

PART ONE

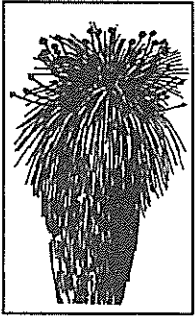
OUR HERITAGE OF WILD PLANTS

ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
1.1	Guests in the Bushland	19	●	●	●	●				●		
1.2	Discussion	19	●	●	●					●		
1.3	Poster	20	●	●	●					●		●
1.4	What is My Bushland Code of Conduct?	20		●	●					●		
1.5	Earth Charter for Plants' Rights	20			●					●		
1.6	Bushland Visit	20	●	●	●	●						
1.7	Leaf Story	21	●			●				●		
1.8	Sorting Fruit	21	●			●				●		
1.9	Paint Prints	21	●	●								●
1.10	Leaf Print Border	21	●	●	●							●
1.11	Bushland Story	22	●	●	●	●				●		
1.12	Flower Sketch	22	●	●	●							●
1.13	Getting to Know a What?	22	●	●								●
1.14	What's a Gum Tree?	22	●	●		●				●		
1.15	Getting to Know My Gum Tree	23	●	●	●	●				●		
1.16	Rainbow Serpent	23	●	●	●	●			●	●		
1.17	Artist's Palette	23	●	●	●							●
1.18	Plant Types	23	●	●	●	●						●
1.19	Mini-Beast Hunt	24	●	●	●	●						
1.20	Ant Explorer	24	●	●						●		
1.21	Drama	25	●	●						●	●	
1.22	Texture Rubbings	25	●	●		●			●	●		●
1.23	Nature's Noises	25	●	●	●	●					●	
1.24	Blindfold Walk	26	●	●	●	●					●	

ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
1.25	Life Beat	26	●			●				●	●	
1.26	Sketch	26	●	●	●	●			●			●
1.27	Weaving	26	●	●				●				●
1.28	Scratch and Sniff	27	●	●	●	●						
1.29	Texture	27	●	●	●	●						●
1.30	Sorting Out Plants	27	●	●	●	●			●			
1.31	Leaf Classification	27		●		●			●			
1.32	Adjectives Poem	28		●	●					●		
1.33	Skeletons in the Bushland	28		●	●	●				●		
1.34	Flower Maths	28		●	●	●			●			●
1.35	Rare Species Letter	28			●	●	●			●		
1.36	Bushland Adventure in Kings Park	29		●	●	●	●					
1.37	"Discovering Hills Forest" Excursion	29			●	●	●	●		●		
1.38	Tree Maths	29			●				●			
1.39	Creative Writing	29			●					●		
1.40	Design Your Own Nature Trail	30			●	●	●		●			
1.41	Leaf Maths	30			●	●			●			●



Background



OUR HERITAGE OF WILD PLANTS

Western Australia's plant life is unique, having developed as a result of the early isolation of Australia from other continents and adaptation over millions of years to survive periods of drought and wet.

Western Australia has one of the richest areas of wildflowers in the world. 8,000 species are found in the south-west of Western Australia alone. 85% of Western Australian plants are not to be found anywhere else in the world.

Western Australian plants have undergone a long period of evolution, making remarkable adaptations to a very ancient landscape and poor soils which lost their nutrients long ago through leaching.

These plants have developed ingenious ways of living in these very poor soils. Some are carnivorous, catching their food as it passes by, rather than through their roots. Others, such as Banksias, have developed special relationships with other organisms, such as Mycorrhizal fungi and Rhizobium bacteria to increase their uptake of nutrient from the soil.

Over the years, some of these plants have become so finely adapted that they only occur in very small areas. *Banksia tricuspis*, for example, only has a 13 kilometre range within the Mount Lesueur National Park and is found nowhere else. Plants with small ranges such as this are common throughout much of Western Australia. Some of these small, localised plant populations utilise bird and mammal pollinators. Bird and mammal pollinated flowers are a feature of Western Australian flora. To attract and support such large pollinators the plants have bright and robust flowers. This is why many Western Australian wildflowers are particularly spectacular.

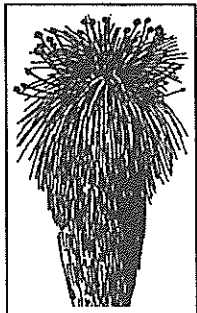


Bush scene, Neerabup.

Tuart, parrot-bush, chenille honey-myrtle and blackboy combine with smaller plants in a natural community.

(Powell, 1990) Reproduced with permission from the Department of Conservation and Land Management (CALM) WA.

Background



Our native bushland is of intrinsic value in that it maintains the original ecosystems. It supports our native animals, providing food and shelter for the pollinators and natural predators. Native bushland keeps the soil healthy, preventing it from blowing or washing away and keeping salty groundwater below the root zone. Bushland provides us with an income through the tourist industry and export wildflower markets and the potential of wild plants to provide food, fibre and pharmaceuticals continues to be explored.

The natural Australian landscape was the basis on which aboriginal culture and lifestyle developed. The Aboriginal people lived with the land utilising the natural resources, using fire to keep major migration routes passable, making access easier to some plant foods, and encouraging new growth that was attractive to animals which could be hunted more easily.

Our State's bushland is a vital part of our heritage and warrants the same if not greater level of appreciation and protection that we give our heritage of historical buildings. Experiencing the variety and cycles of plant life in the bushland is an enriching experience and contributes to the development of a personal and national identity. Western Australian bushland has a special beauty and forms a uniquely Australian landscape which is yet to be fully appreciated. It has recreational value and offers opportunities for relaxation and re-creation of people's inner selves.

Widespread clearing of our native bushland throughout Western Australia in the last 200 years has quickly led to biological and physical changes that have resulted in widespread land degradation such as loss of top-soil, increasing salinity levels and crop failure. Several species of native plants and animals have already become extinct.

Continuing to remove and degrade existing remnant vegetation has repercussions in terms of conservation of the plants and the animals, and of the land itself.

