within the school grounds or in a natural bushland area. It is preferable if the sample can be taken from a humus rich area.

5. Damp soil holds together better than dry soil. Therefore it is better to program this activity for seasons when the soil is damp. Students are also likely to find more soil life during these seasons.

6. Once at the selected site, each group is allocated an area and instructed to measure a 15-20 cm square on the ground. Using hand lenses students examine the soil surface and record what is on the surface. Once this is done the square needs to be dug out to a depth of 15-20 cm. Teachers may need to use a spade to ensure that a clean soil profile is obtained for students. Place this soil sample on several layers of newspaper for further examination.

Students then measure down 10 cm from the ground surface part of the sample and push a stick through the side. Students should describe separately the samples above and below the stick - these represent different parts of the soil profile, and are likely to have quite different characteristics. Including the description of the surface layer, you now have three layers (sections of the soil profile) to examine.

Students then look at the second and third layers with a hand lens and write down on the chart provided what they see and feel.
Activity: Our Soils

7. Alternatively, dig out soil at four different sites. Before digging out the soil, students sketch the surface coverings - such as stones and leaves - and describe the soil colour and any other features. Students then sketch (in colour) a cross section of the hole. This is a soil profile. Record whether or not there are any roots (what are they from?) or animals, such as ants or earthworms. Students should also describe the texture of the soil and stones. The depth at which any changes in soil colour and texture occur should also be noted.

Evaluation

* Were the students able to translate what they saw in the soil into a written form?
* Did students recognise that different soil layers contain different animals? Could they explain this?

Complementary Activities

* Gather the leaf litter. Shake through fly wire mesh to obtain the animals living in the litter. Place over a small white ice-cream container to allow the small animals to drop through. Alight held above the mesh will drive the animals down through the mesh.
* Look for animals in the soil. Put the animals from each layer into a white ice-cream container. Make a chart to show where each was found. Differences and similarities between the layers can be discussed. Look at the way the animals move.
* Encourage the students to identify their own criteria for classifying animals found. If names of the animals are unknown, the students could name the animals themselves. For those who wish to take identification of soil animals further, try using the key in Appendix 1.
Resource Sheet: Our Soils

OUR SOILS

What to Do

1. Select your site.
2. Mark a square (15-20 cm) on the ground.
3. Examine the soil surface using first your eyes and then a hand lens.
4. Sketch what you see.
5. Dig around your square to a depth of 15-20 cm.
6. Put your soil sample on several layers of newspaper.
7. Measure down 10 cm and push a stick through the sample. You now have three layers to examine. (You have already examined the top layer - see diagram.)
8. Look at the 2nd and 3rd layers. Write down what you see and feel.

Sketch soil surface here:

Using Your Senses

Complete the chart using your senses of sight and touch.

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<th>Layer 1 (Surface)</th>
<th>Layer 2</th>
<th>Layer 3</th>
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<tbody>
<tr>
<td>eyes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>^ Lens</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>^ moist</td>
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<td></td>
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<tr>
<td>~ dry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>~ sticky</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>~ other?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Describe the appearance of the layers of soil.

2. List the small animals that you saw.

3. What was the main difference between the surface (layer 1) and the bottom (layer 3) layers of soil?
Activity: One Log For Many

ACTIVITY - ONE LOG FOR MANY

Students translate written information onto a chart which demonstrates the interdependence of plants and animals.

Concepts

* Animals and plants are interdependent.

Objectives

* To develop an understanding of inter-relationships between plants and animals.
* To increase knowledge of the names and characteristics of some woodland animals and plants.

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<td>Literal. Listening and reading.</td>
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PROFILE STRAND LEVEL

Science Living Together
3. Map relationships between living things in a habitat.
4. Identify events that effect the balance in an ecosystem.

English Reading and Viewing
4.8a. Selects, uses and reflects on strategies appropriate for different texts and reading or viewing purposes.
5.8b. Systematically finds and records information.
Background Information

**Fungi** help break down plant and animal remains and keep the soil fertile. Having no leaves, fungi cannot use the energy of the sun for food manufacture (photosynthesis). This means they must feed on other plants and animals. Closely examine pieces of rotting plant and animal matter and you may see a white substance on them. Sometimes it is soft like a sponge but often it looks like tiny white threads. This is a fungus which breaks down the plant or animal matter and releases materials necessary for energy and growth.

**Ferns are** flowerless plants usually found in moist, shady places. The leaves, called fronds, usually grow above the ground while the stem and roots grow underground. Ferns, like mosses and lichen, help trap and build soil particles, forming a new seed bed for the next generation of plants.

**Marsupial Mice** include the mardo, a brown mouse-like marsupial which is about 15 cm long. Its thin pointed tail makes up half its body length. The mardo has a rudimentary pouch. This pouch is formed by a fold of skin on either side of the body, folded towards the middle. The young (up to 12) simply hang from the teats as the mother goes about her nocturnal hunting. Her diet consists of spiders, beetles and other small animals. The mardo is found in the south-western wheatbelt and is replaced by one of the dunnart marsupial mice further east.

**Geckos** are small lizards. They have large lidless eyes and are mainly active at night. They have soft bodies which are not designed to withstand direct sunlight and most species conceal themselves beneath bark, plant litter or stones during the day. Their food consists of small arthropods (animals with segmented bodies and jointed limbs such as insects, spiders and centipedes). Some of the larger geckos also eat small lizards.

**Owls** have large broad heads with a ruff of feathers around the eyes. This ruff covers enormous ear openings. The eyes are very large which helps this nocturnal hunter to see its prey. Owls have short, thick bodies; strong, hooked beaks; and powerful feet with sharp claws. The food of owls includes small birds, bats, small reptiles, large insects, rats, mice and other small animals. Owls, like humans, have both eyes on the front of their face and thus may accurately judge the distance between themselves and their prey. This is called binocular vision and is common amongst those hunting animals for whom sight is important.
Activity: One Log For Many

Key Words
Fungi, habitat, humus, inhabitants, lichen, mammals, reptiles, decomposers, nocturnal, flora, fauna, rudimentary, predators, nutrients.

Resources/References
Bolton, E and Cullen, E. 1987, Animal Shelters. Martin Educational, N.S.W. Bookshelf Stages. (Big Book.)
Gould League Information Sheets on Lichens and Fungi.

Teacher Directions
1. Ask the students to read the resource information sheet in groups of two or three. It may be preferable with some classes to go through the sheet as a class exercise, or to break it up into sections to give to student groups. Ask students to look for relationships between the logs, plants and animals. Ask them to record their observations in the relevant spaces on the resource poster. For example, 'magpies perch on the log'.
2. Links can be drawn between the written and visual information about the log.
3. Use the resource information sheet to complete the resource sheet ('One Log for Many'). Discuss the resource information sheet. Brainstorm various ways the plants and animals can be grouped before the students attempt to complete the sheet. Some of the ways the inhabitants of the log may be grouped include:
   * life under the log;
   * predators living in a log;
   * animals which eat logs;
   * animals without legs that live in or under logs;
   * animals that visit logs;
   * decomposers;
   * animals which sun themselves on logs.

Evaluation
« Could the students complete the resource sheet using the resource information provided?
* Were they able to organise the animals and plants into groups and supply appropriate names for each group?
* Were students able to successfully complete the resource poster?

Complementary Activities
* Use the text for a written comprehension lesson, or as the basis of a vocabulary/spelling list of woodland words.
* Some students may wish to colour in the resource poster. Challenge your students to research the correct colours of birds, mammals, reptiles etc.; or provide them with large posters, photos, charts and books.
* Find old logs in a nearby environment. Record the inhabitants by sketching, listing and writing in detail.
* Draw a life cycle of a tree from seed to log.
Fallen logs and the plants and animals living on them are a miniature community. The log is itself part of a cycle - the life cycle of a tree:

The length of each part of the cycle depends on the type of tree, where it is growing, and what happens. For example, a fire may kill trees or seedlings. Trunks and branches which form logs may decompose (break down) quite quickly and never form hollows, as in the case of rock sheoak and some wattles. Others, like wandoo, last for many years and supply long-lasting hollows.

Humans often think of logs and fallen branches as ugly. However, they provide extremely important food and shelter for a wide range of plants and animals. Some plants and animals are even specialists in wood decay!

What you see living in and around logs will depend on the season. Hard surfaced animals that can tolerate drying out will shelter in and under logs during the summer. Soft-bodied beasts like earthworms tunnel deeper. What you see will also depend on other features such as how shaded the log is and the depth of the surrounding leaf litter.

Plants
Fungi, ferns, mosses and lichens seek the shade, food and moisture provided by the log habitat. The ferns, together with the mosses, will probably grow on the southern side, away from the sun while the lichens will cling to the log above. Ferns, mosses and lichens help build and trap soil particles forming a seed bed for the next plant generation.

Decomposers
Decomposers are plants, animals and other living things that feed on dead plant and animal material. Fungi, along with numerous bacteria, earthworms, mites, insects and other 'mini-beasts', feed on fallen leaves, tree trunks and branches, so turning woodland debris into humus.
Resource Information: One Log for Many

In wheatbelt woodlands termites are the most obvious animals eating logs and other dead plant material. Their feeding habits help keep the ground clear for fresh plant growth and release new plant food into the soil. Termites have even attracted special predators. The best known are numbats and blind snakes. Echidnas also eat termites. However, echidnas eat a wide variety of ants as well as termites.

Eating the Decomposers
Decomposers are food for other animals. Some adult beetles and bugs eat fungi. Insect grubs may eat the fruiting bodies (the bit of mushrooms that we eat) of some fungi. Even living things as small as bacteria are eaten by tiny animals.

There are a large number of beasts that hunt the animal decomposers. Or feed on the animals feeding on the decomposers! Scorpions, spiders, predatory insects, snakes, lizards, birds and small mammals (for example bandicoots and marsupial mice) hunt among the litter and around logs for the decomposers and their predators. Along the western edge of the wheatbelt you may even find a predatory worm - the colourful ribbon worm or nemertean worm.

At least two of the animals listed here would normally be found underneath a log, even during summer.

Living in the Log Hollow
Animals use logs for shelter as well as a place to find food. Logs provide protection from predators and weather. Hollow and cracked logs provide shelter and nesting sites for a large number of animals including beetles, cockroaches, spiders, lizards, marsupial mice, echidnas, numbats and birds.

The Log and Its Environment
The log and the life it supports are a community. This community is linked to the surrounding environment. Predators from the surrounding woodland, such as owls, frogmouths, snakes and foxes - prey on the log's inhabitants.

Woodland birds, such as red-capped robins and western yellow robins, may find the hollow log a good place to perch and watch for prey. Marsupial mice and lizards may use the log as a protective corridor when moving from one place to another, rather than moving across open, exposed ground.
1. Using your resource information sheet 'One Log for Many', list all the flora and fauna mentioned.

Fauna  

<table>
<thead>
<tr>
<th>FLORA/FAUNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>magpies, rufous tree-creepers, tawny frogmouths</td>
</tr>
</tbody>
</table>

Flora

2. Divide the above list into three groups of your own choosing. Your teacher will help you to select groups.

<table>
<thead>
<tr>
<th>NAME OF GROUP</th>
<th>FLORA/FAUNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Feathered animals using logs.</td>
<td>magpies, rufous tree-creepers, tawny frogmouths</td>
</tr>
</tbody>
</table>

3. Write down any plants or animals that fit into more than one of your groups.

a.

b.

c.

4. Complete this diagram, using your list of inhabitants. A key may be helpful.

5. If this log was removed, what effect would it have on:

a. termites? _________________________

b. echidnas?

c. owls?
HOLLOW LOG COMMUNITY

Logs are an essential part of our woodland environment. Study this poster to discover how they provide resting and living spaces for woodland wildlife.

Some of the ways that wildlife use the logs are listed. Test your observation skills and knowledge from your resource sheet to find others. Write your answers in the spaces.

EATING THE LOG AND ITS INHABITANTS
Fungi and some beetles feed on the log itself.
Write the name of one other animal that eats the log

Name two animals that eat 'minibeasts' that eat the log
1. ___________________________________________________________________
2. ___________________________________________________________________

PLANTS
Mosses, lichen and fungi thrive in the damp shade provided by logs.

Name another plant which enjoys the log habitat
______________________________________________________________________

LEAF LITTER
Name a plant, an insect, and a reptile that live in the leaf litter
1. ___________________________________________________________________
2. ___________________________________________________________________
3. ___________________________________________________________________

THE LOG'S SURROUNDINGS
Logs are not only used for food and shelter. For example, logs provide a safe spot for some lizards to sunbake.
Name two other ways animals may use logs
1. ___________________________________________________________________
2. ___________________________________________________________________

LIVING IN THE HOLLOW LOG
Spiders and beetles live in the cracks and hollows of logs.
Write the names of two other animals that live in logs
1. ___________________________________________________________________
2. ___________________________________________________________________

UNDER THE LOG
Snakes and earthworms may be found under logs.
Name a furry animal that might eat them
______________________________________________________________________
Teacher Answer Sheet: One Log for Many

ANSWERS TO POSTER QUESTIONS

Living in the hollow log
* Living in the hollows made by termites are cockroaches, snakes, lizards, marsupial mice, echidnas and numbats.

Eating the log and its inhabitants
* Termites eat the log.
* Echidnas, numbats and blind snakes feed on the termites; and spiders, scorpions, centipedes, lizards and nemertean worms are some of the other predators.

Leaf litter
* Plants which live in the litter are fungi and mosses. Algae could also be included.
* Insects which live in the litter include cockroaches, silverfish, bugs, beetles, termites and springtails.
* Reptiles which live in the litter include snakes and lizards. Some students may want to be more specific and list blind snakes, legless lizards, skinks and so on.

Plants
* Ferns are the most obvious plant missed from those mentioned.

Under the Log
* Marsupial mice or bandicoots are the most obvious. Some students may mention wambengers (phascogales).

The Log's Surroundings
* Magpies, robins and other birds may use the log as a perch.
* Lizards and marsupial mice may use logs as a protective corridor.
Activity: Investigating Logs

ACTIVITY - INVESTIGATING LOGS

Students will measure, calculate and record information on logs then draw up an advertisement designed to attract a specific tenant.

Concepts
* Shelter is important for survival.

Objectives
* To develop mathematical skills by measuring, recording and evaluating information on a variety of logs.
* To heighten awareness of the value of logs in the natural environment.

Curriculum Links

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<td>MP1:1</td>
<td>Carry out activities involving measurement to the nearest metre, centimetre and millimetre.</td>
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<tr>
<td></td>
<td></td>
<td>MP1:4</td>
<td>Measure and compare diameter and circumference of circles in practical activities.</td>
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<tr>
<td>Language</td>
<td>6/7</td>
<td>3.2.15ACD</td>
<td>Advertisements.</td>
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PROFILE STRAND LEVEL

Technology Information 4. Identifies the form, structure, style and presentation used in particular information products and processes.

English Writing 3.11. Controls most basic features of written language and experiments with some organisational and linguistic features of different text types.

Background Information

See resource sheet for information on the use of hollow logs by animals.

Key Words
Crustacean, marsupial, monotreme, scavenger, segment.
**Activity: Investigating Logs**

**Resources/References**
*Nature Walkabout*. Volume 11, Number 6, page 17. Published by the Department of Education, Western Australia.
A variety of posters to be used as examples.

**Teacher Directions**

**Measuring Log Homes**
1. Each student will need - a resource sheet or ruled page, tape measure (or string and ruler), and pencil.
2. Take the class into an area where logs can be found. Decide how long and wide a log needs to be in order to be classified as a log.
3. Each group or student is to select three or more logs and record each log's length, internal and external diameters and circumference (to the nearest centimetre). Discuss why the circumference is not always about three times the external diameter (this is because trees and logs are not perfectly round).
4. Look for evidence of animal activity - insects or other animals sheltering under the bark, diggings around the log, etc.
5. Each group must decide whether or not their logs would provide shelter for two or more of the following: echidnas, numbats, dunnarts, rufous tree-creepers and lizards (descriptions of their requirements are given in the resource information sheet).

**NOTE:** Watch out for venomous animals such as snakes, red back spiders, white tipped spiders and centipedes which may use logs as a home.

**Table: Dimensions of Logs (measure to the nearest centimetre)**

<table>
<thead>
<tr>
<th>Logs</th>
<th>Length</th>
<th>Internal Diameter</th>
<th>External Diameter</th>
<th>Circumference (External)</th>
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<tbody>
<tr>
<td>1.</td>
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<td>2.</td>
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<td>3.</td>
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</tbody>
</table>
Activity: Investigating Logs

**Advertising Log Homes**

1. Each student will need: the resource information sheet Investigating Logs', a large sheet of paper, crayons, pencils etc.
2. In groups of two or three the students read the information sheet. Ask them to choose one of the animals. Students can then record, in point form, the main facts about their animal.
3. Using this information, each student will design an advertising poster for a hollow log which will attract the client of their choosing.
4. Put the following information on a board for students:
   i. decide what you want to say;
   ii. list, on a separate page, the most important facts about your prospective tenant;
   iii. think about the best way of capturing attention;
   iv. decide on the heading, the illustration, the body (details required), and the final message (the 'punchline');
   v. use bright colours, spacing and other attention getting features when you design your poster. Also think about unusual ways of presenting your poster to attract maximum attention;
   vi. where would you need to put your poster so that the desired clients will see it?

**Evaluation**

* Can students measure to the nearest centimetre and calculate the circumference of a circle?
* Are students able to infer from their data and the information provided whether or not logs are suitable habitat for particular animals?
* Does the poster contain sufficient information, based on the information sheet, to attract a specific client?

**Complementary Activities**

* Make bark rubbings of the logs chosen in 'Measuring Log Homes' (see 'What is a Woodland', page 22).
* Sketch the logs.
* On a bar graph show: length, diameter and circumference.
* Make and keep a terrarium complete with a hollow branch for invertebrates.
* Draw up a list of adjectives which could be used to describe the animals discussed in the resource information sheet.
* Can these animals all share the log? What things do you need to consider if this is to occur?
* Research the lizards, snakes, birds of prey etc., of the wheatbelt.
* Research the characteristics which identify different groups of animals, for example, insects, mammals or marsupials.
INVESTIGATING LOGS

**Centipedes** are members of the jointed leg group known as Arthropods. This group includes insects, spiders, crustaceans and many other animals. Although the word centipede means 100 legs, most local centipedes have less than 50. Their narrow bodies are divided into many sections or segments that lie one behind the other. Each segment has a pair of thin legs.