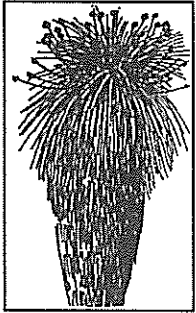
There is no possibility that our bushland can be replaced once cleared, nor completely restored once degraded. We have to teach people to respect and protect the remaining pockets of bushland to retain our natural heritage.



one of Perth's nature reserves.

(Powell, 1990) Reproduced with permission from the Department of Conservation and Land Management (CALM) WA.

Background



WILD PLANT RIGHTS

This section "Wild Plants Rights" encourages students to explore their local remnant bushland and helps them to identify their code of conduct in bushland.

An integral part of "Our Wild Plants" are excursions into bushland. However, special precautions need to be taken to protect the bushland from the 30 pairs of hands and feet that accompany you. Students need to develop and understand the necessary "Rules for Visitors" before they go into bushland. Complete Activity 1.1 "Guests in the Bushland" (page 19) before any bushland trip.



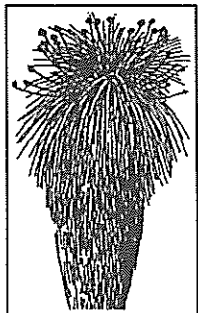
Note:

All plants on public lands are protected and cared for by the Commonwealth, State or Local Government body in which the land is vested.

This includes all parts of the plants both alive and dead and the seeds. Permission can be obtained by teachers from the Department of CALM to collect plants and seeds on vacant Crown Land for educational purposes. A licence costs \$10.00 per year (1993) by application to CALM by the teacher with an accompanying list of student names.

To collect plant materials from other public lands, for example, roadsides, railway reserves, National Parks and Nature Reserves, permission also needs to be obtained for each area from the body in which the land is vested.

Background



GETTING TO KNOW SOME WILD PLANTS

Western Australians should rightly be proud of their heritage of wild plants and value it. Western Australian plants do much to shape our landscape and play an integral role in the development of our identity.

Australia is one of the few countries in the world that still has areas of native plants that have not been modified extensively by humans. With increasing urbanisation and the clearing of bushland, much of the Western Australian landscape is becoming indistinguishable from other parts of the world with similar climates. We can retain our natural heritage, but this can only be achieved if there is widespread appreciation of our plants, we understand the factors that shaped them and we take responsibility for their preservation.

Using Western Australian plant materials on a day-to-day basis in the classroom will give the students a familiarity with local natural materials, help them to recognise plants in their local environment and play a part in developing an appreciation of their natural heritage.

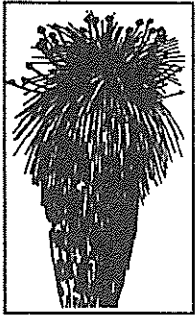
Developing a class herbarium provides a handy record of the plants to be found in bushland local to the school and assists students with plant identification, sorting into families and developing familiarity with their local natural heritage. Help in making a class herbarium can be found in Appendix 1, but remember that collecting of natural materials will require a licence from the Department of CALM and permission from the land-owner.

It is not necessary to collect the Western Australian plant materials from bushland. To give students the experience with living material of native plants, ones we can be sure are Western Australian, a native plant garden can be established in your school grounds to provide the plant species that you require to complete this curriculum package. Help in establishing a school native plant garden can be found in Appendix 2.

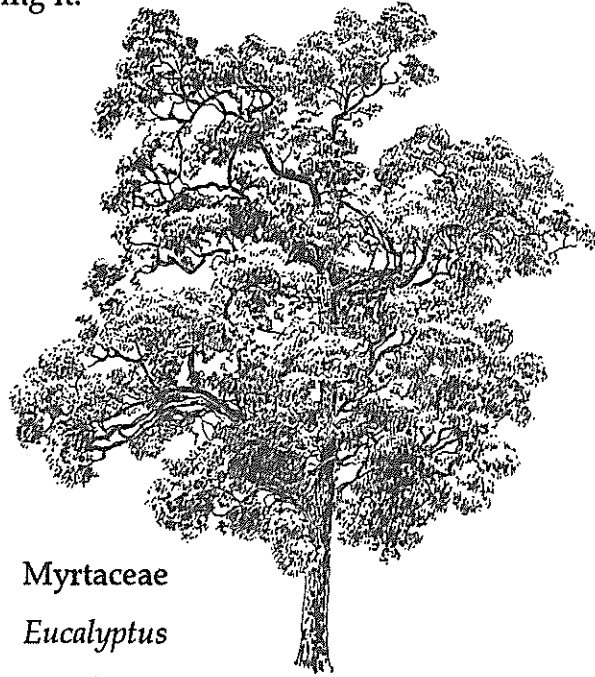
The Western Australian flora is characterised by a huge diversity of species.

Plants are sorted into groups of plants with similar characteristics at three levels: family, genus and species. Species can be grouped together in a genus because of specific shared features. Genera are grouped together into families because they share more general features.

Background

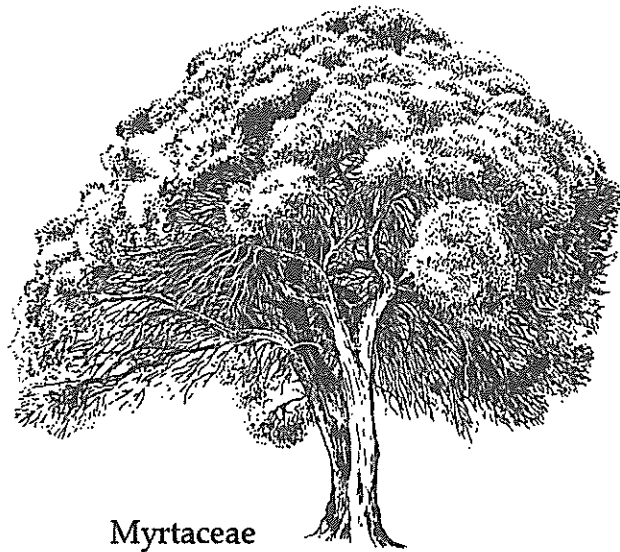


For example: the Myrtaceae or Myrtle family includes Eucalypts, Melaleucas and Peppermints (Paper barks and Honey Myrtles). Members of this family all have oil glands in the leaves. Test this by crushing a leaf and smelling it.



Example:

family: Myrtaceae
 genus: *Eucalyptus*
 species: *calophylla*
 common name: Marri



Example:

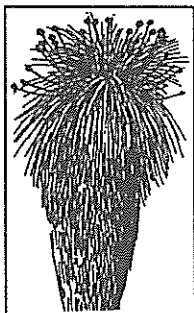
family: Myrtaceae
 genus: *Melaleuca*
 species: *lanceolata*
 common name: Rottneist Tea Tree
 Moonah

(Powell, 1990) Reproduced with permission from the Department of Conservation and Land Management (CALM) WA.

The family of gum trees (genus *Eucalyptus*) are a suitable group to begin with as they are easily identified, uniquely Australian and can be found growing in or around most schools.

Background

WHAT IS A EUCALYPT?

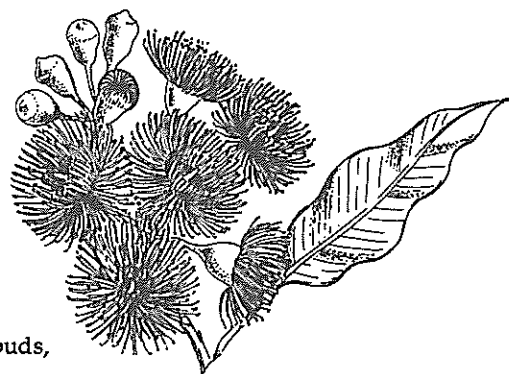


Eucalypts are often called "Gum trees"

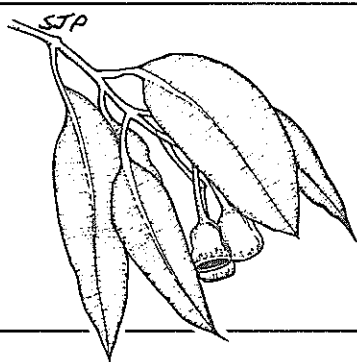
Gum trees grow naturally in Australia. They may be found in school grounds, streets, parks, gardens, the bush, farms and road verges.

Gum trees are planted in many other countries.

How to recognise a Gum Tree

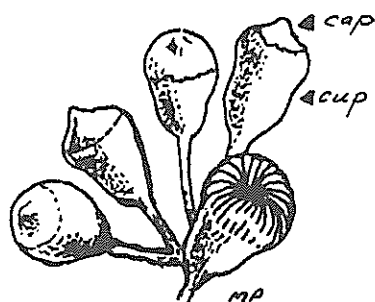


a branch of Marri buds,
flowers and a leaf



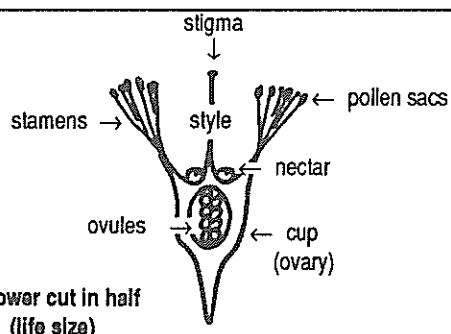
leaves

- ◆ always hang down
- ◆ are leathery to feel
- ◆ have a eucalyptus smell when crushed



buds

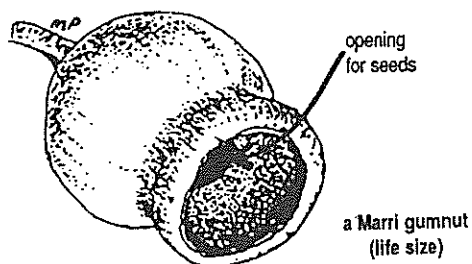
- ◆ are made up of a cap and a cup



a flower cut in half
(life size)

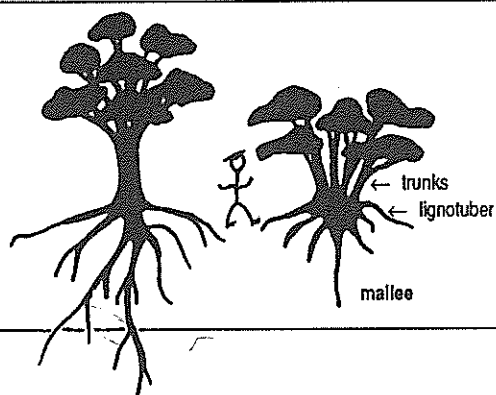
flowers

- ◆ open when the cap is pushed off by the stamens to show bright masses of stamens
- ◆ produce lots of nectar at the base of the cup



fruits

- ◆ hard and woody



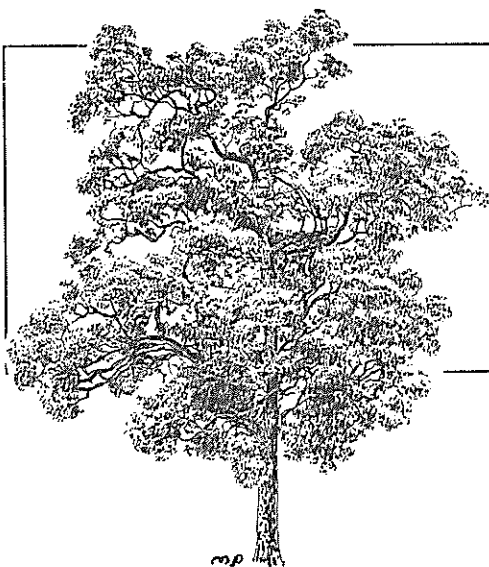
trunks

- ◆ most trees have a single trunk, but some are mallees with several trunks.
- ◆ the trunks grow from the lignotuber.



bark

- ◆ is rough and sheds as strips or flakes
- ◆ or smooth and sheds in sheets



form

- ◆ Tall Shrub to Tall Tree

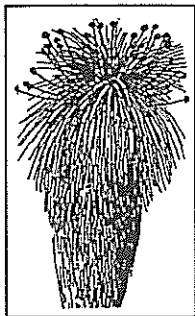
(Reprinted from the Gum Tree Pack, Keighery and Pieroni, 1989 and Leaf and Branch, Powell, 1990).