The centipede has a pair of antennae on its head along with jaws and simple eyes. The appendages of the first body segment form a pair of poison claws which are used for fighting, not walking. They are called poison claws because a gland in the centipede's head fills these claws with poison. Because of their poisonous 'bite', centipedes should not be handled.

Centipedes are carnivorous and eat molluscs, worms, insects and other small animals. The centipede is nocturnal and hides during the day under a log or stone, or finds some other safe place.

**Slaters** have an oval body divided into segments. The body is flattened and quite thin so it can fit into tiny crevices and cracks.

It is one of the few crustaceans that live permanently on land. They breathe moist air by means of plates on their tails. Their compound eyes lie flat on their heads. Slaters have seven pairs of legs which are all of a similar size. They feed largely on vegetable matter and act as scavengers. They live under rotting plant matter such as wood, bark and decaying leaves.

**Lizards** such as small geckos and skinks will go into very small openings, probably down to about five millimetres internal diameter. However, these lizards usually prefer old, large, decayed logs, and they use the small crevices in these larger logs. In part this may be because they can better control their body temperature and water loss in larger logs. For example, lizards probably move around within logs - towards or away from the side exposed to the sun depending on whether they are aiming to become cooler or warmer.

**Common Dunnarts** are a type of marsupial mice. They are slightly larger than introduced mice with larger eyes and ears, and attractive grey fur. They are nocturnal and feed mainly on insects, spiders and other small animals. Logs with an external diameter of about ten centimetres or more will be useful to dunnarts, mainly as a refuge from predators. Generally larger logs are used for breeding. As with lizards, they like confined spaces, but such spots are usually available somewhere in larger logs with hollows.
Rufous Tree-creepers are generally a woodland or forest bird, but will live in mallee vegetation. They feed on insects including ants, beetles and larvae (grubs). Tree-creepers wind their way up trees as they search for their food. They also forage on the ground. They use tree hollows for nesting, but have been recorded using hollow logs on the ground as a refuge from predators and for breeding. They are the only wheatbelt bird recorded as using hollow logs on the ground for breeding. They can use logs with an internal diameter of about 12 centimetres or more.

Numbats are marsupials similar in size to a small cat. They have a coarse, rusty brown coat. Across their rump the fur is darker and striped with crossbars of white. Their tail is long-haired and bushy. The front feet have five strong claws which are used to dig into termite tunnels and expose the termites on which they feed. Numbats use their long pink tongue to lick up termites, their exclusive diet.

Numbats are almost the only marsupials which rest all night and hunt for food during the day. They make use of hollow logs as resting places and also as refuges in case of danger. For nesting, numbats require hollow logs which have an internal diameter of at least six centimetres measured about 20 centimetres inside the entrance of the log. The logs must be over one metre in length, and it is important that no-one can see through the log from one end to the other.

For protection, for example to escape from a hawk, adult numbats use logs which have an internal diameter greater than six centimetres, while young numbats use logs which have an internal diameter greater than four centimetres.

Echidnas are egg-laying mammals (monotremes). They have coarse brown hair and many sharp spines on their back and sides. This mammal measures up to 30 cm long and weighs between three and four kilograms.

The echidna's nostrils and mouth are at the end of a long, thin snout. It licks up insects with its long tongue and sticky saliva. The echidna has no teeth, but crushes its food with horny plates at the base of its tongue and on the roof of its mouth.

Echidnas have very strong digging claws which they use to construct burrows and search for food. Hollow logs are also used as homes by these unusual creatures. They will probably use any log with an inside diameter of 20 centimetres or more. As with other animals, they like a confined space, but can achieve this by moving deeper into logs with large openings.
ACTIVITY - WELCOME TO MICROWORLD

Students are encouraged to examine a small area in detail, then construct a narrative related to specific features of this environment.

Concepts

* At our feet lives a microworld teeming with plants and animals that we rarely notice.
* Your size affects how you relate to your environment.
* By using our imagination, we can better empathise with other animals.

Objectives

* To encourage students to sequence ideas and use inventive and imaginative words.
* To examine a small area in detail
* To encourage students to relate to the perspective of other animals.

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<td>Narratives.</td>
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<td></td>
<td>5.1 G</td>
<td>Speaking and writing word and sentence structure.</td>
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<td></td>
<td>5-1 J</td>
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<tr>
<td>Language</td>
<td>6/7</td>
<td>5.1 L</td>
<td>Speaking and writing first and third person.</td>
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<th>LEVEL</th>
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<td>English</td>
<td>Speaking and Listening</td>
<td>3.4. Reflects on own approach to communication and the ways in which others interact.</td>
</tr>
<tr>
<td>Social Studies</td>
<td>Time, Continuity and Change</td>
<td>4.3. Portrays an event or occasion from a particular perspective.</td>
</tr>
</tbody>
</table>

Exploring Wheatbelt Woodlands
Background Information

Lichens are plants. Those which colonise bare granite are rounded growths that lie flat on the rock surface. They are the result of a symbiotic (living together) relationship between an alga and a fungus. The alga is a tiny green plant that manufactures food by photosynthesis. The fungus does not have chlorophyll so it cannot manufacture food. It can, however, supply minerals and water to the alga. The two plants grow together in order to survive. In summer lichens dry out without dying and in winter they resume their normal growth.

Mosses are established by wind-borne spores. In the wet months mosses range between bright and dark green, but in summer they dry out, becoming dark grey-green. They do not die and are quickly revived by rain. Mosses do not have a true root system but anchoring structures called rhizoids which help loosen sand grains from rocks.

Ferns have a similar life cycle to mosses, but unlike mosses they anchor to the soil with a root system. They may reproduce by growing underground stems from which grow new fronds. On the underside of a frond small brown structures (known as sporangia) may grow in which the spores develop. These spores, like those of the mosses, are carried by the wind.

Sundews are plants that catch insects for food. Some have a flat rosette of leaves covered with sticky tentacles, each with a glistening drop of trapping 'glue'. Other sundews are either twining climbers or grow upright. They have modified leaves with sticky tentacles around a hollow pit. When an insect lands the tentacles close over the struggling prey and more liquid is secreted to digest the insect. The protein is absorbed. When the meal is over the leaf dries, the tentacles open, and the remains are discarded.

Key Words
Adapt, ferns, insects, lichen, moss, narrative, sundews, survive, symbiotic.

Resources/References
Activity: Welcome to Microworld

Teacher Directions

1. Divide the class into groups of three.
2. Have hoops placed on the ground in a bush or garden setting. Try to make sure that there is variation in the area covered by the hoop - small rocks, some grass, moss, dead leaves, flowers, insects, spiders, etc. Do not disturb the area unnecessarily.
3. Weave a story around these natural elements (see suggested story). Use toothpicks to mark the selected features as they occur in the story.
4. Ask for suggestions for other types of stories - aliens, magic spells, intelligent insects, etc.
5. Each group is then to invent their own story (narrative) based on the features of their own micro-world. A quick revision of the narrative structure will help:
   - orientation - which sets the scene (time, place and characters);
   - complication - a problem which shapes the plot through character and action;
   - resolution - which ties the ends together in a satisfying conclusion.
6. Give time for each group to invent their own story. Emphasise that each group member must know the story, as one will be selected to retell their story to another group.
7. When all stories are known, nominate one member to stay, while two move to the next group. The one who stays narrates the group’s story to the incoming group. Rotate narrators.

Evaluation

* Were the students able to use the narrative structure when telling their story?
* Did students pay attention to the details of their microworld and incorporate them into their story?
* Could they recall the major elements of the narrative they heard?

Complementary Activities

* Record the main elements of the story your group invented. This outline is given to another member (one who did not hear this story) who then constructs a written narrative from the outline.
* Divide a blank sheet of paper into six equal sections. Use these to illustrate the main ideas of your story. This could follow a story map activity.
THE WORLD OF THE DRA-LYPHS

Long, long ago in the time of the dinosaurs there lived a most unusual family who had discovered the secret to survival in a hostile, giant world. They began to grow smaller, instead of taller.

Over the centuries the Dra-lyphs became so tiny that not even humans could see them. The dinosaurs did not know they even existed. They learnt to hunt and kill the mighty spiders, to capture and tame the beautiful dragon flies and to hide so well that not even the dreaded scorpion could find them. Today we are going to visit one of these miniature worlds (lower your voice).

Come closer and listen.

Hiding under this stone (or rock or twig or leaf) is Freya, the leader of the Dra-lyphs. She is the most intelligent, the wisest and the most beautiful of all the Dra-lyphs. She has ruled happily for many years in the tiny kingdom but is now facing an enormous problem.

Her world is threatened by a fearsome monster called Risloth who lives many kreons away (point to another part of the area enclosed by the hoop). This creature has threatened to destroy Freya and all the Dra-lyphs.

Freya cannot allow this to happen so she calls a meeting. (Show where the meeting is held.) From under the leaves, behind the rocks and around the twigs creep all the Dra-lyphs. What can they do? Everyone is terrified of the Risloth. Finally Mutha, Freya’s uncle, has a plan. He will talk to Risloth in an effort to secure peace. The others laugh at him but Freya gives her blessing.

Mutha has a difficult journey (add problems relevant to the terrain - climbing mountains, tackling gullies, giant trees and threatening beasts).

Finally he reaches the lair of Risloth. The beast is astounded that such a tiny creature dares to speak to him - the mighty Risloth! He is so surprised that he starts to listen to Mutha and is persuaded to respect the boundaries suggested by Mutha. This way they can live in harmony (using the hoop, show where these boundaries will be.)

Mutha returns in triumph.
Activity: Catch That Fly

ACTIVITY - CATCH THAT FLY

Students will use information about flies to plan and construct a blowfly trap.

Concepts

* Animals have very different life cycles:
  - some lay eggs, others bear live young;
  - some feed and protect their young, others lay eggs and leave them;
  - some produce many young at a time, others produce one at a time.
* Even meat can be a home!

Objectives

* To examine the life cycle of a fly.
* To construct a trap based on the information gained.
* To evaluate the effectiveness of the planning, discussion and construction of various fly traps.

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<td>Investigating the characteristics and development of frogs.</td>
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<tr>
<td>Science</td>
<td>7</td>
<td>Animals</td>
<td>Hypothesise about the behaviour of social insects.</td>
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PROFILE    STRAND                        LEVEL
Science     Conducting Investigations    Organise and use equipment to gather information and present it.
           Evaluating Findings            Evaluate the fairness of a test they have designed and carried out.
Social Studies Investigation, Communication and Participation 4.17. Translates information from one form to another.
Activity: Catch That Fly

Background Information

All adult insects have six jointed legs, three main body parts (head, thorax and abdomen) and one pair of antennae. Most insects also have wings. While winged insects usually have four wings, flies have only two.

A fly's life is divided into four stages - egg, larva, pupa and adult. At each stage the fly's appearance changes completely. The larvae of many flies live and feed on rotting vegetable matter, while others prefer flesh. Flies with flesh eating maggots, such as blowflies, are discussed here.

Eggs are laid in meat, the bodies of dead animals or in the wounds of living ones. A female fly lays from 1-250 eggs at a time depending on the species.

Larvae (singular larva) are called maggots. Maggots tunnel through flesh, spending their time eating and growing. They moult several times as they grow. They are a creamy colour and may be dangerous disease carriers. When they are ready to become adults, the larvae build a strong, oval-shaped case called a pupa around their bodies. Some larvae only feed on dead meat, and these have been used to clean dead flesh from wounds on humans. They can do this very efficiently and without damaging living flesh.

Inside the pupa, the larva gradually loses its wormlike look and takes on the shape of the adult fly. After the change is complete, the adult fly bursts one end of the pupa, or in some species splits the back of the pupal case, and crawls out.

Adults emerge from pupae, their wings still moist and soft. The wind dries the wings quickly and blood flows into the wing veins and stiffens them. The mouth is fitted for sucking only.

Both male and female flies feed on nectar from flowers which supply carbohydrate (sugars) as an energy source. Females require a protein meal to develop their ovaries and produce eggs. They obtain this from a range of sources including wounds on live animals, carcasses and raw meat. Protein sources must be moist to attract flies and provide a suitable environment for egg survival and development. Eggs and larvae are very susceptible to desiccation (drying out).

Flies are most active between 26 and 38 degrees Celsius. Wind also affects fly activity. Wind speeds above 9 kilometres per hour will reduce flight activity. They do not fly at all when the wind speed exceeds 30 kilometres per hour.
Activity: Catch That Fly

Blowflies are best known as household pests and for the damage they do to the sheep industry. However, they have their positive side. They greatly speed the decay of dead animals and adult flies pollinate some plants. Maggots also make good fishing bait!

Key Words
Arthropods, carbohydrates, larva, life cycle, moult, protein, pupa, desiccation.

Resources/References
Video - Web of Life 11-2. Section titled 'Lifetimes of Change'. Department of Education, Western Australia.
WA Gould League. Day of Insects. (A Kit.)
See your local Department of Agriculture officers and obtain information sheets on blowflies.

Teacher Directions

1. Students will be required to design, explain and build a fly trap. In order to do this effectively they will need to understand the life cycle of the fly and its special needs. Some of these needs include the following information. Flies will have no problems going through a funnel from the broad end but will find it difficult to do the reverse. When leaving the bait, flies will tend to fly to the brightest light.

2. The background information can be used as student research sheets or as teacher information for presenting to students.

3. Use videos to introduce the concept of life cycles. Once life cycles are understood, the details of the flytrap can be discussed.

4. Students could work individually, in pairs or small groups. They will need to produce a fully labelled diagram of their trap.

5. Upon completion of the diagram, a brief oral explanation of each trap will be required. The talk could be freely developed, but some of the following points should be covered:
   * materials used;
   * method of operation;
   * bait to be used;
   * placement around the school with reasons (consider wind and temperature factors);
   * approximate cost;
   * ease of construction;
   * what will happen to the fly once it has been caught.
Activity: Catch That Fly

6. The class will then need to decide whether to build their own traps or whether to select several to try (Some may be impractical, too costly or too dangerous to be built at school.) Sites will need to be decided - near the school canteen is NOT a good idea! Do remember to check with cleaners and your principal before placing these traps.

7. Traps should not be left for long periods - one day is sufficient. If left any longer you may find the disposal of the flies and their offspring rather daunting.

8. A simple trap can be made from a two litre plastic drink container. Remove the lid, cut around the container about 10 cm from the lid, invert the top section into the remaining base.

9. Obtain a suitable bait (chopped liver works well) and place it in the bottom of the container. Now your trap can be placed in a suitable site. Encourage the students to observe where flies gather and to find reasons for their presence in that place.

Evaluation

* Were the designs clear, easy to follow and well-labelled?
* When presenting their talk, was the speaker fluent, audible, able to refer to his or her diagram, and well prepared (refer to teacher directions for more detail)?
* Did the trap work?

Complementary Activities

* Examine the flies with a magnifying glass. Look at the body parts, wing, legs, etc.
* Discuss why a fly is an insect (see Appendix 1).
* Compare the fly's life cycle with humans, moths, frogs, bees, etc.
Activity: The Ochre Trail

ACTIVITY - THE OCHRE TRAIL

Students benefit by learning to use a number of strategies that increase their understanding of informational texts. The 'Think Sheet' and 'Graphic Outline' are two of many strategies available.

Concepts

* Animals depend on their environment for survival.
* Animals and plants are in many ways interdependent.
* People use a variety of substances to make useful things, materials, tools.
* People may derive benefit from the conservation of resources.

Objectives

* To gain an understanding of the background of one piece of woodland.
* To identify some of the ways in which the aboriginal people used woodlands.

Curriculum Links

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<td>4.2 B</td>
<td>Listening and reading - survey text.</td>
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<tr>
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<td></td>
<td>4.2 C</td>
<td>Listening and reading - headings and subheadings.</td>
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<tr>
<td>Social Studies</td>
<td>5</td>
<td>Society and Culture</td>
<td>Differing cultures may use the same natural environment differently.</td>
</tr>
</tbody>
</table>

PROFILE | STRAND | LEVEL
---|--------|----------------------------------|
English | Reading and Viewing | 3.8a. Integrates a variety of strategies for interpreting printed and visual texts.
| | | 3.8b. With teacher guidance uses several strategies for identifying resources and finding information in texts.
Social Studies | Place and Space | 3.3. Describes how natural features affect the ways people live in particular places.

Background Information

Dryandra Woodland, north-west of Narrogin, was set aside as State forest in 1934 because of its value as an area for mallet, a group of trees useful for tannin production. Today Dryandra covers an area of 28 000 hectares. The soils are a mixture of clay with extensive areas of sands and gravels. Breakaways are formed from the erosion of some soils to leave residual, gravel topped cliffs. Numerous species of dryandra grow on the rocky slopes and neighbouring gravel plateaus. These plants give the area its name. Powderbark wandoo is also found in the breakaway country with wandoo woodlands on lower slopes and valleys.
Activity: The Ochre Trail

**Ochre** is a kind of earth (iron oxide mixed with clay or sand) which was ground to a fine powder and used as a pigment for decoration by local Aborigines (Noongar). Its colour varies from pale yellow to a brownish-red. The ochre found in Dryandra is a reddish shade.

**Numbats** are marsupials about the size of a small cat. They are characterised by a barred coloration and bushy tails. Females do not have the characteristic marsupial pouch. They eat termites which they catch with their tongues.

Woylies are also marsupials and about the size of a cat. They are a small, kangaroo-like animal. This small wallaby builds a ground nest of grass or shredded bark in the shelter of bushes or other low vegetation. Its front feet have a good set of nails which are used to dig in search of underground fungi and bulbs. They also eat seeds, resin and insects.

**Key Words**
Breakaway, exotic plants, mallet, numbat, prediction, woylie.

**Resources/References**
Department of Conservation and Land Management, Perth.
WA Museum Education Package. *Keeping the Spirit Alive.* Aboriginal tools, plants, etc.