Example:	family:	Myrtaceae
	genus:	<i>Eucalyptus</i>
	species:	<i>calophylla</i>
	common name:	Marri

Background

WHAT IS A BANKSIA?

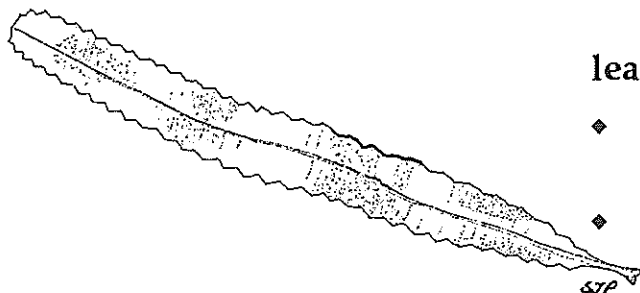
All the world's 75 species of Banksia occur in Australia. 59 species of the world's Banksias are to be found in Western Australia.



How to recognise a Banksia

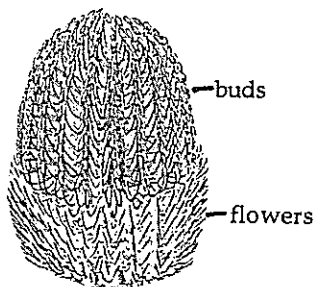


New Holland Honeyeater on a branch of Firewood Banksia, buds, flowers and leaves



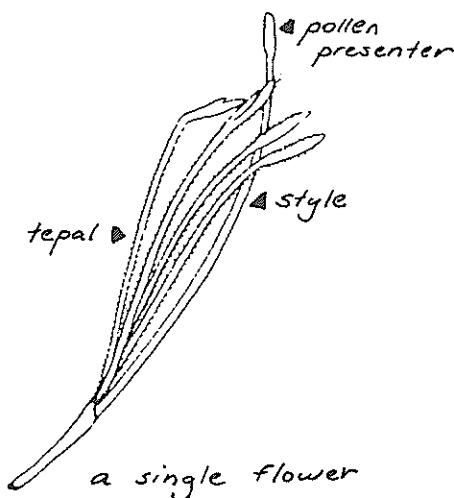
leaves

- ◆ most are saw-toothed, but several species have needle-like leaves
- ◆ tough leaves



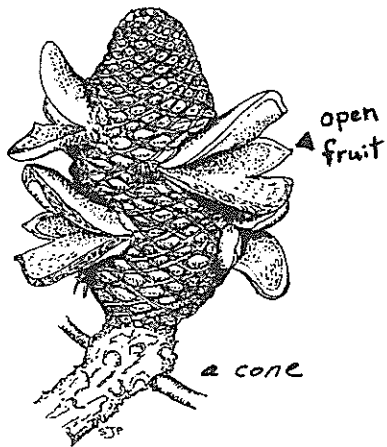
buds

- ◆ look like hundreds of crowded, matchsticks sticking out from a central spike



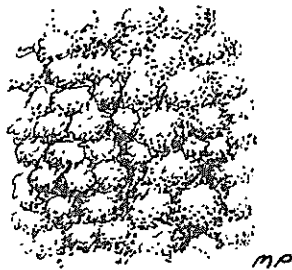
flowers

- ◆ grow in heads of tens to thousands of flowers and are arranged spirally around the end of the stem
- ◆ open when the wiry style straightens to present the pollen and later the stigma
- ◆ are cup shaped with lots of nectar at the base of the cap
- ◆ are divided into four parts called tepals (fused petals and sepals)



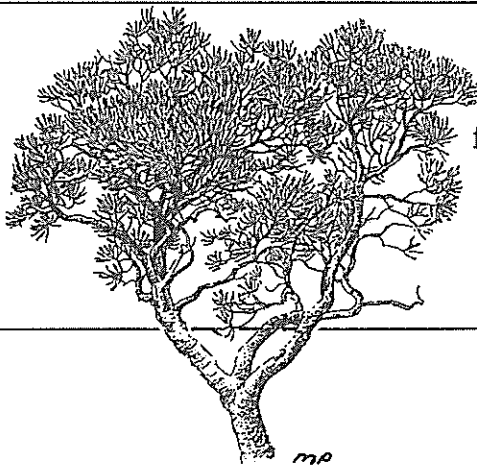
fruit

- ◆ hard and woody
- ◆ only a few flowers set seed in each cone
- ◆ 1 - 50 fruit per cone
- ◆ each seed has a wing
- ◆ cones remain on the plant for many years
- ◆ seed may be dropped from the cones in the first year, or remain on the plant for many years



bark

- ◆ usually rough



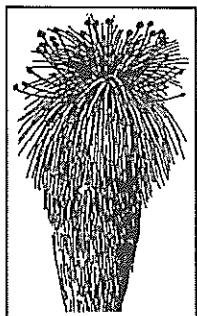
form

- ◆ Low Shrub to Tall Tree

Example:	family:	Proteaceae
	genus:	<i>Banksia</i>
	species:	<i>menziesii</i>
	common name:	Firewood Banksia

Background

WHAT IS A WATTLE?

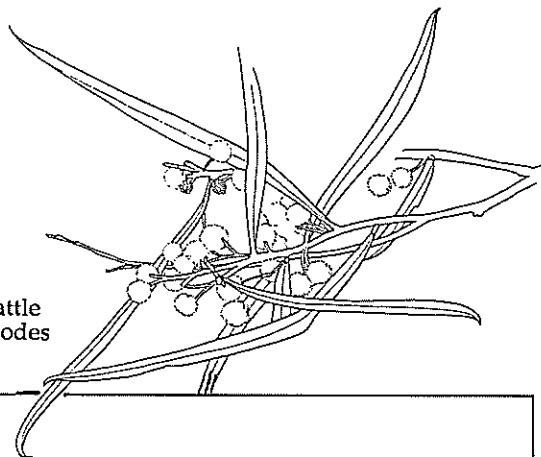


Found throughout Australia and Africa.

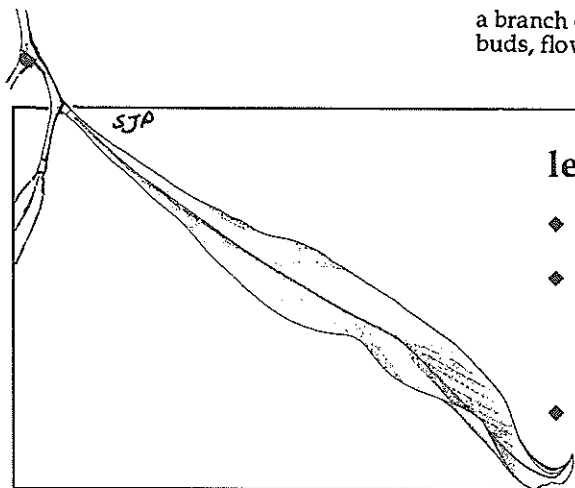
Recognised by pea pod and yellow flower.

Hundreds of different types of wattles are native to Western Australia.

How to recognise a Wattle

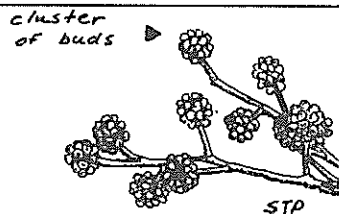


a branch of Coojong Wattle
buds, flowers and phyllodes



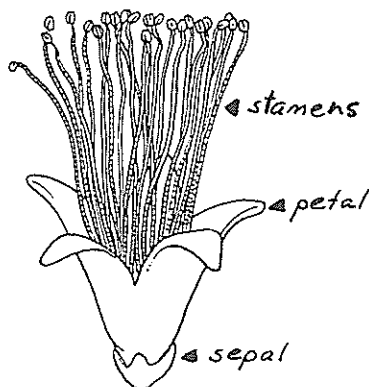
leaves

- ◆ young seedlings have true leaves
- ◆ most mature wattles do not have leaves but have flattened leaf stalks called phyllodes which are shaped like leaves
- ◆ leaf shape is very variable; some leaves are quite spiny



buds

- ◆ cluster of small pinhead-sized balls, each ball opening out into a single flower



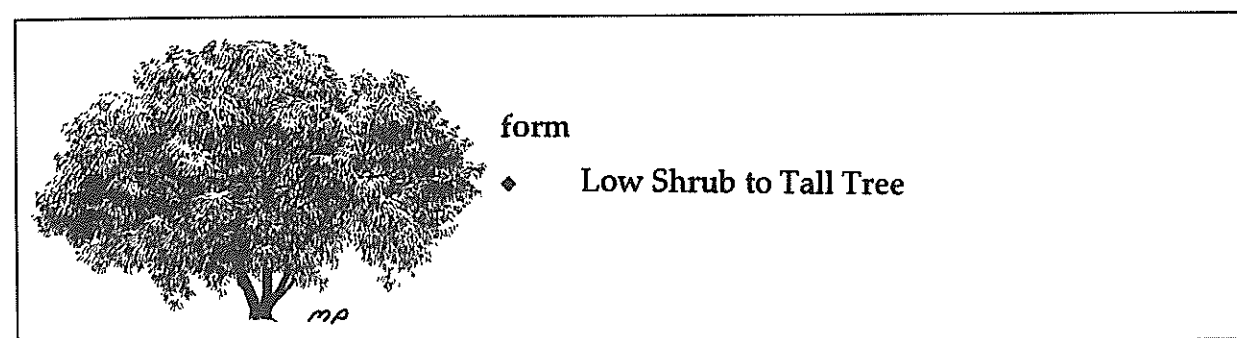
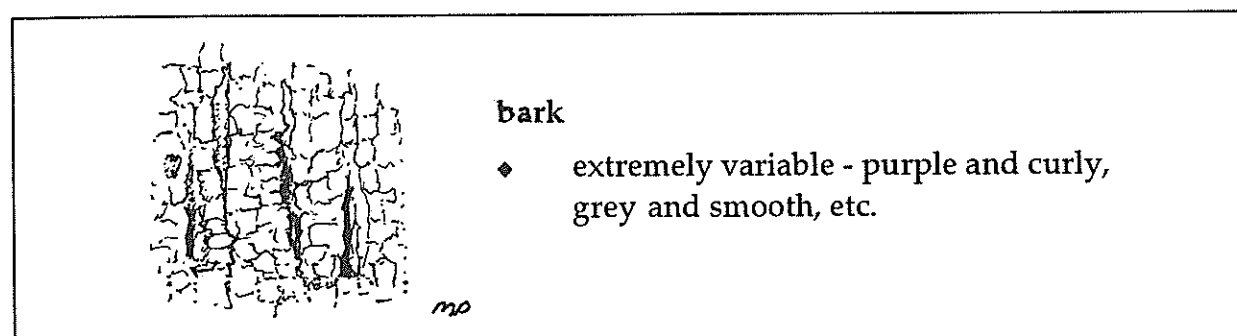
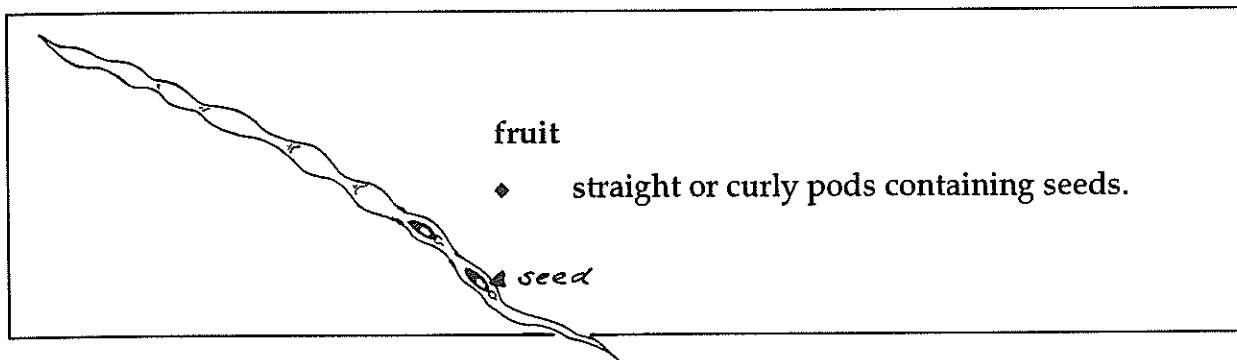
flowers