**Teacher Directions**

1. Efficient readers:
   * use previous knowledge to make meaning from print;
   * predict using titles, illustrations and headings,
   * read and discuss the text.
2. To help all readers we need to find ways of dealing with text.
3. The ERICA Model (Effective Reading in the Content Area) consists of four stages:
   * preparing for reading;
   * thinking through the reading;
   * extracting and organising information;
   * translating information.
4. Regular use of these four stages will allow the teacher to plan:
   * the reading skills to be developed;
   * how reading will be used to assist the learning of specific content.
Activity: The Ochre Trail

5. In an effort to help students deal with text two activities have been compiled - a Think Sheet and a Graphic Outline. The Think Sheet is used to tap the student's background knowledge, to identify relevant knowledge, and to teach students to organise their ideas. The Think Sheet encourages students to interact with the text as part of an overview of the text, and allows students to guess without fear of failure. Introduce ERICA strategies as a class activity until the students understand them and the reasons for their use.

6. The Graphic Outline will provide a purpose for reading and help students to recognise the scaffolding of text as an aid to confirming the content.

7. This covers the first two ERICA stages. Using this information students could be encouraged to write reports, carry out further studies and present this information to the class.

Evaluation

* Were students able to gain meaning from text?
* Were students able to effectively use the relevant elements of ERICA?

Complementary Activities

* Plan a visit to the Dryandra Woodland, or to a similar woodland area.
THE OCHRE TRAIL

(Adapted from *Voices of the Bush*)

The Ochre Trail, a walk of five kilometres, introduces visitors to the natural and cultural heritage of Dryandra.

THE NOONGAR PEOPLE

Ochre
The ochre pit beside the trail was quarried by local Aborigines (the Noongar) before the arrival of the first Europeans. The clay ochre was highly valued for body decoration and rock art such as the hand paintings found in Bates Cave near Hyden.

Food
The Noongar people found food in abundance in the Dryandra area. Wandoo woodlands were feeding grounds for wildlife, especially kangaroos and wallabies. Trees also provided nesting sites for birds and possums. Fire was used to flush game and for the regeneration of food plants. The men hunted larger animals, particularly kangaroos and emus, and the women and children dug for roots, collected fruits and seeds and caught smaller animals. The seed of the jam (*Acacia acuminata*) and the fruits of the quandong or native peach (*Santalum acuminatum*) were favoured. The clear gum of wattle species and nectar from banksia and eucalypt flowers provided sweets. The Noongars' diet also included small marsupials, mice, snakes, goannas and parrots. Invertebrates, especially the grubs of some beetles and moths, were enjoyed.

Tools
Hardwood from eucalypts was used for spears, boomerangs, axe handles and digging sticks. Corkwood from the Christmas tree (*Nuytsia floribunda*) was used for shields, and selected stones for cutting edges and grinding stones.

FIRE
The Ochre Trail will also take you past the fire tower which is still in use today. Fire control is important, and a system of firebreaks and access tracks help protect the mallet plantations and the bushland, especially the thickets which provide shelter for many native animals.

WOODLAND
Open woodland of wandoo (*Eucalyptus wandoo*) and powderbark (*Eucalyptus accedens*) predominate in Dryandra. The smooth, white-barked trees growing on the lower slopes are wandoo. Powderbark has larger fruits and thicker rounder buds, and grows on the higher, gravelly slopes. Its bark is powdery to touch.
Resource Information: The Ochre Trail

Mallet
Brown mallet (*Eucalyptus astringens*), which grows naturally on the slopes adjoining breakaways, has a straight trunk with erect branches. There are also plantations that were established between 1926 and 1956. Mallet's bark is smooth and brown or silver grey, with patches of unshed bark adhering to the trunk. The bark is rich in tannins and astringent to the taste.

During the early years of settlement mallet bark was exported for tanning. With large scale felling and stripping of bark from trees, mallet became scarce in its natural state and the then Forests Department took steps to protect this species and to provide for plantations in reserves such as Dryandra. In the 1930s, 400 to 800 hectares per year was cleared of wandoo and powderbark trees and sown to mallet. At this time labour was readily available because of the Depression and the unemployment relief schemes. The local industry, however, became uneconomic by 1960, with the increased cost of labour and transport and the introduction of synthetic tannins. The sowing of mallet for commercial use has come to an end, but the mallet of Dryandra is still used today. The timber is pale-brown, straight-grained and very strong. It is used for tool handles, fence posts and firewood.

CONSERVATION
Today Dryandra is of outstanding value for nature conservation, education and recreation. The number of native mammal species found in the wheatbelt has been reduced since the first arrival of European settlers. Extensive clearing of bushland for farming and the introduction of exotic plants, disease and predators such as the fox have all taken their toll.

Mammals
Only a few isolated woodland areas remain of sufficient size to provide habitat for many native mammals. Dryandra covers approximately 28,000 hectares and maintains populations of 14 species of ground-dwelling mammals. These include the small kangaroo-like woylie (*Bettongia penicillata*), the tammar (*Macropus eugenii*) and the unique numbat (*Myrmecobius fasciatus*). The numbat is a small marsupial which feeds exclusively on termites and is the Western Australian mammal emblem. Both the numbat and the woylie are very rare with only a few known populations still remaining. Those who enjoy a quiet walk in the bush may be rewarded by a glimpse of the shy and timid numbat, but the woylie won't be around. It sleeps during the day.

Birds
Of the 100 or so bird species using the area one of the most interesting is the malleefowl (*Leipoa ocellata*). It is an 'incubator-bird' hatching eggs by building large mounds of leaf litter mixed with soil. The heat generated by the rotting vegetation is sufficient to hatch the eggs. Making sure the eggs are not too hot or cold requires constant attention and much hard work for the male malleefowl as he tends the mound throughout the day adding and removing soil.

Exploring Wheatbelt Woodlands
THINK SHEET

Before you read the text, predict the answers to the questions listed below. Record your predictions on the sheet. After reading the text, prove or revise your predictions.

DRYANDRA STATE FOREST - REFLECTING CHANGING NEEDS

1. LOCAL PEOPLE

Before European settlement, who were the local human inhabitants of the Dryandra area?

PREDICTION

PROOF

2. FOOD

The Aboriginal people were hunters and gatherers of food. List some of the foods they may have eaten.

PREDICTION

PROOF

3. MALLET TREES

Timber from these trees is a pale brown colour, straight-grained and very strong. How might we use this timber today?

PREDICTION

PROOF

4. USE OF WOODLANDS

Why do we need to maintain the forest and woodland areas?

PREDICTION

PROOF
This diagram will help you to understand the text you are about to read. Use the headings, sub-headings and illustrations from your resource information sheet (The Ochre Trail') to complete this Graphic Outline.

**THE OCHRE TRAIL**

<table>
<thead>
<tr>
<th><strong>Heading</strong></th>
<th><strong>Sub-Heading</strong></th>
<th><strong>Illustration</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The Noongar People</td>
<td>Ochre</td>
<td></td>
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<tr>
<td></td>
<td>Food</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tools</td>
<td>Christmas Tree</td>
</tr>
<tr>
<td>Fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodland</td>
<td>Introduction (no heading)</td>
<td>Wandoo</td>
</tr>
<tr>
<td></td>
<td>Mallet</td>
<td></td>
</tr>
<tr>
<td>Conservation</td>
<td>Introduction (no heading)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mammals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Birds</td>
<td>Mallee Fowl</td>
</tr>
</tbody>
</table>
STUDENTS COPY - GRAPHIC OUTLINE

This diagram will help you to understand the text you are about to read. Use the headings, sub-headings and illustrations from your resource information sheet ('The Ochre Trail') to complete this Graphic Outline.

THE OCHRE TRAIL

<table>
<thead>
<tr>
<th>Heading</th>
<th>Sub-Heading</th>
<th>Illustration</th>
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</thead>
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<tr>
<td>The Noongar People</td>
<td>Ochre</td>
<td></td>
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<tr>
<td></td>
<td>Tools</td>
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<td>Fire</td>
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<tr>
<td>Woodland</td>
<td>Introduction</td>
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<td>(no heading)</td>
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<td></td>
<td>Mammals</td>
<td>Mallee Fowl</td>
</tr>
</tbody>
</table>
USES OF WOODLANDS

This theme explores some of the uses made of woodlands and examines how these uses interact.
ACTIVITY - TIMBER!

A photograph is used as a basis for a resource sheet on the uses of timber in domestic and commercial environments.

Concepts

* Timber is a renewable resource.
* It is a versatile and durable material that continues to be in demand.
* The resource must be managed carefully to ensure supply.

Objectives

* To understand the importance of timber as a versatile woodland product.
 » To become aware of the changing and continuing uses of timber over time.
 » To identify the uses of timber in the student's immediate environment.

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<tbody>
<tr>
<td>Social Studies</td>
<td>Yr5</td>
<td>Environment</td>
<td>Different regions can be distinguished by their natural environment. Natural environments influence human life styles and activities.</td>
</tr>
<tr>
<td>Social Studies</td>
<td>Yr7</td>
<td>Change Environment</td>
<td>Change occurs in all societies. In attempting to satisfy wants, people adapt to and modify the natural environment, and utilise its resources.</td>
</tr>
</tbody>
</table>

PROFILE STRAND LEVEL

Social Studies Resources 3.10. Describes how limited resources necessitate choice.
2.13. Suggests ways to manage individual and group resources
**Activity: Timber!**

**Background Information**

The *eatly* settlers used timber in many ways. Wood burning was the main energy source for cooking and heating and timber was vital for building homes, roofs, fences, furniture, troughs, tools, toys, carts and railway sleepers. Some timbers are currently enjoying a revival after plastics, nylon, fossil fuels and alloys replaced many uses of wood earlier this century. Special timbers are now selected for aesthetic appeal, as others are for strength and durability.

Woodland species were cut from the bush, but plantation timber is now a common source. We still use timber for many purposes including wood-turning (bowls and ornaments), furniture, firewood, flooring, pencils, musical instruments and paper.

In the wetter parts of the south-west pine plantations provide softwood for furniture, particle board and scantling while blue gums are a source of paper pulp. The brown mallet plantations at Dryandra are the only plantations in the drier part of the south-west. These produce wood for tool handles, fence posts and firewood. Farmers in the wheatbelt use timber from their own properties for fence posts and firewood.

New uses of local timbers are currently being researched with the intention of establishing further plantations within the wheatbelt. Contact CALM offices at Narrogin, Katanning or Merredin for further information.

**Key Words**

Renewable, wandoo, mallet, mallee, jam, York gum, sheoak, scantling.

**Resources/References**


**Teacher Directions**

Using the photograph of the 'Settlers' and the resource sheet, have students list possible uses of timber by the pioneers. Discuss the picture and the answers to the first three questions before going on to describe uses for wheatbelt timbers.

Use the following information to answer question (4) in the resource sheet:

i. wandoo (sometimes called white gum) - sleepers, fence posts, uprights in farm sheds;
ii. jam - fence posts, old sheep yards, shed stumps, wood turning;
iii. mallet - axe and shovel handles, fence posts and firewood;
iv. mallee - roots used as firewood and sometimes for ornamental work;
v. sheoak - furniture, shingles, turning;
vi. York gums - wood turning, mallet heads.

Focus questions could relate to the increasing demand for Australian timbers to compensate for restrictions on rare and imported timbers. How will this affect our environment?
Activity: Timber!

Evaluation

* Were the students able to complete the resource sheet adequately?

Complementary Activities

* List the ways you use timber in your home.
* See also the Living With Our Forests Year 7 Resource Pack produced by the Forest Industries Federation (WA) Inc.
Activity: Timber!
Look carefully at the picture of the pioneer settler’s home.

Instructions

1. List four ways that you can see wood being used.
   1. __________________________
   2. ________________
   3. ________________
   4. ________________

2. Can you think of four other ways that the pioneer family may have used wood?
   1. __________________________
   2. __________________________
   3. __________________________
   4. __________________________

3. Why are there so many dead trees in this picture?

4. In the wheatbelt woodland the main trees that can be used for timber are:
   - Wandoo
   - Jam __
   - Mallet.
   - Mallee
   - York gums.
   - Sheoak
   
   Next to each tree, write a use for that particular timber.
Resource Sheet: Timber!

5. Look around the room. How is timber used in the school environment? Think about the school grounds as well as the classroom. List the uses of timber that you can see.

6. You can see that we still use timber in many ways. Why is timber such a useful resource?

7. How does our demand for timber and wood products affect the environment?

8. What can we do to be sure that there will always be an adequate supply of timber?

Find or draw some pictures showing the use of timber in our environment.
TIMBER!

Answer Sheet

1. Wood is used for cooking, building the house, fence posts, table, cart, shed.

2. Wood could also be used for furniture, heating, toys, tools, troughs, roofing.

3. The trees were ring barked and allowed to die before being cut down. The stumps were to be burnt out later.

4. **wandoo** (sometimes called white gum) - sleepers, fence posts, uprights in farm sheds;
   - jam - fence posts, old sheep yards, shed stumps, wood turning;
   - **mallet** - axe and shovel handles, fence posts and firewood;
   - **mallee** - roots used as firewood and sometimes for ornamental work;
   - **sheoak** - furniture, shingles, turning;
   - **York gums** - wood turning, mallet heads.

5. Furniture, pencils, rulers, bookcase, ceiling, playground equipment, verandah, fence, doors, signs, seats, shade.

6. It is versatile, durable, strong, attractive. It is also a renewable resource.

7. Increased demands put pressure on the woodlands and forests. It is important to ensure that cutting is sustainable, and doesn't preclude other uses.

8. The establishment of hardwood plantations, in addition to softwood (pine) plantations will help with a long term supply.
Activity: Woodlands in the Old Days

ACTIVITY - WOODLANDS IN THE OLD DAYS

An interview with senior citizens who have lived locally for many years can reveal interesting details of the changes in woodlands.

Concepts

* Expanding agriculture and a changing rural culture have modified wheatbelt woodlands.
* Anecdotes about the bush are interesting and may be very informative.

Objectives

* To formulate questions that will provide information about the woodlands.
* To work in a small group situation to plan an interview, and thus develop skills in cooperation.
* To interview a small group of older community members about their memories of the woodlands in the old days.
* To develop questioning and listening skills through the interview activity.
* To understand that change occurs in the environment, and that history helps us to understand what we see today.

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<td>Interviews, Anecdote, Listening</td>
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<tr>
<td>Social Studies</td>
<td>5</td>
<td>Change, Environment</td>
<td>Events and people of today are linked with those of the past. Natural environments influence human life styles and activities.</td>
</tr>
</tbody>
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PROFILE STRAND LEVEL

English Speaking and Listening
4.1. Interacts confidently with others in a variety of situations to develop and present familiar ideas, events and information.
4.2. Considers aspects of context, purpose and audience when speaking and listening in familiar situations.
Activity: Woodlands in the Old Days

Background Information

Identify two to four senior citizens in the local community who are reasonably talkative and at ease with children and invite them to the school to be interviewed by the class for about forty-five minutes. Outline the theme of 'Changes in the Wheatbelt Woodlands' so they have time to think about particular differences between then and now. Where possible, involve a Noongar community member to give a broader perspective.

Teacher Directions

1. Prepare the class some time in advance of the interview by outlining the objectives of the activity - to find out in an interesting way how the local woodlands have changed in living memory. Give some background on the interviewees.
2. By preparing the questions in advance it is possible to minimise similarities in questions and maximise the range of questions.
3. Brainstorm for questions in small groups on butcher's paper for ten minutes. Suggest items like trees, wildflowers, snakes, rabbits, water, bushfires, malleefowl, walking through the bush to school, sandalwood, eating bush tucker, camping out in the bush.
4. Pin up papers and eliminate duplicate questions. Choose the most interesting questions and elect a representative from each group to form the interviewing panel. Students take it in turns to ask their questions, while other members of the group make notes.
5. Alternatively, you may wish to give each student a question to ask.
6. Give a copy of the interview questions to the interviewee before the interview day so that they can prepare their answers.
7. Follow up the interview with a discussion to clarify the main differences between past uses of the woodland and current ones. A short description could be written on one aspect of the changes that were revealed. List the ways in which human activities, or a major event such as a fire or wind storm, have influenced what we see now although the evidence of the disturbance has gone.

Evaluation

* Were the students able to formulate questions appropriate to the task?
* Were there a variety of questions, for example, both open-ended and specific questions?
* Were the students able to record the main ideas in point form?
* Did the students understand that events and actions in the past influence what we see today and what our options are for the future?

Complementary Activities

* A farm case study, documenting changes in a farm that has been in one family for generations, or a 'history of my street' would also show that there have been interesting changes over time.
Activity: Dryandra Deductions

ACTIVITY - DRYANDRA DEDUCTIONS

This is a problem-solving, mathematics activity which covers a variety of issues which may be faced by woodland managers.

Concepts

* Management decisions in wheatbelt woodlands may involve mathematical calculations.

Objectives

* To solve problems given in the resource sheet.
* To consider some realistic mathematical exercises relating to woodlands.

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<td>Mathematics</td>
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<td>SP1.2</td>
<td>Investigate position and layout in the environment.</td>
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<tr>
<td>Mathematics</td>
<td>6</td>
<td>N P2.19 NP3.8</td>
<td>Carry out games and activities involving problem solving, classification and the application of logic. Divide whole numbers and decimals by a counting number to ten.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>7</td>
<td>NP3.3</td>
<td>Divide whole numbers and decimals by a counting number to nine.</td>
</tr>
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</table>

PROFILE STRAND LEVEL

| Mathematics N43. | Make a suitable choice of operation for situations involving whole numbers amounts of money and familiar measurements. |

Background Information

Key Words
Wandoo, powderbark, box poison, mallet, plantation.
Teacher Directions

Suggested approach for different age groups is:
* Some explanation may be needed to assist Year 5 students.
* Questions 1, 5, 7 & 12 are suitable for Year 5.
* Year 6 - omit questions 2, 11, 13.
* Year 7 - answer all questions.

Evaluation

* Did students successfully complete the resource sheet?
Dryandra woodland is the largest area of woodland in the western wheatbelt and has great importance as an area for nature conservation, education and recreation. Dryandra is a scenic area with magnificent woodlands of wandoo and powderbark, brown mallet plantations and bushland thickets which shelter large numbers of native animals. The mallet plantations are also used for timber production.

The Department of Conservation and Land Management (known as CALM) manages and looks after the woodland and has to make decisions on how to best use this unique resource. Many of the problems involve mathematics.

Perhaps you can help!

Work through the following problems and show your working out in the space provided.

The fence around the boundary of the woodland is old and sheep from the farm next door have escaped into Dryandra. The farmer has decided to replace the fence.

The north side fence is 6.1 km long, the west side is 13.3 km long and the southern boundary beside Dryandra is 7.8 km. The fence along the eastern side, which adjoins a road, is in very good condition and doesn't need to be replaced.

1. How much wire does the farmer have to buy? Circle the correct answer.
   a. 23.2km
   b. 25.2km
   c. 27.2km

2. The wire comes in 200 m rolls. How many rolls are needed?

3. The wire costs $120 per roll, and the farmer will pay half the cost in March, and half the cost in April. How much will the farmer pay for the wire in April?

4. CALM has some wandoo posts from a section of the woodland that had to be cleared for a road. Five strainer posts are needed per kilometre of fence. How many will be needed altogether?

5. Some of the farmer's sheep died after escaping. Originally he had 350 sheep in his paddock and when he got them in there were only 289 in the mob. The rest had pushed through the old fence and eaten box poison. How many had died?
6. If the sheep were worth $13 each, how much did the farmer lose?

7. The Narrogin Cycle Club rides out to Dryandra for a race. The woodland is 22 km from Narrogin and has a cycle track of 16 km within the woodland. The cyclists ride out to Dryandra, around the cycle track and back to Narrogin. How far do they ride?

8. The cyclists travel at an average speed of 30 km/hour. How long does the round trip take?

9. CALM has issued a timber cutting licence to Woodland Timber Products to harvest some of a 90 hectare brown mallet plantation each year to make axe handles. A mallet tree can provide six axe handles, of 80 cm in length, weighing 800 gms each. How many trees would have to be harvested to produce 90 axe handles? Circle the correct answer.
   a. 15 trees
   b. 25 trees
   c. 17 trees

10. How much would this load of 90 axe handles weigh?

11. An axe sells for $48 and the wooden handle is 1/3 of the total cost. What return will Woodland Timber Products receive from the sale of:
    (a) each handle?
    (b) 90 handles?

12. If no replanting of brown mallet trees takes place and 6 ha of the plantation is harvested each year, how long will it be before the plantation is completely used?
Teacher Answer Sheet: Dryandra Deductions

DRYANDRA DEDUCTIONS

Answer Sheet

1. 27.2km
2. 136 rolls
3. $8160
4. 136
5. 61 sheep
6. $793
7. 60km
8. 2 hours
9. 15 trees
10. 72 kg
11. a) $16
    b) $1440
12. 15 years
ACTIVITY - USING OUR WHEATBELT WOODLANDS

The many uses of woodlands are examined, leading to a written exposition on the need to conserve the resource.

Concepts

* We use woodlands in many ways.
* Some uses may not be compatible in the long term.
* The wheatbelt woodlands must be managed carefully to ensure they will remain in years to come.

Objectives

* To list ways that we use woodlands.
* To formulate sound arguments to support certain uses of woodlands.
* To write an exposition detailing the main reasons for conserving wheatbelt woodlands.

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<td>Environment</td>
<td>People may make different uses of the same natural environment.</td>
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PROFILE STRAND LEVEL

Social Studies Place and Space 2.5. Describes choices people make in their use of places.
4.5. Describes how peoples beliefs and practices influence the ways they interact with places.
Activity: Using Our Wheatbelt Woodlands

Background Information

Much publicity is given to conflicts over how our environment should be used. A growing population and changing community values pose difficult issues for woodland managers.

Uses of woodlands may include: active recreation (such as hiking and cycling), passive recreation (bird watching, picnicking), tourism, water supply, mining, research, education, protection of sites of Aboriginal significance, camping, conservation of flora and fauna, wildflower picking (under permit), timber harvesting, firewood collection, soil conservation, bee-keeping, and seed collection for revegetation. There are many other uses.

An exposition is a writing form that presents:

i. a 'thesis' which consists of the statement of the problem or the point of view;

ii. 'arguments/assertions' in which arguments for the point of view are presented with supporting data, references or comment; and

iii. a 'conclusion' in which the major points are summarised and thesis reiterated.

Key Words

Conserve, manage, exposition, thesis, argument, conclusion.

Resources/References


Teacher Directions

1. Brainstorm uses of woodlands. Accept all suggestions. Divide the class into small groups and assign several of the suggested uses to each group. Have students consider reasons for the importance of their allocated uses. Report to class.

2. Choose a contentious use of woodlands to encourage creative, sound arguments. For example - "We should allow equal access to any group that wants to use the woodland for any purpose", or "We must allow mining in woodland reserves".

3. Students should address the topic in debating order, for and against. Introduce the concept of supporting a point raised by a speaker and of disagreeing or rebutting a point which has been made. Students could be encouraged to use the name of the previous speaker whose point they are about to support or rebut.

4. Emphasise the need to listen carefully to the arguments.

5. A summary at the end would help to focus and lead into the writing activity.

6. Using the exposition resource sheet, explain that the thesis is a point of view on the set topic. The assertions are the main points of argument (three in this case) and each must be supported by a reasoned case. Summarise the three in the conclusion.

7. This could be split into two sessions as it may develop into quite a lengthy activity.

8. If preferred, this could be used as a modelled activity on the board to help students see the necessary steps.
Activity: Using Our Wheatbelt Woodlands

**Evaluation**

* Were the students able to complete the exposition sheet using a well reasoned argument?

**Complementary Activities**

* If the class has prior debating experience, a proper debate is an excellent adjunct to this activity.
Resource Sheet; Using Our Wheatbelt Woodlands

EXPOSITION - Taking one point of view on using our wheatbelt woodlands

State problem and point of view.

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<th>Evidence/data/references</th>
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<td></td>
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<td>2.</td>
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<td>3.</td>
<td></td>
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</table>

Conclusion or summary
A brochure to entice tourists to a woodland is produced by focusing on appealing features of the area.

**Concepts**

* Woodlands have intrinsic value as a natural ecosystem.
* Woodlands are of interest to tourists in a number of ways.

**Objectives**

* To design a brochure that will encourage tourists to visit your local woodland.
* To identify features of tourist brochures that catch attention.

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<td>Language</td>
<td>5/6/7</td>
<td>3.2 AB 3.2.15 D</td>
<td>Informational text. Advertisements.</td>
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<td>English</td>
<td>Speaking and Listening</td>
<td>3.2. Recognises that certain text types of spoken texts are associated with particular contexts and purposes.</td>
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<tr>
<td>Arts</td>
<td>Presenting</td>
<td>3.3, 3.8, 3.13, 3.18. Plans and presents art works for a particular audience or purpose.</td>
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</table>

**Background Information**

Tourist brochures attract the eye with colour, large headings, pictures, concise information and often a map.

A brochure is an effective way to display the features of woodlands through selective use of photographs, drawings, and graphics.

**Key Words**

Brochure, facilities, understorey.
Activity: **Wander in the Woodlands**

**Teacher Directions**

1. Collect sample brochures from a travel agent. Examine their features and list them on the board. Ask students to identify aspects of their local woodland, and information about it, that they consider should be included in their woodlands brochure. These could be interesting places, common plants and animals, interesting landform features and a map. Include facilities such as toilets and barbecues, and show uses and aesthetic values.

2. Using a sheet of A4 paper, fold the long side twice to establish the correct size, then plan the layout. Maps must be clear with kilometres and nearby towns marked. The extent of the woodland and a description of the main vegetation types, including understorey, could be mentioned.

3. Activities which could be undertaken are walking, drawing, bird watching, picnicking and nature study.

4. Pictures of plants, animals, birds or reptiles could be drawn or cut from magazines.

5. Consider unusual ways of presentation such as shaping the brochure to resemble a tree or a bird.

**Evaluation**

* Were the students able to prepare brochures with appeal, artistic merit, clarity and relevant information?

**Complementary Activities**

* Pretend you are being interviewed for a radio programme to promote tourism in your area. Prepare a talk that will encourage people to visit your woodland.
Activity: Woodlands Through Different Eyes

ACTIVITY - WOODLANDS THROUGH DIFFERENT EYES

An awareness raising activity which looks at woodlands through the eyes of a variety of interest groups in a role play situation.

Concepts
* People look at woodlands in different ways and value woodlands for different reasons.
* It is sometimes difficult to understand other people's point of view.
* It is possible and valuable to empathise with the needs and interests of others.
* An increased awareness and understanding of the many values of the woodlands encourages their conservation.

Objectives
* To increase student awareness of the demands placed on woodlands.
* To develop an empathy with other people's values.
* To enjoy a drama activity that introduces new perspectives to relevant conservation issues.

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<td>2.1.1 M 3.2.6 BCD 5.2 DG</td>
<td>To project into the feelings of others. Explore opposing views. Encourage tolerance. Use of palm cards. Role play.</td>
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<tr>
<td>Social Studies</td>
<td>5</td>
<td>Society and Culture</td>
<td>Differing cultures may use the same natural environment differently</td>
</tr>
<tr>
<td>Social Studies</td>
<td>7</td>
<td>Society and Culture</td>
<td>Differing values, interests and goals can lead to conflict among individuals and among groups.</td>
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<td>Technology</td>
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<td>3.1. Identifies cause and effect relationships in systems including some effects on people and the environment.</td>
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<tr>
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<td>Reading and Viewing</td>
<td>4.2. Considers aspects of context, purpose and audience when speaking and listening in familiar situations.</td>
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</table>
Activity: Woodlands Through Different Eyes

Background Information

See the role play cards.

Key Words
Hectares, custodianship, walk trail, heath, leisure, koonacs, waterlogged, recommendation.

Teacher Directions

Scenario
The local woodland is becoming degraded as a result of overuse by a variety of conflicting interest groups. The Department of Conservation and Land Management (CALM) has assigned a team to assess the best way to conserve the woodland while still allowing public access for a wide range of uses. They call a public meeting.

Students play the roles of different woodland users. They put the case for their interest group at the meeting. Another group of students, acting as CALM officers, recommends which activities should be allowed in the woodlands on the basis of the information given at the public meeting.

Materials
* Overhead projector
* One copy of map on overhead sheet
* Coloured cellophane
* Set of role play cards.

1. Divide students into ten groups, giving each a role card and map.
2. Group members need to discuss their interest in the woodland and plan the arguments that they will put forward at the public meeting to support their continued use of the area. Groups should mark on the map the area which they want to use.
3. The teacher, in the role of chairperson at the meeting, asks a representative from each group to present their views.
4. Each group is given an equal and limited time to speak. (Suggested time three minutes.)
5. Speakers should refer to the map on the overhead and mark in the area that they require for their activity by attaching a piece of coloured cellophane. Each speaker uses a different colour (if practicable) so that areas of overlap are clear. Have the reporter group speak last. They should state what they intend to report and why. This is likely to provide an opportunity to discuss media reporting.
6. The Chairperson notes the arguments put by each speaker and uses them to review the demands placed on the woodland. Point out clearly the overlapping cellophane areas on the overhead and discuss possible conflicts of interest.
7. The group of CALM officers (could be year sevens in a composite class) outlines their proposed management strategies and gives the reasons behind their decision.
Activity: **Woodlands Through Different Eyes**

8. Complete the activity by discussing the range of possible uses of the local woodland and the difficulties that management teams may have in accommodating all interest groups. Focus on the values that different people place on the woodland.

**Evaluation**

* Were students able to take the viewpoint of a group with attitudes different from their own?
* Were students able to appreciate a range of values and propose compromises to resolve conflicts?

**Complementary Activities**

* Each interest group could prepare a management plan featuring their use and including other compatible uses.
The Gun Club

You are members of the 'Hotshot Potshots'- the local gun club. The club needs to expand its rifle range which adjoins the woodland. It would like to clear only a small area - about two hectares - so that an open range can be established. You are a responsible club, despite the name, and wouldn't want to be near the picnic area or any camping sites, so there wouldn't be any danger to other users of the woodland. You don't think that the noise would frighten the wildlife and you only shoot at targets, not live animals. You don't believe that your use of the woodland conflicts with other uses.

Aboriginal Group

You are members of a local Noongar family group who historically have custodianship over the area. Although no major sacred sites have been recorded, there is part of an ancient trail along which Aboriginal people moved from east to west in summer. The woodland was used as a reserve for the use and benefit of Aborigines and your families camped in this bush up until 1950, when they shifted into town and the reserve was set aside as parkland. One member of your group is a recognised elder, and your group wants to re-establish links with the land and camp on the site. You do not want any of the walk trail disturbed or developed because it is an ancient trail. You want year round access for camping and hunting and want to use some wood from the reserve to make artefacts for sale.

Shire Works Committee

You are responsible for the operation of the shire gravel pit. An increase in the road building conducted by the shire means that you have to expand the gravel pit. There is high quality gravel in large tonnages in the heath (low shrubs) that runs along the northern side of the woodland. The local farmers don't want the shire to use the gravel from private property as wheat prices are high and they need to crop as much as they can. The woodland is the ideal place to get more gravel and there aren't any big trees to knock over in the heath. The bare red gravel pit won't be attractive, but the shire will replant some shrubs after all the gravel has been removed.
Resource Information: Woodlands Through Different Eyes

Picnicker

You like to go to the area for a Sunday picnic with the family. Although you like the peace and quiet of the undisturbed bush, it would be much more pleasant if there was a barbecue built in a clearing with a wooden table and benches. An information board to show the old Aboriginal walking trail would be appreciated, so that you and your family could have an easy stroll along it after lunch. Of course, a small toilet block is quite necessary, and the road into the bush is rather bumpy and you don't have a four wheel drive vehicle. You think it should be upgraded and about $20 000 should be spent to improve the area for picnickers' use.

Naturalists' Club

You are the organisers of the local naturalists' club which has forty members. You want the natural woodland to remain undisturbed except for the surveys that your members do on the birds seen in the area, and the numbat-watch programme where you track numbats to help a CALM research scientist. You don't want any more roads into the area. In fact, you would like to see most of the existing tracks closed and revegetated. You feel that you have responsibilities not only to your club members, but to your children and all future generations to protect this unique vegetation and wildlife.

Trail Bike Riders

There are an increasing number of young riders who enjoy trail bike riding as a leisure activity. The local community is putting pressure on you to organise an established bike area well out of town to minimise the noise problem. There is nowhere to go, other than the bush, where quite a few kids have been riding anyway. You want to use the existing tracks, but sometimes it's good to go through the bush just for the challenge to see if you can make it. You want the woodland to remain basically the same but you don't care if some is cut for firewood, or mined for gravel, as long as there are some trees left to ride around.

Reporter

You are a recently qualified journalist who began work six months ago with a local newspaper. You are ambitious and looking for an opportunity to prove yourself, be noticed and get a better job in Perth that pays more money. You are looking for some statement that you can use as a big headline to catch the readers' attention and get them to buy the newspaper. It doesn't matter to you who gets to use the land. All you want is a good story. Your paper is read by 23 000 local people so it is quite influential. It is part of your code of ethics that you report fairly and accurately.
Resource Information: Woodlands Through Different Eyes

Farmer

You own the farming land that adjoins two sides of the woodland. In recent years, camp fires have got out of control and burnt quite a bit of your crop and stubble. You don't really want campers or picnickers to know that the big dam near the edge of your paddock is well stocked with koonacs. It's bad enough that they go paddling and swimming in the dam without permission and scare the stock away. If the picnickers take wood from the woodland for their barbecues then more trees may be cut to supply wood. Water run-off could increase from the bush area into your paddock that is becoming waterlogged anyway. You have planted thousands of trees to protect your soil, so you would hate to see any trees lost from the nearby woodland.

Campers

You like to enjoy the great outdoors in a natural setting. You like to camp 'rough' in the bush and sit around a blazing fire at night. You would appreciate a toilet block, but do not consider one essential. You bring everything you need in the back of your four wheel drive. You want to be able to walk wherever you wish and see native animals in an undisturbed, natural landscape. Of course you want to gather firewood. Old logs on the ground are great because they burn well. You have a metal detector and like to look around in the bush and do a little prospecting. You often take home a collection of rocks to study as well as bits of old metal found in the woodland.

Department of Conservation and Land Management Officers

You have been asked by the State Government to look at this piece of woodland and see whether it should be set aside for nature conservation or some other purpose. Consider all the points raised at the meeting and make a summary. Make a recommendation on the future of the reserve.
ACTIVITY - POISONOUS PLANTS

Many woodland plants were used for food or medicine. However, some are poisonous. People using woodland plants need to know which are poisonous and which are useful. Some of the poisonous woodland plants can be identified by their flower and leaf arrangement.

Concepts

* Poisonous plants are part of the woodland ecosystem.
* Native animals are more tolerant to these poisonous plants than introduced species.
* There are dangers in all environments. It is important to understand them and to ensure personal safety by appropriate actions.

Objectives

* To draw a poisonous plant showing its identifying features and thus help students distinguish plants which may be toxic.
* To teach students not to taste plants they don't know.

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<td>Community and Environment 1.5</td>
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<td>Structure and Function</td>
<td>2. Link observable features to their functions in living things familiar to them.</td>
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Activity: Poisonous Plants

Background Information

Many woodland plants have been used for food and medicine. For example, berries from some astrolomas and tubers from selected orchids were used for foods, and the bark around part of wandoo roots was used as a medicine. However, there are also many woodland plants which are poisonous. For those using woodland plants it was important to know the toxic as well as the useful plants. In some cases, for example toxic zamias, special treatment destroys toxins and makes the plants edible. In other cases mildly toxic plants were used to 'poison' water and stun animals for capture. Therefore toxic plants weren't always avoided - some had important uses.

Other useful information about toxic plants includes:
* A poison is a substance that, when introduced into or absorbed by a living organism, causes illness or death.
* A poisonous plant is one which can produce a poison in its-leaves, fruit, seeds, bulbs, flowers or stem capable of causing illness or death.
* Many woodland plants contain toxic substances which may be harmful to humans. These substances affect people in a variety of ways depending on what type of toxin is present in the plant and how much is swallowed or rubbed on the skin. The toxic substances commonly affect either the heart, the nervous system, the digestive system, the respiratory system, or the skin. Sometimes a combination of organs are affected.
* When a plant causes harmful effects, medical advice should be sought immediately. It is important to take a specimen of the plant to the doctor, as correct identification of it can assist in decisions on the treatment required.
* Native animals appear to have a tolerance to many naturally occurring poisons, while domestic stock find them deadly. In the bush, plants containing poisonous chemicals are a part of the natural environment. Some may even be vital to the survival of some native animals by providing a safe habitat.
+ The leaves and seeds of many of the native pea family are highly poisonous. Fungi and other plants may also be toxic.