- ◆ yellow colour is due to the stamens
- ◆ grow in heads which may either be in a ball shape or long and finger-like with few to many tens of flowers in each head
- ◆ each individual flower has five minute sepals and five minute petals
- ◆ masses of stamens and one style sticking out of the stamens
- ◆ flower heads are grouped in a variety of ways

A single flower

Flower sketch reproduced with permission from Marchant, N.G. et al. (1987)

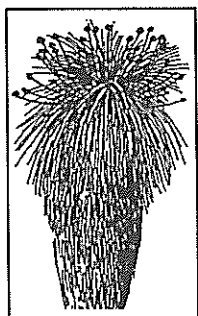
Flora of the Perth Region. Part one. Western Australian Herbarium, Department of Agriculture WA



Example: family:	Mimosaceae
genus:	<i>Acacia</i>
species:	<i>saligna</i>
common name:	Orange Wattle
	Coojong
	Golden Wreath
	Wattle

Background

WHAT IS A KANGAROO PAW?



The Kangaroo Paw is only found growing naturally in Western Australia. The red and green Kangaroo Paw is the State's floral emblem.

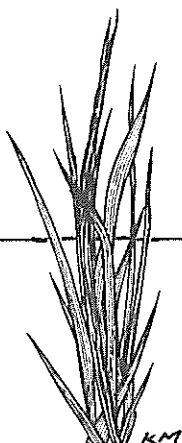
Kangaroo Paw plants grow up to 2 metres tall, with few leaves and very tall flower stalks.

Some smaller species are called Cats Paws.

How to recognise a Kangaroo Paw

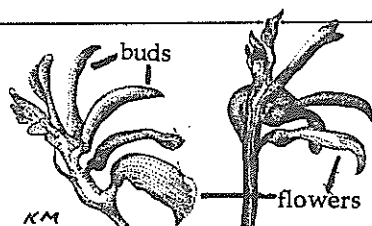


Whole plant of the Red and Green Kangaroo Paw (*Angiozanthos manglesii*)



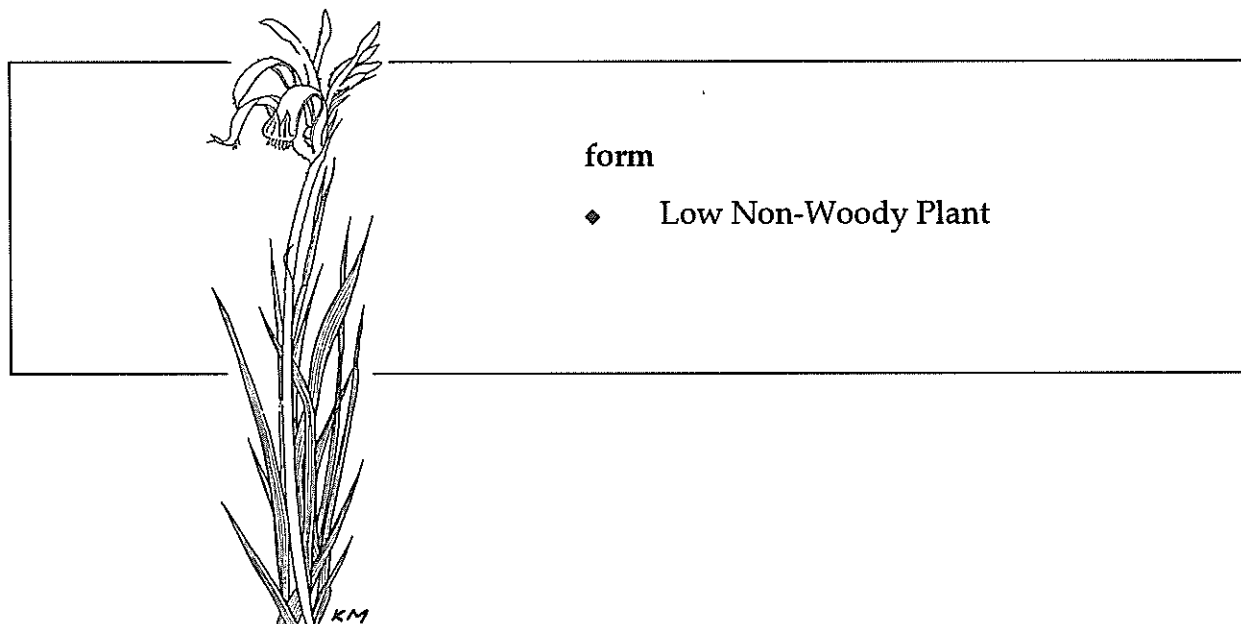
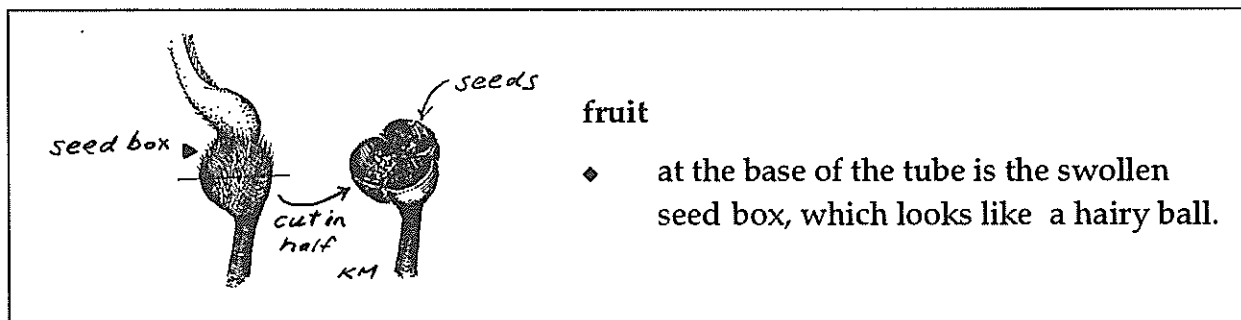
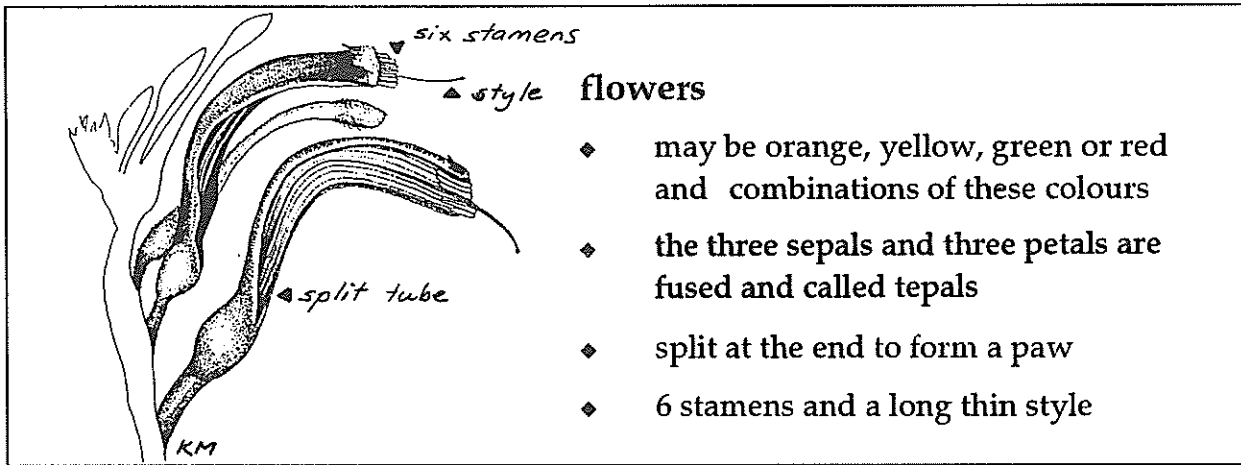
leaves