Identification of poisonous pea plants is covered in the resource information sheet.

Key Words
Poisonous, gastrolobium, toxic.

Resources/References
Your local Department of Agriculture or Agriculture Protection Board (APB) officer may be able to help with more information.
Activity: Poisonous Plants

Teacher Directions

1. Distribute resource information sheet ('What is a Poisonous Plant?'), resource sheet ('Poisonous Plants in Woodlands') and a piece of box or prickly poison, or drawing of a poisonous plant. A farmer, or officer from either CALM or the Agriculture Protection Board, may help provide specimens for your class.
2. Students read the information sheet and complete the resource sheet.

Evaluation

* Were students able to accurately complete the resource sheet?
* On an excursion, were students able to identify gastrolobiums in a woodland environment?

Complementary Activities

* First Aid - see Year 6 Health syllabus.
* Present a selection of native plant cuttings including at least one poisonous plant. Using a checklist, students identify the plants most likely to be poisonous.
WHAT IS A POISONOUS PLANT?

It is not easy to identify poisonous native plants. Plant characteristics which should make you wary are milky sap, prickles (though not all prickly plants are actually poisonous) and an almond or peach-like smell. Skin irritations after touching a plant, especially on the inside of the wrists, are another indication of a potentially poisonous plant.

In the case of poisonous pea plants in the gastrolobium group, most can be identified from the following combination of characters.

* Usually the leaves emerge in groups of two or more from the same point on the stem (very few exceptions).
* There are spikes on the end of each leaf and the leaves are slightly folded rather than flat. However, note that some poisonous pea plants, including box poison, have soft leaves without spikes. Box poison is one of our most common poisonous plants.
* The plant has a pea flower.
* Stipules are always present under new leaves (see picture), they may fall off as the leaves become older.

Flowers are usually arranged as spikes at the end of branches.

**NOTE:** There are many poisonous plants which don't fit the descriptions given here. If you don't know whether or not a plant is poisonous, treat it as a toxic plant. Never taste a plant or touch it with your tongue in case it is poisonous. When handling poisonous plants, do not touch your eyes, and wash your hands before eating.
POISONOUS PLANTS IN WOODLANDS

Look at the plants that have been provided. They are members of the pea family and from the genus *Gastrolobium*. You may have seen them in the bush. All members of the *Gastrolobium* group are poisonous and they have caused the death of many farm stock.

Draw the plant.

What features of the plant can help you to identify it as a poisonous plant?
Woodlands
A changing environment

Nothing stays the same - change is inevitable. This theme focuses on some of the many aspects of change occurring in woodlands.
ACTIVITY - WHERE DO I LOOK?

Students are given a list of ten objects to discover in the bushland.

Concepts

* The interaction of plants, animals and the physical environment results in changes.
* The effects of these changes can be observed and their causes interpreted from evidence.

Objectives

To recognise change in the natural environment.
To understand some of the processes which bring about change.

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<td>SP4.5</td>
<td>Investigate change of shape by distortion.</td>
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<td>Mathematics</td>
<td>7</td>
<td>SP2.5</td>
<td>Carry out activities in which the features and functions of the objects and structures in the environment are investigated.</td>
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<td>Natural and Social Systems</td>
<td>2.13 Describes ways in which elements of natural systems form communities.</td>
</tr>
<tr>
<td>Science</td>
<td>The Changing Earth</td>
<td>2. Describe changes that occur in their local environment.</td>
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<tr>
<td>Science</td>
<td>Reactions and Change</td>
<td>4. Recognise and describe conditions which influence reactions and predict their applications.</td>
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</table>

Background Information

Key Words
Natural, environment, features, mouldy, destroyed, erosion.
Activity: Where Do I Look?

Resources/References
Video - The Living Soil Australia. 1982.

The Gould League Association have a number of Nature Walkabout and Information Kits.

Teacher Directions

1. Discuss the need to get on hands and knees and look closely at the ground, at wood, under plants, at plant surfaces, etc.
2. After completing the activity, discuss the concept of 'change' and the factors which have caused change to occur.
3. You may wish to use one or both resource sheets - the information on each is the same but the items are different.

Evaluation

* Were the students able to identify changes in the environment and complete the resource sheet?
* Were students able to identify the causes of change?

Complementary Activities

* Join the Gould League Club of Western Australia and get involved with more exploratory activities and excursions.
* Refer to activities in Landcare In Your Hands by the Department of Agriculture. Pages 148 -157 'Soil and Leaf Litter Animals'.
WHERE DO I LOOK? (A)

We often walk in our natural environment and only see the ground, rocks, bushes and trees. But there is much more happening than these most obvious features. Nature is constantly changing.

Here is a list of items found in our natural environment that often go unnoticed. See if you can discover them.

When each one is found, draw a picture of the object in the space. On the lines following, describe in a few words what you found and what you think caused the change you have observed.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PICTURE</th>
<th>WHAT IS IT?</th>
<th>WHAT CAUSED THE CHANGE?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Something old</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Something mouldy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Something young</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Something falling apart</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Something broken</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
WHERE DO I LOOK? (B)

We often walk in our natural environment and only see the ground, rocks, bushes and trees. But there is much more happening than these most obvious features. Nature is constantly changing.

Here is a list of items found in our natural environment that often go unnoticed. See if you can discover them.

When each one is found, draw a picture of the object in the space. On the lines following, describe in a few words what you found and what you think caused the change you have observed.

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<thead>
<tr>
<th>ITEM</th>
<th>PICTURE</th>
<th>WHAT IS IT?</th>
<th>WHAT CAUSED THE change?</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Something destroyed by animals</td>
<td><img src="image1.jpg" alt="Picture" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Something destroyed by people</td>
<td><img src="image2.jpg" alt="Picture" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Something split</td>
<td><img src="image3.jpg" alt="Picture" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Something fallen</td>
<td><img src="image4.jpg" alt="Picture" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Something that doesn't belong</td>
<td><img src="image5.jpg" alt="Picture" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity: Bushfire!

ACTIVITY - BUSHFIRE!

Students read the selected excerpts about bushfires and write an adjective based acrostic poem.

Concepts

* Plants and animals, including people, are affected and changed by heat and fire.
* The gain or loss of heat in a substance may cause changes in state.
* Burning requires fuel, oxygen and the appropriate ignition temperatures.
* Bushfires may have both positive and negative effects on animals.

Objectives

* To be aware of the changes that take place in the natural environment when a bushfire occurs.
* To develop the language skills of students with regard to the use of adjectives.

Curriculum Links

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<td>Reactions and Change</td>
<td>4.17. Translates information from one form to another.</td>
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<tr>
<td>English</td>
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</tr>
<tr>
<td>Reading and Viewing</td>
<td>4.5. Justifies own interpretation of ideas, information and events in texts containing some unfamiliar concepts and topics and which introduce relatively complex linguistic structures and features.</td>
</tr>
</tbody>
</table>
Activity: Bushfire!

Background Information

Uncontrolled fire can endanger human life and do a great deal of damage to property and remnant vegetation. On the other hand, fires may stimulate regeneration and regrowth in native bush thus creating habitats for plants and animals.

The effect of fire on natural communities depends on many factors of which the following are particularly important:

i. fire frequency, that is, how often fires occur. This may range from once a year in some rangeland systems to once every 400 years or more in temperate rainforests;
ii. the time of year (season);
iii. fire intensity;
iv. the patchiness of fire;
v. events, such as heavy rainfall or drought, before or after a fire.

When an area is burnt, some plants are killed, others receive a setback, yet others are stimulated into germination and growth.

Key Words
Environment, germinate, excerpt, acrostic, fumes, dehydrated, foliage.

Resources/References

Teacher Directions

1. Read the excerpts and discuss bushfires including their causes, destructive power, prevention and usefulness (for example, seeds that usually only germinate with fire, use in prescribed burning to reduce a fire hazard, etc).
2. Discuss the authors’ use of adjectives to make the texts interesting and exciting. Wells and Southall have used many adjectives. Students can underline these.
3. Students to write an acrostic poem focusing on adjectives. Using more than three words per line or using short sentences is effective.

Evaluation

* Did students demonstrate creativity and effective use of adjectives in the acrostic poem?
Complementary Activities

* Write an excerpt similar to one of the examples given. Use a native animal as the subject. Use the resource information sheet 'The Effects of Fire on Animals' as a springboard for ideas and discussion.

* Students to choose 10 words from the list below (taken from the excerpts) that they are unsure about and research their meanings. Make up a crossword using the words and definitions.

  Adapted, strategies, essentially, ingrained, environment, retreat, distress, emerge, refugees, rhizomes, germinate, devastation, excerpt, acrostic, consuming, swift, bounded, self-preservation, devouring, voracious, smoulder, draught, hovering, wallabies, bandicoot, scurried, fitful, gusty, eddies, ember, harbour, canopy, seizing, fumes, eucalyptus, ridge, gullies, extraordinary, proportion, mysteriously, superimposed, rending, thunderous, acrid, bellowing, bough, seared, dehydrated, foliage, legions, mantle, hostility, penetration, imprisoned, withered, drought, committed, manipulates, frenzy.

* Refer to activities in *Sowing The Seeds For Change* published by Greening Western Australia. Pages 275-277, 'Adaptation To Fire'.

* Visit a bushland that has recently been burned by a fire. Look at the changes and regrowth that have occurred. In spring you may even discover orchids.
Resource Information: Bushfire!

BUSHFIRE!

1. The following pages contain excerpts from stories and articles about bushfires. Read the excerpts and discuss them with your class.

2. Using these excerpts and your own knowledge about the changes that occur during a bushfire, write an acrostic poem on the sheet attached. Use three or more words per line.

Fire On The Ridge

The wind was still fitful and gusty and the day seemed to be growing hotter, though the sun had swung right over the sky and was close to the ridges now.

As dark fell it became harder, and then impossible, to see the smoke still gently rising from the trees. The flames had gone but the seeds of the fire still lived among the branches and the leaves, and the dry grass and twigs scattered on the forest floor. Small seeds of fire lived, and moved, and stirred. Small eddies of moving air crept among the trees, fanning this ember and the coal, stirring, blowing, gently fanning.

Over the tops of the trees the wind still rushed and roared in angry gusts but down under the canopy the air moved more gently, fanning, stirring, until small flames caught the edges of a leaf here, a blade of grass there. Small flames grew and reached out, seizing another leaf, a twig, a stick, some bark.

Small flames became large flames, taller than a man, taller than a house, taller than a tree, bursting through the canopy to suck greedily at the oxygen and the eucalyptus fumes, then exploding in a great sheet of fire right across the ridge. Suddenly, the whole hillside came to life with the hungry red flames. In a line they marched northward along the ridge toward the little township spread over the ridge and down into the gullies.

Old Man Fire

Soon Old Man Fire was racing through the bush, roaring loudly and consuming everything in his path. He swept the terrified animals along in front of him and burned their homes as he passed.

The bigger, swifter creatures ran as fast as they could. The smaller, slower ones hurried behind.

The kangaroos and wallabies bounded this way and that. The emus rushed with great long strides. The koalas and wombats hurried as best they could. The gliders flew from tree to tree. And the bandicoots and mice scurried along, squeaking in fright.

Ash Road

He stumbled to the road into an extraordinary world of blacks and greys and tongues of fire. It was like a black and white photograph of enormous proportions, in the midst of which candles burned mysteriously. It was a creaking and cracking and rending world superimposed upon a thunderous background roar. It was a world of wraiths and ghosts and changing shapes of fantastic forms fashioned from smoke. It was a world of acrid odours, of strange smells and sensations, terrifyingly unreal, but a world becoming cooler, for the monster had swept over it and gone bellowing into the depths of the forest. It left behind it a hundred thousand tiny fires in the boughs and branches of seared trees and in the undergrowth, thousands of tiny fires that flaked off from the heights and fell through masses of foliage still and pale and dehydrated, millions of sparks that scattered on the wind, and legions of tiny dead creatures. Snakes and lizards and feathered creatures and furred creatures were strewn the length of the road or lay buried in the forest ashes.

And he was frightened of the sky. It was so threatening, so ugly, so unlike anything he had ever seen. It was a hot brown mantle over the earth with pieces breaking off it, little black pieces of ash; an oppressive mantle that did not prevent the penetration of the sun's heat but imprisoned it, added to it, and magnified the hostility of the day.

It was an angry day; not just wild or rough, but savage in itself, actively angry against every living thing. It hated plants and trees and birds and animals, and they wilted from its hatred or withered up and died or panted in distress in shady places.

Resource Information: Bushfire!

**Who Burned Australia**

A wildfire sweeps through the bush leaving the landscape blackened, bare and seemingly lifeless. But life soon returns. Burrowing animals - spiders, insects, reptiles, mammals - emerge from their underground refuges. Others, which escaped the fire by moving out of its path, on the ground or in the air, return.

New shoots appear on the branches and trunk of trees, around the bases of trees and shrubs, and from underground roots, rhizomes and bulbs. Seeds, buried in the soil or newly released from woody capsules, germinate. Within weeks, if there is sufficient moisture in the soil, the burned area is a mass of new growth. Some years later, there are few signs of the original devastation.

Bushmen will tell you that animals know when fire is about. No less than the bush itself, its animals have adapted to the constant risk of fire and developed strategies to escape it. The first is to run.

Blind panic plays some part in the animals' urge to run from a fire, but there is an ingrained sense of self-preservation too. Bushfires are essentially fronts of fire moving swiftly through the environment, driven by their own self-created draught and by the devouring need for more and more fuel.

Trees left behind by the fire will continue to burn, sometimes until nothing is left but a flowing pit in the ground, but more often they will smoulder for a time, then go out. Once burned ground cover offers no continuing fuel for a fire, so only a few minutes after a fire the ground itself is cool enough to stand on.

Birds survive best of all. They merely fly above the fire and settle on the far side. Unless a fire is so voracious as to burn all the available oxygen, they run little risk. They have even been observed hovering around the edge of a fire, picking up insects driven out of the flames.

Ground-dwellers retreat to their burrows. The wombat seldom suffers in a fire. Rocks harbour frogs, lizards and small snakes; the fire moves so quickly that their moist hiding places are seldom even made uncomfortable.

**The Death Of A Wombat**

Others will race away from it, turn from it. The wombat, cut off from his burrows, will try to reach the only river left with water by the drought. The koala cannot escape. He will, of course, fight for life in the prison to which he has committed himself, the trees that grow the only food that he can live by. The kangaroo may have a better chance. His huge legs might be faster than the fire. Even if the wombat turned, went through the fire, he still might be too slow, and the wombat is very slow. But the dingo has a chance, and he lies down now as the fire approaches, flops on his chest and splayes out his paws, and pants very easily to save his heart. He closes his eyes and listens to the flames. The marvellous fine mesh of muscle at the root of either ear manipulates the pointed shapes with delicate precision. In perhaps three minutes his contest will come.

The blaze has blackened eighty yards of land. In the next hour it will burn out twenty miles. It is not a fast fire yet... twenty miles an hour, but it is too fast for many of the beings of the bush. For the wombat, half a mile in an hour, it is much too fast.

Over the whole land the sky is shut out. Life is whipped from trees in the space of seconds. An avalanche of burning sends the air into a frenzy. Now to feed the thunder comes a wind, and the twenty miles an hour are turned to seventy!

Resource Information: Bushfire!

ACROSTIC POEM

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E
THE EFFECTS OF FIRE ON ANIMALS

(Adapted from Figure 9.1 in Managing Your Bushland by B.J.M. Hussey and K.J. Wallace, see Resources/References)
Activity: Let's Have a Bonfire!

ACTIVITY - LET'S HAVE A BONFIRE!

Students are to calculate the amount of wood used by campers.

Concepts

* People benefit from the conservation of resources.
* Using natural timber for fuel reduces the habitat and food resources of native animals.

Objectives

* To calculate the area of ground cleared of firewood to make one bonfire.
* To evaluate the effect of firewood gathering on animals.
* To describe change in a natural environment as a result of man's actions.

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<td>Mathematics</td>
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<td>MP1.1</td>
<td>Carry out activities involving measurement to the nearest metre, centimetre and millimetre.</td>
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<tr>
<td>Social Studies</td>
<td>6</td>
<td>Environment</td>
<td>Differing demands of the natural environment may lead to conflict.</td>
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PROFILE   STRAND   LEVEL
Social Studies Place and Space 3.6. Identifies issues about care of places arising from the different ways in which they are valued.
Science Processing Data 4. Draw conclusions that are linked to the information gathered and purposes of the investigation.
Mathematics NI, 2, 3, 4 Count, order, estimate and describe with whole numbers.
Activity: Let's Have a Bonfire!

**Background Information**

Fallen branches and hollow logs are used extensively by many mammals, birds, insects, worms and other animals as well as a range of plants, particularly fungi. These hollow logs and branches provide both food and shelter. For example, logs provide cover for many reptiles including some which feed on small animals living in or under logs. In turn, many of the latter feed on other plants and animals that are part of the community using fallen wood for food and shelter. Logs also provide corridors which shelter animals moving from place to place. A marsupial mouse scampering alongside a fallen branch is less obvious to owls and other animals which enjoy mice as part of their diet. Finally, the logs provide food for termites, the principal prey of some reptiles and a number of other animals including numbats and echidnas.

The greater the variety of habitats, the greater the variety of fauna. Fallen logs provide a special habitat, and they are a very important part of our woodlands. Also, read the information provided with 'One Log for Many' and 'Investigating Logs' in this package.

**Key Words**

Pi, radius, perimeter, calculate, formula.

**Teacher Directions**

1. Students need to carefully follow directions on their resource sheet. Prior to the excursion introduce students to pi and radius.

2. Ensure that the witch's hat is placed in the centre of an area that has plenty of firewood on the ground. Students should radiate from the witch's hat.

**Materials**

* Chalk (one piece per person)
* Trundle wheel
* Witch's hat.

**Evaluation**

* Were students able to calculate the area of a circle?
* Did students accurately complete calculations based on the questions?
* Did students recognise that collecting firewood has an effect on animals?

**Complementary Activities**

* 'Investigating Logs' and 'One Log for Many' from the theme 'Woodlands as Homes' in this package (see pages 67 and 60).
LET'S HAVE A BONFIRE!

You are on a school camp and have been asked to collect enough fire wood for the evening's bonfire.

Estimate how many square metres of ground will be cleared if each child in your class collects five logs or branches for your bonfire.

Answer...................

YOU WILL NEED

* One piece of chalk per person.
* One trundle wheel per class.
* One witch's hat per class.

INSTRUCTIONS

1. Stand near the witch's hat.

2. Walk away from it and mark a large white cross with your chalk on five branches or logs which would be suitable for a fire. Keep as close to the witch's hat as possible but make sure that you don't mark someone else's fire wood!

3. Stop at the fifth piece of wood that you mark and raise your hand in the air so that your teacher knows that you have finished.

4. Your teacher will now select someone to walk from the centre out to the perimeter of the circle with a trundle wheel to measure the radius.

5. Wait until your teacher calls you in.

6. When you are all back at the witch's hat, calculate the area of your circle using the given formula.

\[
\text{Area of a circle} = \pi r^2
\]

3.14 x radius squared

8. How does your answer compare with your estimate?
LET'S HAVE A BONFIRE

Questions

1. If your class were to spend two nights camping here and all the marked wood was collected and burnt, estimate the area from which fallen branches and logs would be cleared for firewood.

2. In a week of camping, what area would your class clear of wood?

3. How long do you think it would take nature to replace that wood?

4. List three problems that collecting and burning wood for fires creates.
   i.
   n.
   in.

5. What other form of heating could be supplied at picnic sites to replace fire wood?

6. Describe something important that you have learnt from today's activity?
Activity: Feral Animals- Do They Have a Right to Be Here?

ACTIVITY - FERAL ANIMALS - DO THEY HAVE A RIGHT TO BE HERE?

Students prepare interview questions based on a resource information sheet about feral animals. A news report is written based on an interview with another student.

Concepts

* Some animals depend on other animals for food.
* Some animals can live in a wide range of environments.
* Feral animals are causing problems to flora, fauna and soil structure.

Objectives

* To understand the changes in the natural environment caused by feral animals.
* To develop language and writing skills using a news media exercise.

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Activity: Feral Animals- Do They Have a Right to Be Here?

Background Information

Feral means wild, untamed. It is a word most often used to describe domestic animals which have established breeding populations in the wild. Individual stray animals aren't necessarily feral. However, if stray animals breed and their descendants live and breed in the wild, then those descendants are called feral animals.

Feral animals are closely associated with the first European settlers who came to Australia. Some of their animals were abandoned or lost and established breeding populations in the wild. These include camels, pigs, horses, goats, cats, dogs, donkeys, honeybees, doves and water buffaloes. Others, such as rabbits, foxes, deer, hares and starlings were deliberately released into the countryside. Yet others, like mice and rats, stowed away on ships and invaded the continent.

Key Words
Feral, erosion, interview, predators, competing, report, destruction, diseases, control.

Resources/References

Teacher Directions

1. Discuss the definition of ‘feral’.
2. Brainstorm a list of the feral animals in Australia.
3. Discuss the problems caused by feral animals including disease, erosion, and competition with and predation on domestic and native animals.
4. Students are to choose an animal (fox, cat or rabbit). They read the appropriate article and prepare ten interview questions based on the information. Another person studying the same animal is interviewed and a news report is written based on the interview and the information.
5. Students read out their report to the class.
6. The best article could be submitted to the local newspaper.

Evaluation

* Were the interview questions appropriate?
* Were the students able to answer the interview questions?
* Was the news report completed correctly?
* Did students better understand the effects of feral animals in Australia?
Activity: Feral Animals - Do They Have a Right to Be Here?

Complementary Activities

* Run a class debate based on the statements:
  i. 'Cats are causing such a problem to native wildlife that they should all be put down (or sterilised)';
  ii. 'A virus should be introduced that will sterilise all cats and cat owners will need to immunise their pets against this virus on a regular basis'.
* Students find the following 10 words in their excerpt and write a sentence explaining the meaning of each word:
  i. Rabbits - inedible, erosion, denuded, averaging, outstrip, voracious, ultimately, myxomatosis, resistance, fumigating;
  ii. Cats - population, predators, cunning, lingering, responsible, crustaceans, molluscs, competing, persuaded, descendants;
  iii. Foxes - highlighted, acute, prey, domestic, carrion, mange, distemper, rabies, numbat, woylie.
* Invite a guest speaker from CALM or the APB to talk about feral animals.
* Construct a table showing how each animal became feral, for example, were they deliberately released into the wild?
FERAL ANIMALS - DO THEY HAVE RIGHTS?

Feral means wild, untamed. It is a word most often used to describe domestic animals which have established breeding populations in the wild. Individual stray animals aren't necessarily feral. However, if stray animals breed and their descendants live and breed in the wild, then those descendants are called feral animals.

Feral animals are closely associated with the first European settlers who came to Australia. Some of their animals were abandoned or lost and established breeding populations in the wild. These include camels, pigs, horses, goats, cats, dogs, donkeys, honeybees, doves and water buffaloes. Others, such as rabbits, foxes, deer, hares and starlings were deliberately released into the countryside. Yet others, like mice and rats, stowed away on ships and invaded the continent.

The following information sheets describe those feral animals which are causing greatest concern in our wheatbelt woodlands - foxes, cats and rabbits.

Note that controlling foxes and cats could lead to an increase in rabbits, while controlling rabbits alone could lead foxes to hunt more native animals or domestic stock. Therefore it is advisable to control foxes, cats and rabbits at the same time.
Cats turn feral when owners move on and leave them behind, or when unwanted cats are dumped in the bush. Some people prefer to abandon animals rather than have them destroyed. Domestic cats may destroy about twenty-five native animals every year. This accounts for most of the young birds bred in suburban areas each year. Feral cats eat many more native animals.

**What They Look Like**

Scientists have discovered that most feral cats are either tabby or ginger-coloured. It has been suggested that other colours are more readily seen by predators, such as wedge-tailed eagles, and therefore cats with these colours are more likely to be killed and eaten.

Feral cats are generally larger and heavier than domestic cats. They are also extremely cunning and difficult to shoot or trap.

**Breeding**

Females can breed in their first year and thereafter have two litters a year, averaging 3-5 kittens per litter.

For example, a female cat having four female kittens a year for ten years could be responsible for nearly 2 million female descendants!

**Effects on Native Fauna**

Feral cats catbirds, frogs, reptiles, fish, insects, crustaceans, molluscs, mammals and plant material.

An average feral cat needs 300 grams of flesh each day to survive. This means 10 small animals per day, 70 per week or 3 650 per year! Cats also affect native animals by competing with them for food.
Diseases

Feral cats can spread disease into wildlife populations. Diseases include notoedric mange (a skin disease caused by parasitic mites) and toxoplasmosis (an infection throughout the body by microscopic animals).

Control

Actions which will minimise the effect of cats on fauna include:
* de-sexing cats;
* attaching bells to cats' collars (although this will make hunting more difficult, it will not prevent them taking wildlife);
* keeping cats in at night;
* ensuring that pet cats are adequately fed.

The public should also be persuaded not to dump cats or take them on holidays where they may get lost. Most dumped cats suffer a lingering death from starvation.

Trapping and shooting cats will work, but attempts at poisoning have been less successful.

YOUR TASK AS A NEWS REPORTER

1. Read the article on the cat.
2. Prepare ten interview questions based on the article.
3. Interview another person who has also studied the same article as yourself and record their answers.
4. Write a news report (use the example provided as a guide) based on your interview and the information that you have read.
5. Include a colour or black and white drawing with your report.
The fox was introduced to eastern Australia in the 1860s. It was introduced for sport hunting, and by 1917 had spread to Kalgoorlie.

**What They Look Like**

The fox is an attractive creature about the size of a small dog. It is actually a member of the dog family. Its pale red to deep reddish brown fur is highlighted by a white chest and throat and a white or black tip on its bushy tail.

Foxes have an acute sense of hearing and smell.

**Breeding**

Both males and females breed in their first year. A litter of 4-5 cubs are born each year. At about 10 weeks of age the cubs are out of the den hunting for prey.

**Effects on Native Fauna**

The red fox kills native animals, feral rabbits, domestic fowl, and lambs. Studies have shown that 75% of a fox's diet is carrion (dead) sheep and fresh rabbits. The remainder of its diet consists of insects (especially grasshoppers), domestic fowl, lizards, frogs, small mammals, fish, baby emus, small bats, berries and fruit.

**Diseases**

Foxes are subject to diseases such as mange and distemper and would be carriers of rabies should it ever reach Australia.
Resource Information: Feral Animals - Do They Have a Right to Be Here?

Control
The main methods of control are shooting and poisoning with meat baits. In Western Australia the poison 1080 is used. Because 1080 is a natural poison found in some Western Australian plants, native animals are little affected by the concentrations used in specially prepared dried meat baits.

In Dryandra Woodland where fox numbers are controlled, the numbat and woylie populations have increased.

YOUR TASK AS A NEWS REPORTER

1. Read the article on the fox.
2. Prepare 10 interview questions based on your article.
3. Interview another person who has also studied the same article as yourself and record their answers.
4. Write a news report (use the example provided as a guide) based on your interview and the information that you have read.
5. Include a colour or black and white drawing with your report.
RABBITS

Rabbits live in burrows called warrens. They eat grasses and other plants that grow around the burrows leaving inedible plants. Loss of plant cover contributes to soil erosion, and in some environments with very high rabbit numbers the land is denuded of plants.

What They Look Like

Usually a grey brown colour with a pale belly. Black or ginger forms are also seen. They have long hind legs, short front legs, long ears and large eyes.

Breeding

Rabbits are able to breed at the age of 3-4 months. They can have up to six litters per year. Each Utter averages 3-5 kittens. This totals an average of 20 kittens per rabbit per year!

Destruction

Rabbits may breed so quickly that their numbers outstrip their food supply. They not only eat grass, they sometimes also dig up and eat roots and climb trees to strip the leaves and eat the bark. This ultimately leads to the death of trees.

Apart from their voracious eating habits they sometimes take over the burrows of native animals leaving them no where to breed.

Control

Myxomatosis, a disease spread by mosquitos and fleas, was introduced to control rabbits. At first this killed nine out of ten rabbits, but today with more rabbits showing resistance to the disease, the number has been reduced to five out of ten.

Poisoning with 1080 oats and fumigating warrens are the most successful methods of control. Ripping of rabbit warrens has also proved effective in some cases.
YOUR TASK AS A NEWS REPORTER

1. Read the article on the rabbit.
2. Prepare 10 interview questions based on your article.
3. Interview another person who has also studied the same article as yourself and record their answers.
4. Write a news report (use the example provided as a guide) based on your interview and the information that you have read.
5. Include a colour or black and white drawing with your report.
**Resource Information: Feral Animals - Do They Have a Right to Be Here?**

Using the information given about feral animals and the following guidelines write a newspaper report. Below is an example only.

**MASTHEAD**
THE NARROGIN GAZETTE

**HEADLINE**
FERAL CATS - STILL A PROBLEM

**JOURNALIST**
By Linda Norman

**DATELINE**
Narrogin; Mon:

**INTRODUCTION**
The Regional Manager of CALM, Mr Chris Brook has rejected a claim that feral cats are no longer causing damage.

**LEAD STORY**
The claim made by...

**CROSS-HEAD**
Native Animal Deaths

**LEAD STORY**
Cats are the cause...

**CROSS-HEAD**
Increased Numbers

**LEAD STORY**
It has been found-

Example
The Regional Manager of CALM, Mr Chris Brook has rejected a claim that feral cats are no longer causing damage.

The claim made by... ________________________________

NATIVE ANIMAL DEATHS

Cats are the cause...

INCREASED NUMBERS

It has been found...
ACTIVITY - TESSA THE TAMMAR WALLABY AND BILLY THE BRUSHTAIL POSSUM

Students study the table showing changes in wallaby and possum population numbers after fox baiting was implemented. The information is graphed and interpreted.

Concepts
* Predation may have a dramatic effect on animal populations.
* Introduction of a new predator into a system may affect the persistence of its prey.
* The increase of foxes means the decrease of small native mammals.
* Fox baiting improves the survival of small mammals.

Objectives
* To graph the population changes that occur as a result of fox baiting and describe the implications of these changes for the management of native animals.

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<tr>
<td>Mathematics</td>
<td>5/6/7</td>
<td>NP4.1, NP4.3</td>
<td>Construct and read graphs and interpret graphical information. Record data and interpret tables.</td>
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<tr>
<td>Science</td>
<td>6</td>
<td>Animals</td>
<td>Investigating the responses of animals to their environment.</td>
</tr>
<tr>
<td>Language</td>
<td>5/6/7</td>
<td>3.2.12AB</td>
<td>Figures.</td>
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<th></th>
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<tbody>
<tr>
<td>Social Studies</td>
<td>Investigating, Communication, and Participation</td>
<td>4.17. Translates information from one form to another.</td>
</tr>
<tr>
<td>Science</td>
<td>Processing Data</td>
<td>4. Draw conclusions that are linked to the information gathered and purposes of the investigation.</td>
</tr>
<tr>
<td>Science</td>
<td>Biodiversity, Change and Continuity</td>
<td>3. Explain why some living things have become extinct and identify current endangered species.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>C5.3, 4</td>
<td>Read and describe information in tables, diagrams and bar graphs.</td>
</tr>
</tbody>
</table>
Activity: Tessa the Tammar Wallaby and Billy the Brushtail Possum

Background Information

The red fox was first introduced into Victoria from Britain in the 1860's. It colonised most of the Australian mainland over the next seventy years. Foxes are members of the dog family which includes dogs, foxes and wolves.

Adults measure a little over one metre in length and weigh between 4.5 and 8.3 kg. They have a very acute sense of hearing and smell. Their whiskers give them information by touch, but their eyesight is less well developed.

Foxes tend to eat whatever is most easily available to them. They have a habit of burying excess food for later use. There is strong evidence to suggest that foxes have caused the decline of many small to medium sized native mammals.

Foxes breed once a year and the average sized litter is four. They are capable of breeding at ten months. Each fox occupies a home range from between 280-1600 ha in size. The size depends on the fox population and availability of food.

Key Words
Wallabies, tammar, dwindling, feral, baiting, woodlands, sightings.

Resources/References
Contact your local APB officer - they will have further information including pamphlets.

Teacher Directions

1. Discuss the problems associated with foxes and native wildlife.
2. Discuss ways of reducing the fox population and the difficulties of being successful with these methods. Methods include shooting, trapping, and poisoning. Information on these methods can be found in Managing Your Bushland (see References).
3. Go over the differences between bar and line graphs with the students.
4. When discussing question (6) on the resource sheet, bear in mind that an area such as Tutanning Nature Reserve (area about 2 000 ha) will have a maximum number of animals it can support. In this instance the actual number doesn't matter, but it may be appropriate to discuss the concept.

Evaluation
* Were students able to successfully interpret the information in the table and graphs?
* Were students able to graph the data supplied?
TESSA THE TAMMAR WALLABY AND BILLY THE BRUSHTAIL POSSUM

Wallabies and tammars are just two of our native animals that are dwindling in numbers due to predation by foxes and cats. The table below shows how their numbers are increasing in Tutanning Nature Reserve (near Pingelly) since fox baiting commenced in 1984.

### Sightings of Tammar Wallabies and Brushtail Possums Since Fox Baiting Commenced in the Tutanning Nature Reserve.

<table>
<thead>
<tr>
<th>Year</th>
<th>Sightings/hour</th>
<th>Sightings/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>1989</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>1991</td>
<td>4.0</td>
<td>4.5</td>
</tr>
</tbody>
</table>

1. Draw a bar graph for wallaby sightings and a line graph for possum sightings based on the tabled information.

2. Explain what happened in both graphs.
3. If foxes were not baited what would happen?

4. Why is it important that native animals increase in number?

5. Do you know of a native animal that was once commonly found around your local area but which has since disappeared?

   What was it? ____________________________________________

   What happened to it?

6. Using the information from the table estimate the number of sightings in the year 1993.
Activity: Before and After

ACTIVITY - BEFORE AND AFTER

Students study maps of cleared land and remnant native vegetation near Nugadong and focus on changes in the area of native vegetation. The effects of these changes are considered.

Concepts

* Change occurs in all environments and societies as a result of natural, technological and social factors.

Objectives

* To recognise that changes have occurred to the land as a result of clearing native vegetation to create agricultural land.

Curriculum Links

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<th>STAGE/ YEAR</th>
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<tbody>
<tr>
<td>Social Studies</td>
<td>6</td>
<td>Environment</td>
<td>People may make different uses of the same natural environment.</td>
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<tr>
<td>Mathematics</td>
<td>5/6</td>
<td>MP1.5</td>
<td>Relate measurement of length to other measures.</td>
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<tr>
<td>Mathematics</td>
<td>5/6/7</td>
<td>SP1.2</td>
<td>Investigate position and layout in the environment.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>7</td>
<td>MP1.2</td>
<td>Carry out calculations using kilometres based on life situations.</td>
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<tr>
<td>Language</td>
<td>5/6/7</td>
<td>3.2.13 AB</td>
<td>Maps.</td>
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<table>
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<th>PROFILE</th>
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<th>LEVEL</th>
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</thead>
<tbody>
<tr>
<td>Social Studies</td>
<td>Place and Space</td>
<td>4.5. Describes how people's beliefs and practices influence the ways they interact with places.</td>
</tr>
<tr>
<td>Social Studies</td>
<td>Investigation, Communication and Participation</td>
<td>4. Translates information from one form to another.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>N5.2,3,4</td>
<td>Estimate and calculate mentally.</td>
</tr>
<tr>
<td>Science</td>
<td>Processing Data</td>
<td>4. Draws conclusions that are linked to the information gathered and purposes of the investigation.</td>
</tr>
</tbody>
</table>
Background Information

Land from which native vegetation has been removed, usually to create farmland, is called cleared land. Uncleared land is the remaining natural vegetation and includes patches of bushland managed by government agencies - for example water reserves, nature reserves, uncleared road verges - and patches of bushland on private land. Nature reserves are areas of bushland set aside for the conservation of flora and fauna. The Department of Conservation and Land Management (CALM) manages nature reserves on behalf of the National Parks and Nature Conservation Authority.