- ◆ long, strappy, thin and green



buds

- ◆ hairy, long and clustered



Example:	family:	Haemodoraceae
	genus:	<i>Anigozanthos</i>
	species:	<i>manglesii</i>
	common name:	Kangaroo Paw

ACTIVITIES

■ Activity 1.1

JUNIOR
MIDDLE
UPPER

BUSHLAND

SCIENCE
LANGUAGE

GUESTS IN THE BUSHLAND

In this activity students visit some bushland. Before visiting the bushland the students need to know the rules for visitors. They need to learn how to walk through bushland without destroying the living things through which they pass.

Before the class arrives:

1. In a part of the school playground, mark out your area of "bushland" with chalk
2. Place eggshell "homes" in the "bushland" and cover with hessian and leaves
3. In class, discuss your ideas about Rules for Visitors to bushland
4. Invite the group to visit the "bushland". In your invitation, describe how animals live in fragile homes in the bushland litter on the bushland floor. Areas with no litter are free from homes and are the areas you invite your visitors to tread on.

First allow one visitor at a time and then the whole group. Listen to hear if any homes are crushed.

Decide on the best way for a group to visit the bushland without crushing homes.

Decide on a set of rules for your visit to the bushland that will respect the plants and animals that live there all the time.

Resource: *Area of bitumen/paving to set up as the "bushland"*

Leaf Litter

Hessian to cover the area

60 eggshells, washed and stored in the fridge

Chalk

■ Activity 1.2

JUNIOR
MIDDLE
UPPER

LANGUAGE

DISCUSSION

Discuss the saying:

"Take only photographs and leave only footprints."

■ Activity 1.3

POSTER

JUNIOR
MIDDLE
UPPER

LANGUAGE
ART & CRAFT

Prepare a poster to encourage people to care for their bushland by giving positive messages.

For example, how could the "Picking Wildflowers is Prohibited" or "No Littering" or "No Dumping of Rubbish" be turned around into a positive message?

Example: *"Let everyone enjoy the beauty of our native flowers".*

Resource: *Drawing page 7*

■ Activity 1.4

WHAT IS MY BUSHLAND CODE OF CONDUCT?

Resource Sheet 1 page 31

MIDDLE
UPPER

Students read the Bushland Code of Conduct and add their own ideas to it.

LANGUAGE

■ Activity 1.5

EARTH CHARTER FOR PLANT'S RIGHTS

Resource Sheet 2 page 32

UPPER

Read the introductory paragraph of the United Nations Charter of Children's Rights. Have the students write an Earth Charter for Plant's Rights.

LANGUAGE

■ Activity 1.6

BUSHLAND VISIT

Resource Sheet 1 page 31

JUNIOR
MIDDLE
UPPER

Arrange for your group to visit some bushland,

1. Go over the students' "Bushland Code of Conduct" established in Activity 1.4.
2. Walk carefully through the bushland.
3. Search the ground for fallen leaves. Collect 5 different leaves.
4. Find the plant that your leaves come from and smell, feel and look at the fresh leaves on the plant.
5. Arrange with the owners of the bushland to allow the students to collect a variety of leaves and fruits (nuts) for use in Activities 1.7 to 1.11 which you will return after you have used them in the classroom. Emphasise that you have obtained permission to borrow the natural materials and they are to be returned to the bushland as they have a part to play in recycling of materials in the bushland.

BUSHLAND

SCIENCE

■ Activity 1.7

JUNIOR

SCIENCE

LANGUAGE

LEAF STORY

Write an adventure story of your favourite leaf's life. Encourage the students to include the leaf's trip to the classroom and how important it is that the leaf is returned to the bushland.

■ Activity 1.8

JUNIOR

MIDDLE

UPPER

SCIENCE

MATHEMATICS

SORTING FRUIT

Make a class collection of fruits (nuts) of native plants and sort them into sizes and shapes.

Resource: *Fruits (nuts)*

Glossary page 320

■ Activity 1.9

JUNIOR

MIDDLE

ART & CRAFT

PAINT PRINTS

Collect a variety of leaves and paint onto one side with thinned paint. Press the leaf onto a piece of paper and remove. You should see the veins of the leaf showing. You can make gift wrapping if tissue paper is used.