Remnants of native bushland have many values. Depending on their size and location, they may conserve interesting populations of our native plants and animals, or prevent the erosion of unstable soils, or provide pleasant surroundings for a picnic site. There are many other important values, and a more complete description of these is given in Managing Your Bushland (see Resources/References).

From the viewpoint of native animals (and probably plants) many remnants are too small to provide the habitat they require on a long term basis given the changes, such as fire and drought, with which they must cope. This is particularly true for those animals which will not travel across cleared farmland, or only do so with great reluctance and a high probability of becoming a predator's dinner! Such animals may become extinct on small remnants of bush which are not connected to others.

To improve the conservation value of small remnants, their size should be effectively increased by revegetation which either directly increases the size of the remnant, or which connects the remnant with other, larger areas of bushland. These issues are considered in much more detail in Managing Your Bushland.

Key Words
Debate, remnant, bushland, conservation, productive, habitat, flora, fauna, cleared, uncleared, nature reserve, area, calculate, vegetation.

Resources/References

Teacher Directions
1. This activity requires that students have a clear understanding of terms such as 'cleared land', 'uncleared land' and 'nature reserve'. These concepts should be discussed at length with students prior to the activity.
2. Putting the resource sheets on an overhead as a teacher directed activity works effectively.
3. The amount of uncleared land, excluding nature reserves, at December 1970 is approximately 7cm² or 112km².
Activity: Before and After

4. The amount of nature reserves is approximately 1.5cm$^2$ or 24km$^2$.

5. (Question 12) Emphasize the need to have 'ribbons of green' or bush corridors linking areas of remnant vegetation so that each area is easily accessible by wildlife and seeds can be more easily distributed.

Evaluation

» Were students able to accurately calculate areas using the given information?
* Were students’ estimating skills adequate?
* Was the table completed accurately?

Complementary Activities

* Refer to activities in *Sowing The Seeds For Change* published by Greening Western Australia. Particularly pages 111-117 'Wandoo Woodlands'; and pages 207-211 'Remnant Vegetation'.
* Refer to activities in *Landcare In Your Hands* published by the Department of Agriculture (WA), particularly pages 116-119 To Clear Or Not To Clear.
* Refer to the activity in *Our Wild Plants* published by Greening Western Australia entitled 'Remnant Bushland Survey'.

* Map for Activity ‘Before and After’ - Adapted from Kitchener (1979), see references.*
BEFORE AND AFTER

The debate about keeping areas of remnant bushland or clearing is an ongoing one. Agriculture is an important industry which provides food and overseas income from export of farm products. At the same time, clearing of land contributes to land degradation which in turn affects farm production. Clearing may also threaten the survival of our remaining native plants and animals. There is currently a debate as to whether or not any more bushland should be cleared for agriculture.

1. Discuss this statement.

2. What does the term **cleared land** mean?

3. What does the term **uncleared land** mean?

4. What is the difference between a **nature reserve and uncleared land**?

5. Look at the map of the Nugadong Nature Reserve and surrounding area. The map covers a total area of 2464km$^2$ (154cm$^2$). Shade in the following:
   * Lakes - blue
   * Cleared land - yellow

6. Using the grid squares as your guide, estimate how many square centimetres (cm$^2$) are covered with the uncleared land outside nature reserves. Using the scale on the map, convert this to square kilometres (km$^2$) and complete the table. When estimating, exclude areas that are less than half covered (that is, count them as zero) and count areas that are more than half covered as one cm$^2$.

<table>
<thead>
<tr>
<th>LAND USE</th>
<th>AREA IN cm$^2$</th>
<th>AREA IN km$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncleared land outside nature reserves at 1970</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncleared land protected in nature reserves at 1970</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

7. Add the areas of uncleared land together. This is the total area of bushland remaining on the map.

_________________________km$^2$
**Resource Sheet: Before and After**

8. What is the difference between the total map area and the total area of uncleared land (including nature reserves)? This is the total area of cleared land on the map.

_________________________________________ km²

9. What do these results tell you?

10. Using your own knowledge and the information given on the table, describe some of the problems created by clearing bushland.

i. ________________________________________________________________________

ii. ________________________________________________________________________

iii. ________________________________________________________________________

iv. ________________________________________________________________________

11. Using your answer from Question (6), what percentage of uncleared land is set aside for nature conservation? Do you think this is enough?

12. Your landcare group has been given a grant of quite a few thousand dollars to increase the area of nature reserves on the map by 64 km².

Study the map carefully and mark the area (as shown on the key) which you would fence to develop as an additional nature reserve.

Why did you choose this area?

13. Discuss your results with the class.
Students play a board game based on events in the life of a numbat.

**Concepts**

* Animals have special needs which must be met if they are to survive.
* Important life decisions are made in response to unexpected events.
* Human use of woodlands affects their use by other animals.

**Objectives**

* To focus on the different events that may occur in the life of a numbat.
* To make choices regarding the best options provided in the board game, and learn how decisions in response to a particular event affect future events and options.

**Curriculum Links**

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<tr>
<td>Mathematics</td>
<td>5</td>
<td>N P2.16</td>
<td>Carry out games and activities involving problem solving, classification and application of logic.</td>
</tr>
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<td></td>
<td>6</td>
<td>N P2.19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>N P2.21</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>5/6/7</td>
<td>NP5.1</td>
<td>Investigate everyday events, games and activities that have a chance outcome.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SP1.3</td>
<td>Carry out activities to investigate regions, paths, routes and networks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SP2.5</td>
<td>Carry out activities in which the features and functions of objects and structures in the environment are investigated.</td>
</tr>
<tr>
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<tr>
<td>Language</td>
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<td>3.2.8 A</td>
<td>Instructions.</td>
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Activity: **Numbat Manoeuvres**

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<td>3.4. Describes places according to their location and natural and built features.</td>
</tr>
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<td>2.16. Selects, compares and categorises relevant information.</td>
</tr>
<tr>
<td>Science</td>
<td>Living Together</td>
<td>2, 3, 4. Identify, describe and map relationships between living things.</td>
</tr>
<tr>
<td>English</td>
<td>Speaking and Listening</td>
<td>3.1. Interacts for specific purposes with people in the classroom and school community using a small range of text types.</td>
</tr>
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</table>

**Background Information**

Numbats are endangered due mainly to loss of habitat and predation by foxes. Other factors, such as drought and frequent burning of their habitat, may also have a negative effect. They depend on termites for their survival. They are now restricted to eucalypt woodlands and forest, particularly areas dominated by wandoo or jarrah. Areas with this vegetation provide numbats with hollow logs for shelter and branches for termites. The numbat is the only marsupial adapted to feeding exclusively on termites.

A pair of numbats require an area of about 50 hectares of bush to survive. It is suggested that a population of 250 numbats may be required for long term survival. These numbats would need 6000 hectares of suitable habitat to survive.

Fox control has seen an increase in the numbat population at Dryandra Woodland north-west of Narrogin.

Hollow logs on the ground are essential cover for numbats in the western wheatbelt and adjoining forest. The effects of fire can improve or destroy the habitat they require. Ironically, fire consumes hollow logs but it also creates them if trees are burnt down.

**Key Words**
Numbat, choice, decision, change.
Activity: Numbat Manoeuvres

Teacher Directions

Materials
* Die
* Markers.

1. Discuss numbats with the class using the background information.
2. Divide your class into groups of three or four and give each group a copy of the board game.
3. Explain to students that the game focuses on decision making as well as numbat awareness. Stress the need to read the trail information as they go.
4. Go through some of the choices where the track divides.
   You will find that many students will not read the information on the trail, only the instructions. On conclusion of this activity there is a quiz. You may wish to inform the students of this prior to playing the game. The quiz may be given to the students to evaluate their knowledge.

Evaluation
* Were students able to make an informed decision when choices were present?
* Were students able to complete the quiz based on the board game?

Complementary Activities
* Quiz - 'You Are The Numbat'. See resource sheet - the questions are based on the board game. You may wish to do this quiz in small groups.
Resource Sheet: Numbat Manoeuvres

QUIZ - YOU ARE THE NUMBAT!

Questions:

1. What did you feel like doing after a good nights sleep?

2. In which two situations did foxes threaten numbats?

3. Which two events threatened the fox?

4. Name a type of food you enjoy.

5. Which two unfortunate things occurred due to the bushfire?

6. You had a couple of near misses in the bushfire. What were they?

7. What animal ate your source of food?

8. What do the termites do in a drought?

9. Where did you hide when you saw the hunter?

10. Which birds screeched playfully overhead?

11. Name one problem the sheep caused after getting through the fence.

12. Why do you think the naturalist would lobby for your habitat to be protected?

13. What was the last thing you did?
Teacher Answer Sheet: Numbat Manoeuvres

QUIZ - YOU ARE THE NUMBAT!

Answers:

1. Look for a feed.

2. Chases you. Chases your young ones.

3. Out of its territory and gets into a fight with another male. Eats 1080 poison baits.

4. Termites.

5. Cover is removed therefore hawks can now see you. Lost a young one to heat exhaustion. Hollow log homes burnt.


7. Echidnas.

8. Go deeper.

9. In a hollow log.


12. You are not as commonly found as you should be!

13. Back to your special spot to sleep for the night.
Board Game: Numbat Maneuvers

BEGIN THE DAY

- After a good night's sleep, head out of your burrow, looking for food. Roll the dice.

- Meet fox on the road. Miss a turn.

- Fox chases you. Go back 2 spaces.

- Fox eats 1000 poisonous berries in your area. Go forward 2 spaces.

- Fox runs out of its territory. Gets into a fight with another fox. Go forward 3 spaces.

- Fox in chasing your young ones. Go back 2 spaces.

- Eucalyptus tree blown down by winds. Miss a turn.

- Motorbike riders race through the bush. Stay still. Miss a turn.

- Nearly got taken by a hawk! But escaped. Go forward 3 spaces.

- Discover an untouched patch of woodland. Time to search for food. Go forward 4 spaces.

- Found a good patch of termites to eat. Roll the dice again.

- Bushfire! Miss a turn while you escape.

- Numbat Manoeuvres

- Back to your favourite burrow to sleep for the night. More forward one space.

- Have a good meal. Roll a dice. Roll the dice again.

- A numbat passes by. You take a photo. You could be famous. Go forward 3 spaces.

- A numbat out for a walk. You see a family of wombats. Go forward 3 spaces.

- A rocky outcrop and a bear cub. Go forward 3 spaces.

- Puzzled by a hunter with a gun. Hide in a log. Miss a turn.

- Eucalyptus tree knocked down by winds. Miss a turn.

- Numbat Manoeuvres

- You find a sunny log to warm yourself on a cold morning. Go forward 4 spaces.
WOODELAND INVERTEBRATES
["Minibeasts" or "Spineless Beasts"]

Invertebrates are animals without backbones such as insects, worms, and spiders. They are less visible than vertebrate (animals with backbones), a group which includes mammals, birds, reptiles and amphibians.

By virtue of their total mass and numbers invertebrates are the largest animal group in woodlands. They play a very important part in the woodland system. For example, termites are vital for recycling wood, flies and wasps contribute to plant pollination, and earthworms improve soil fertility and structure. In contrast, other invertebrates such as saw fly larvae and leaf miners may severely damage the leafy crown of trees and affect their survival and timber values.

Most guides for identifying invertebrates are designed for specialists. However, the more common groups of these minibeasts may be identified by using the pictures and keys on this and the following pages.

The keys used here are only for common invertebrates visible to the naked eye and occurring in woodlands outside pools of water. For identifying invertebrates in pools, look at the pictures in Exploring Granite Outcrops published by the Department of Conservation and Land Management.

Key to the Adults of Major Invertebrate Groups of Wheatbelt Woodlands

This key is not designed for life stages other than adults. For example, it will not work for insect larvae (such as fly maggots). If you are unsure of the meaning of words - such as "antenna" or "segments" - used in the key, then look at the figures.

1. Animal without legs.........................go to 2.
   Animal with legs..............................go to 6.

2. Animals with tentacles, often with a shell....Mollusca (snails and slugs).
   Animals without tentacles, and never with a shell.................................go to 3.

3. Animals, worms, with many segments, round in cross-section.................go to 4.
   Animals, worms, without segments, flat in cross-section........................go to 5.

4. Segmented worms with no sucker, live in soil.....Annelida (earthworms).
   Segmented worms with a sucker, live above the soil.......Annelida (leeches).
   (Uncommon in the wheatbelt and only found near fresh water.)  ^^^^^^^
Appendix 1

Very colourful worms, usually only seen in wet seasons under rocks or logs..................Nemertea (ribbon worms).

Drab coloured flatworms, not common in the wheatbelt outside water .................Platyhelminthes (flatworms).

Three pairs of legs, body divided into three obvious sections - a head, thorax (chest) and abdomen. One pair of antennae, but these are not always obvious. Often have wings.......Insecta (flies, wasps, beetles, bugs and so on). See page 3.

Not as above..........................go to 7.


Not as above..............go to 8.

8. No antennae, body divided into two parts, a combined head and chest section (cephalothorax) and an abdomen. Attached to the head/chest section are 4 pairs of walking legs. In the case of scorpions, the abdomen is divided into many segments.....Chelicerata (Arachnida) (spiders, scorpions, ticks, mites, harvest spiders, pseudoscorpions).

Body long, divided into many similar segments with more than eight pairs of walking legs, one pair of antennae..........Chilopoda and Diplopoda (Myriapoda) (centipedes and millipedes).
Appendix 1

**Simplified Key to Common, Adult Insects of Woodlands**
*(Adapted from a key devised by the National Museum of Victoria)*

1. Social insects living in large communities. These communities live in mounds or within rotting logs and trees. The communities include wingless workers. Their food source includes wood and other dead vegetation (in contrast to honeybees which feed on nectar and pollen and whose workers are winged)..............Isoptera (termites).

   Not as above......go to 2.

2. Wingless............go to 3.

   With wings..........go to 7.

3. Body distinctly divided into head, thorax (chest) and abdomen; a narrow waist with a swollen knob lies between the thorax and abdomen........Hymenoptera (Formicoidea, ants).

   Body not distinctly divided into 3 parts.......go to 4.

   Antennae long; 3 long tail-stems (cerci) present on the end of the body...Thysanura (silverfish).

   Antennae short, may be hidden away.....go to 5.

4. Two short tail-tubes at the rear end of the body; small insects parasitic on plants......Hemiptera (Aphididae, aphids).

   No tail-tubes; parasitic on animals......go to 6.

5. Small insects with body flattened sideways; back legs much longer than the other four........Siphonaptera (fleas).

6. One pair of wings; each back wing is replaced by a tiny hair with a small knob on the end (you may need a hand lens to see this)........Diptera (flies).

   Two pairs of wings............go to 8.

7. Front wings hardened or thickened at least partly and opaque, hind wings membranous, not opaque........go to 9.

   Both pairs of wings membranous although they may be covered with scales (as for example in moths) or hairs............go to 14.
Appendix 1

9. Mouth a straight sucking tube usually resting between the first pair of legs, front wing partly membranous.......Hemiptera (Heteroptera, bugs).

Mouth parts of the chewing type........ go to 10.

10. Front wing very hard with no distinct veins........ Coleoptera (beetles).

Front wing thick but not hard, distinct veins are present.....

° Christmas beetle

11. All three pairs of legs similar in shape although they may vary in length......go to 12.

One pair of legs differs in shape from the other two pairs....go to 13.

12. The first segment of the thorax (chest) is very large, almost hiding the head........Blattodea (cockroaches).

The first segment of the thorax small, second segment very long, head easily seen, stick-like or leaf-like insects........Phasmida (stick and leaf insects).

13. Front legs differ from others, they are used for seizing prey......Mantodea

Praying mantis (Paying mantises).

Back legs differ from others, they are used for jumping........Orthoptera (grasshoppers and crickets).

14. Mouthparts a distinct sucking-tube.......go to 15.

Mouth with chewing jaws........ go to 16.

15. Sucking-tube straight and usually resting between the first pair of legs, wings all clear and membranous........Hemiptera (Homoptera, bugs).

Sucking-tube coiled, both pairs of wings covered with coloured scales which easily come off when touched........Lepidoptera (butterflies and moths).
16. Tail-stems are present and are smooth and hard usually forming a pair of pincers.......Dermaptera (earwigs).

Tail-tubes not always present. If present, not hard pincers.......go to 17.

17. Wings with few long veins or cross veins, veins often do not reach the edge of the wings, front and back wing usually joined together with small hooks.......Hymenoptera (wasps and bees).

Wings with several long veins and very many cross veins-go to 18.

18. Antennae very short, eyes very large, body very long and thin.....Odonata (dragon flies and damsel flies).

Antennae long, eyes easily seen but not unusually large, body thin but not unusually long..........Neuroptera (lacewings).
Appendix 2

GLOSSARY OF KEY WORDS

Definitions relevant to the teaching activities in this package are provided, other meanings are not given. Many of the definitions are adapted from *The Macquarie Dictionary*. A complete list of the references used is given at the end of the Glossary.

All of the key words listed in the teaching activities have been included except for some very commonly used words.

**acrostic**
a series of lines or verses in which the first, last, or other specific letters form a word, phrase or similar.

**adapt**
adjust or modify fittingly.

**animals**
living things which eat to obtain nutrients. They cannot use sunlight, carbon dioxide and water to manufacture complex sugars as plants do. Most animals can move of their own volition. Animals also consist of many cells, and all except sponges coordinate their body parts using nerve cells.

**argument**
a process of reasoning.

**arthropods**
the animal phylum of segmented invertebrates which have jointed legs. Includes the insects, arachnids (includes spiders and mites), crustaceans (includes crabs and slaters), and myriapods (includes centipedes and millipedes). See also Appendix 1.

**baiting**
luring and killing animals with poisoned or drugged food.

**box poison**
a native shrub from Western Australia of the genus *Gastrolobium*. It is extremely poisonous to stock and many other animals including humans.

**breakaway**
a term which, in South-western Australia, is applied to low, steep cliffs capped with gravel (laterite) or coffee rock (another form of laterite).

**bushland (also bush)**
natural vegetation of any kind; a tract of land covered in such vegetation.

**calculate**
to ascertain by mathematical methods, compute.

**canopy**
the uppermost layer of vegetation. In a woodland, the branches, twigs and leaves of the trees.

**carbohydrates**
compounds of carbon, hydrogen and oxygen which include sugars, starch and cellulose. They form the supporting tissues of plants and are important food for plants and animals.

**casuanna**
- see sheoak.

**characteristic**
indicting the particular quality; typical.
classification - the assignment of plants and animals to groups within a system of categories distinguished by structure, origin, etc.
clay - natural earthy material which is plastic when wet, smooth to touch and can be rolled (when wet) into a long ribbon.
cleared - cleared land is land from which trees and undergrowth have been removed, usually to form farmland or grazing land.
competing - rivalry among organisms, both of the same and of different species, for food, space and other resources which support life.
concentric - having a common centre, as may occur with several circles or spheres.
conservation - keep in a safe or sound state.
conserve - to preserve, to keep in a sound or safe state.
crustacean - a class of arthropods, usually aquatic, commonly having the body covered with a hard shell or crust. Includes crabs, shrimps, and slaters.
cultural - of or pertaining to those ways of living, built up by a group of humans, which are transmitted from one generation to the next. Includes tools, ways of building, communication methods, art, etc.
custodianship - the job of keeping, guarding.
derosion - the process by which the surface of the earth is worn away by the action of water, winds, waves, etc.
eucalyptus - any of the plant genus *Eucalyptus*. This group includes many tall trees as well as mallees.
excerpt - a passage taken out of a book, magazine, paper, etc.
fauna - animals of a given region or period. The fauna of Western Australia, for example, includes all animals native to Western Australia.
exposition - a detailed statement of explanation.
facilities - things that make it possible to perform any action more easily, structures designed for a specific purpose.
edmund - a passage taken out of a book, magazine, paper, etc.
Appendix 2

feral - having reverted to the wild state, as from domestication.
ferns - plants which do not produce flowers, distinguished from similar plants in having few leaves, large in proportion to the stems and bearing sporangia (reproductive parts) on the undersurface of leaf margins.
flora - plants of a particular region or period. The flora of Western Australia includes all plants which are native to Western Australia.
ofoliage - the leaves of a plant, collectively.
foraging - the seeking or obtaining of food.
formula - a rule or principle frequently expressed in algebraic symbols.
fumes - smoke or vapours coming from matter.
fungi - a group of plants characterised chiefly by the absence of chlorophyll (essential for photosynthesis) which live upon dead or living organic matter. Includes mushrooms, moulds, mildews, rusts and smuts.
Gastrolobium - a genus of poisonous plants from the pea family.
germinate - to begin to grow or develop into a plant as from a seed, spore, bulb, etc.
globular - globe shaped.
habitat - the native environment where a given plant or animal naturally lives and grows.
heath - a tract of uncultivated land covered by low, usually small-leaved shrubs.
hectares - the common unit of land measure in the metric system. Equal to 2.47 acres and 10,000 square metres.
humus - a dark organic material in soils, produced by the decomposition of vegetable or animal matter.
inhabitant - a permanent resident.
insect - a group of small, air breathing arthropods; characterised by a body clearly divided into three parts and by having only three pairs of legs and usually having two pairs of wings. See also Appendix 1.
introduced plants - plants transported into and grown in an area where they do not naturally occur.
;am - a type of wattle (Acacia acuminata) native to Western Australia. European settlers named it after the raspberry-jam smell of its freshly cut wood.
koonacs - an Australian freshwater crayfish.
Appendix 2

larva  the young of any insect which undergoes metamorphosis (a complete change in appearance). Examples include the change from maggots (a larva) to adult flies; and from caterpillars (a larva) to butterflies.

leaf litter  freshly fallen or slightly decomposed leaves scattered over the ground under trees or other vegetation.

lichen  plants which consist of a compound of a fungus and alga living together in a mutually beneficial relationship. They grow in crust-like patches or bush-like forms on rocks, trees, etc.

life cycle  the course of development from the fertilisation of the egg to the production of a new generation.

litter  the freshly fallen or slightly decomposed accumulation of dead leaves, twigs and small branches scattered on the ground under vegetation.

loam  a mixture of sand, silt and clay, often high in organic matter. Loam soil particles stick together when wet, have a smooth feel and may feel slightly gritty. Greasy to the touch if much organic matter present.

magnify  to increase the apparent size of, to enlarge.

mallee  any of various Australian species of *Eucalyptus* having a number of almost unbranched stems arising from a large underground root stock. The latter is an adaptation of the stem, and not a true root.

mallet  any of several species of the genus *Eucalyptus* in Western Australia. The word is from the Noongar language and is generally applied to straight, smooth-barked trees which have bark rich in tannin.

mammals  a class of vertebrates whose young feed upon milk from the mother's breast. All except the platypus and echidnas give birth to live young.

manage  to take charge or care of.

marsupials  the group of mammals, the females of which usually have a pouch or fold of skin on the abdomen in which the young are carried when young. Distinguished from other mammals by the lack of a placenta.

melaleucas  plants from the genus *Melaleuca*. This group includes trees and shrubs, some of which are known as paperbarks. Occasionally they are also called tea trees, however, this term is more accurately applied to the genus *Leptospermum*.

monotremes  the order of mammals, restricted to the Australian region, comprising of only the platypus and echidnas, oviparous (egg laying) mammals in which the genital, urinary, and digestive organs have a common opening.
Appendix 2

moss  small leafy stemmed plants growing in tufts, sods, or mats on moist ground, tree trunks, rocks, etc. Mosses are not flowering plants, they reproduce by spores and with the liverworts form a group of plants known as bryophytes.

mouldy  covered with mould (fungi).

moult  to cast or shed feathers, skin, etc, to be succeeded by new growth.

narrative  a story of events or experiences, whether true or fictitious.

native  of indigenous origin, growth or production. An animal or plant indigenous to a particular region.

natural  living and non-living components of the world surrounding man which are not produced by man. Includes native animals, native vegetation, weather, rocks which have not been produced by man, and so on.

nature reserve - in Western Australia, an area of Crown (public) land set aside for the conservation of flora and fauna. These areas are managed by the Department of Conservation and Land Management (CALM) on behalf of the National Parks and Nature Conservation Authority.

nocturnal  active at night.

numbat  a small, slender, reddish-brown, insectivorous marsupial, with a long bushy tail, pointed snout, and conspicuous white stripes across the back, found in certain areas of South-western Australia.

nutrients  substances which, if taken up by a living thing, provide energy or promote growth.

ochre  any of a class of natural earths, mixtures of hydrated oxide of iron with various earthy materials, ranging in colour from pale yellow to orange and red, and used as pigments.

organic matter  characteristic of, pertaining to, or derived from living organisms.

perimeter  the circumference, border, or outer boundary of a two-dimensional figure.

pi  the letter Jt, used as a symbol for the ratio (3.141592+) of the circumference of a circle to its diameter.

plantation  a group of planted trees or plants.

polygon  a closed plane figure having more than four angles and sides.

powderbark  the tree Eucalyptus accedens, found in South-western Australia in the central western wheatbelt and adjoining Darling Scarp northwards to south-east of Geraldton. Often found growing on gravel slopes above wandoo.

predator  an animal that habitually preys upon other animals.

prediction  - a statement that foretells the future.
productive - having the power of producing, producing readily or abundantly.
protein - any of the substances formed by long chemical chains of amino acids. They are found in all cells and are a very important group of substances in most living things.
pupa - an insect in the non-feeding, usually immobile, transformation stage between the larva and the adult. The plural of pupa is pupae.
radius - a straight line extending from the centre of a circle or sphere to the circumference or surface.
recommendation - representation in favour of a person or thing.
remnant - part, quantity or number remaining. Often used to describe remnant patches of native vegetation in the highly cleared agricultural landscape of Western Australia.
renewable - able to be restored or replenished.
reptiles - a class of cold blooded vertebrates including lizards, snakes, alligators, etc.
rudimentary - first principles; elementary.
scantling - timber of comparatively small size such as a rafter or purlin.
scavenger - any of various animals feeding on dead organic matter.
secretive - showing a tendency to be shy or reticent.
segment - any one of the rings that compose the body of an arthropod, or any other animal with a comparable structure, or one of the sections of a limb between the joints.
serrated - having notches or grooves along the edge like a saw.
sheoak - any plant of the genera *Casuarina* or *Allocasuarina*. Common examples in the wheatbelt include rock sheoak, swamp sheoak and tamma shrub.
shrub - a woody perennial plant smaller than a tree, usually having permanent stems branching from or near the ground.
soil - the ground or earth; that portion of the earth's surface in which plants grow; a well developed system of inorganic and organic material and of living organisms.
sundews - any of a group of small plants, species of the genus *Drosera*, with sticky hairs that capture insects.
symbiotic - the living together of two species of organisms to the mutual benefit of each.
symmetry - the correspondence, in size, form and arrangement, of parts on opposite sides of a plane, line or point.

tammar - a small, scrub wallaby of South and South-western Australia.

texture - the characteristic appearance or quality of something, especially as conveyed through touch.

thesis - a proposition which is stated, generally to be discussed and proved, or maintained against objections.

toxic - poisonous.

transect - to cut across, dissect.

uncleared - land from which the natural vegetation has not been cleared.

understorey - the shrubs, grasses and other plants under a canopy. For example, the shrubs, grasses and other plants growing under a tree canopy in a woodland.

vegetation - plants collectively, or the plant life of an area considered as a whole.

wallaby - any of the smaller members of the family Macropodidae, many resembling kangaroos, others more possum-like in size and appearance.

wandoo - a large smooth-barked Western Australian tree, *Eucalyptus wandoo*, also known as white gum.

woodlands - land covered with trees, the canopy cover of which is usually taken as being between 5% and 30%.

woylie - a small bettong of central and southern Australia, having a long prehensile tail, covered with black hairs on the upper surface towards the tip.

York gum - a rough-barked gum tree, *Eucalyptus loxophleba*, found throughout the wheatbelt. Also occurs in mallee form. The tree takes its name from the town of York.

**References**


VIDEOS FROM THE STATE FILM LIBRARY OF WESTERN AUSTRALIA

The State Film and Video Library has an excellent range of videos including many relevant to this set of teaching activities. These videos are listed under subject headings for your convenience.

Your school should be a member of the State Film and Video Library, but if you would like further information, please use the following contact numbers:

Telephone - (09) 427 3159
Fax - (09) 427 3256.

WHEATBELT

A Waltz Through The Hills
W.A. 1988 116mins BRN 672683

When their mother dies, two young children in a W.A. wheatbelt town decide to run away to avoid being placed in orphanages. They are befriended by a young Aboriginal man who helps them survive through their bush trek, eventually reaching Perth.

Wild/lowers of Australia (Volume 1: Flowers and Their Habitats)
Adelaide 1991 30 mins 1 booklet BRN 651998

Presents a look at the native flora of the woodlands, wetlands, grasslands, arid and coastal lands of Australia.

Caring For The West’s Golden Grain
W.A. 1986 34 mins BRN 233698

A description of the wheatbelt area of W.A., its climate and farming techniques used to combat the environment and soil fertility.

SOIL

The Living Soil
Australia 1982 9 mins BRN 637769

Uses slow motion and time lapse photography to depict both the life of the soil and life within it.
Appendix 3

BUSHFIRE

Fire Safety; Hall of Flame
California 1991 15 mins BRN 658300

Presents the basic dangers of fire to children. The fire safety and preventative measures for children cover playing with matches, camp fires and fire in the home.

Nature of Australia; a Portrait of the Island Continent. Ep 2 "Land of Flood and Fire"
Melbourne 1988 55mins BRN 583 237

Focuses on the adaptations of animals to fire and flood and the changes in the land caused by fire and flood. Also discusses the ancient Aboriginal people.

Ash Wednesday
Australia 1983 27mins BRN 204443

An account with film clips of the bushfires that ravaged the hills area near to Adelaide in the summer of 1983 and the operations conducted to quell the blaze.

Buildings and Bushfires - Improving the Chance of Survival
Melbourne 1988 20 mins BRN 582517

Shows how embers, radiation and flames from bushfires, aided by the wind, cause ignition and destruction of buildings.

W.A. Fire Brigades: Always Ready
Perth 1990 17 mins BRN 617668

A brief look at the W.A. Fire Brigades Board and its role in the largest fire district in the world.

When the Fire Comes
N.S.W. 1987 50 mins BRN 624362

Outlines modern bushfire fighting and prevention techniques.

TREES

The Living Forest
Australia 1973 24 mins BRN 570652

Detailed study of the ecology of an Australian eucalypt forest and the many plants and animals which constitute the forest community.

Trees
N.S.W. 1988 12 mins BRN 605476

Where they grow in Australia, their parts, their role in the water cycle, methods of reproduction, aesthetic value and care.

Exploring Wheatbelt Woodlands
Appendix 3

The Tree
U.S. 1977 11 mins BRN 612878

A girl observes how living things such as trees and animals are mutually dependent on each other.

The National Tree Program - Towards the Greening of Australia
Australia 1985 13 mins BRN 486753

A general introduction to the role of trees in the Australian environment. The program discusses tree decline in Australia and outlines government and community schemes to combat further loss.

The Fate of the Eucalypts
Victoria 1981 21 mins BRN 615187
(Australian Native Forests No. 2)

Since 1788, Australia's forest cover has declined from 15% to 5% of our land area and the situation is still deteriorating. This program reviews past exploitation, examines current trends and aims to clarify the issue of the purpose of Australia's remaining forests.

LAND DEGRADATION

Nature of Australia: A Portrait of an Island Continent. EP6 "The End of Isolation"
Melbourne 1988 55 mins BRN 583229

Focuses on the land and what has happened to it since European settlement; the destruction caused by grazing sheep, feral animals, removal of vegetation, damming of rivers and introduced pests such as rabbits.

Wheat Today, What Tomorrow?
W.A. 1987 34 mins BRN 493777

David Bellamy explores the effects on W.A. farming lands of cultivation and erosion.

BUSH FOOD

Bush Tucker Man
Canberra 1986 57 mins BRN 550070

Major Les Hiddens travels in remote wilderness and learns about bush food from Aboriginal people.

Mayi Wini. Part 1 Winter Foods
N.T. 1986 35 mins BRN 597891

Demonstrates traditional bush foods and shows the traditional implements used to gather and prepare foods.
Appendix 3

ANIMALS

The Little Marsupials
Australia 1985 25mins BRN 30333
(Fauna - Animals of the Australian Continent Series)

This program contains rare and sometimes unique footage including footage on the honey possum and numbats.

Gardening With Wildlife
London 1983 24 mins BRN 551117

How to make our gardens more attractive to birds and more interesting for ourselves. Although an English program, much of it is applicable in Australia.

FERAL ANIMALS

Beasts of Burden
Australia 1983 73 mins BRN 629242

This program is about the problem of wild donkeys, pigs and cane toads in the outback of Australia and methods used to eradicate them

MISCELLANEOUS

The Gift
Victoria 1988 90 mins 1 book & 1 study guide BRN 556609

Sophia and Nikos win a valuable block of bushland which their father is anxious to sell to buy a better home. But the two kids have their own ideas. There are also other threats.

Living Together
Australia 1988 60 mins BRN 573678

This program shows aspects of Australian Society in action - individuals and groups interacting in the Australian Environment over the last few decades.
**BIOGRAPHIES OF THE PROJECT TEAM**

**Lyn Chadwick** is a wheatbelt Farmer and teacher from Wickepin. She has taught full-time for six years and part-time for two years. Her life-long interest in natural history and the environment is reflected in her involvement with land care and naturalists’ groups. Lyn believes that education is the key to conservation. Her joint interests in both farming and production are shown in 'Uses of Woodlands', the theme she developed.

**Justine Harding** is from a farming background and in her fifth year of teaching. After two years in the goldfields, Justine has returned to Williams, her home town. During her life Justine has seen great changes in her local environment and has become particularly interested in land care issues. Her role in developing a school nursery to supply trees to local farmers shows her commitment to restoring woodlands. Justine was responsible for 'What Is a Woodland'?

**Janette Huston** has taught for nine years including seven in the wheatbelt towns of Mullewa and Katanning. Now living in Gidgegannup, she is teaching in Perth as well as co-writing an environmental package titled *Our Wild Plants* for Greening Western Australia. Her interest and enthusiasm in environmental education developed in Katanning where she was very active with the local land conservation district committee, Ribbons of Green, and Ribbons of Blue. Janette is currently involved with her local land conservation district committee and believes that the future of conservation lies with education. Janette was responsible for co-editing this package and writing the theme 'Woodlands - A Changing Environment'.

**David Mayes** is the Education Officer at the Narrogin District Education Office. His initial interest in environmental education was aroused during teaching service at Cunderdin Agricultural College. David has spent ten of his fifteen years teaching in rural schools including Newman and Narrogin Senior High Schools. David's role in the project included coordination, liaison and advice.
Jill Nottle has lived in the Narrogin area for many years as a student, teacher and farmer. She has taught full-time for 12 years in both city and country schools. Land care issues, both at the farm and district scale, stimulated Jill's interest in all aspects of land conservation. After coordinating the development of classroom activities with an environmental theme, Jill recognised the need for a more comprehensive approach to environmental education. She sees *Exploring Wheatbelt Woodlands* as an important contribution to improving environmental education in wheatbelt primary schools. Jill was responsible for 'Woodlands as Homes'.

Ken Wallace is CALM's Regional Manager for the Wheatbelt Region. In this role one of his responsibilities is the management of some one million hectares of nature reserves. Ken believes that unless local communities understand and value their native plant and animal communities, much of our wheatbelt wildlife will be lost. Community education is vital to ensure that we don't lose our natural heritage. Ken's role in producing these teaching activities has been as project supervisor, biological information resource and co-editor.

*Exploring Wheatbelt Woodlands*
Wheatbelt
of Western Australia

SCALE

'wheatbelt' after D Murray from 'Western Landscapes'.edited by J Gentili, published by UWA Press (1979)