Resource: *Leaves*

Thinned paint

■ Activity 1.10

JUNIOR

MIDDLE

UPPER

BUSHLAND

ART & CRAFT

LEAF PRINT BORDER

Students to collect about 15 leaves from bushland floor or native plants in the school grounds. On a piece of paper, glue them to form a border, or make contact prints as in Activity 1.9.

Photocopy each page and you will have a set of native plant borders to be used for art, creative writing, etc.

Resource: *Leaves*

Glue

Extension: *The original page can be used as a class display, perhaps with a student's drawing of a Eucalyptus flower, for example, inside the border.*

■ Activity 1.11

BUSHLAND STORY

JUNIOR
MIDDLE
UPPER

LANGUAGE
SCIENCE

1. Draw the shapes of your bushland leaves on coloured paper.
2. Cut out the leaves and make a border around a piece of paper.
3. Write a draft story about your visit to the bushland and the different plants you saw. Write your good copy on the page with the border.

Resource: *Leaves*

■ Activity 1.12

FLOWER SKETCH

JUNIOR
MIDDLE
UPPER

ART & CRAFT
SCIENCE

One flower is put in the middle of a small group. Look at the finite detail of the flower. The students are to draw the flower including as many details as possible. (Note: a sketch may be all that is necessary as colouring in often spoils their efforts!)

Resource: *Flower of native plant.*

Background pages 10 -17

Glossary under 'Flowers'

■ Activity 1.13

GETTING TO KNOW A WHAT? *Resource Sheet 3 page 35*

JUNIOR
MIDDLE

BUSHLAND

ART & CRAFT

Photocopy Resource Sheet 3 onto an A3 sheet: one sheet per group of students.

Students go outside with crayons and paper, and make leaf rubbings and bark rubbings.

Cut out the rubbings and glue onto A3 sheet to make a collage of different leaf and bark rubbings.

Glue the leaf rubbings onto the branches and bark rubbings onto the trunks and branches.

Resource: *Crayons*

Extension: *Draw a picture of yourself on a piece of paper. Cut this out and paste it under the tree.*

■ Activity 1.14

WHAT'S A GUM TREE?

Resource Sheet 4 page 36

JUNIOR
MIDDLE
BUSHLAND

LANGUAGE
SCIENCE

Students find a Gum Tree, examine its leaves, trunk and bark, buds, flowers and fruit and record their findings.

Resource: *Background: "What is a Eucalypt?" pages 10 - 11*

Extension: *Modify the recording sheet to repeat for Banksia, Wattle, Kangaroo Paw or other local plant species.*

■ Activity 1.15

GETTING TO KNOW MY GUM TREE

Resource Sheet 5 page 37

JUNIOR
MIDDLE
UPPER
BUSHLAND
SCIENCE
LANGUAGE

Students examine their gum tree and report their findings.

Resource: *Background "What is a Eucalypt?" pages 10 - 11.*

Extension: *Design a similar sheet and repeat for Banksia, Wattle, Kangaroo Paw (see Background pages 12 - 17) or other local plant species.*

■ Activity 1.16

RAINBOW SERPENT

JUNIOR
MIDDLE
UPPER

BUSHLAND

SCIENCE
MATHEMATICS
LANGUAGE

1. Read or tell the story "Rainbow Serpent" by Dick Roughsey to students.
2. Make up a story about how you discovered the Rainbow Serpents scales that fell off.
3. Give students rainbow chips - coloured slips of card cut from colour paint charts.
4. Visit local urban bushland to find these colours in the environment.
5. Create a painting of the local area using the colours you have discovered.

Resource: *Rainbow chips*

■ Activity 1.17

ARTIST'S PALETTE

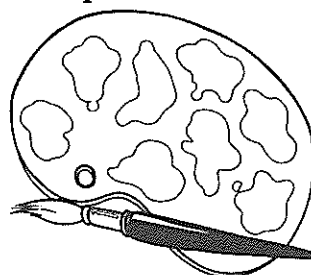
Resource Sheet 6 page 39

JUNIOR
MIDDLE
UPPER

BUSHLAND

ART & CRAFT

Students colour in an artist's palette to show those colours seen in the bushland.



■ Activity 1.18

PLANT TYPES

JUNIOR
MIDDLE
UPPER

BUSHLAND

SCIENCE

Students examine the different plants in an area defined by a hoop. Discuss how many different species (kinds) of plants there are within it. What differentiates each kind of plant? Using the plants' characteristics to help identification, students give each species of plant a name. Students record each plant by sketching it and colouring it in.

■ Activity 1.19

MINI-BEAST HUNT

Resource Sheet 7 page 40

JUNIOR
MIDDLE
UPPER

BUSHLAND

SCIENCE
ART & CRAFT

Students search for as many different kinds of insects in an area defined by a hoop. Students draw them and do research to identify them. Find out about unusual features to report back to the class. For example, bull ants spray their nests with antiseptic.



■ Activity 1.20

ANT EXPLORER

JUNIOR
MIDDLE

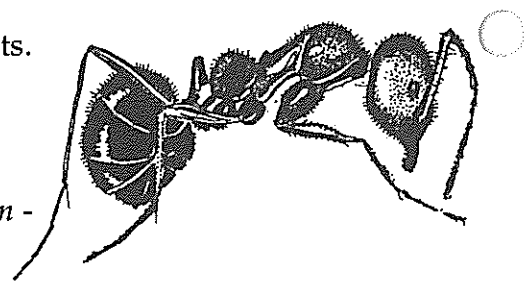
BUSHLAND

LANGUAGE

Read the poem "Ant Explorer" to the students.

The Ant Explorer by C.J. Dennis

Once a little sugar ant made up his mind to roam -
Too far away, far away, far away from home.
He had eaten all his breakfast, and he had his Ma's consent
To see what he should chance to see and here's the way he went -
Up and down a fern frond, round and round a stone,
Down a gloomy gully where he loathed to be alone,
Up a mighty mountain range, seven inches high,
Through the fearful forest grass that nearly hid the sky,
Out along a bracken bridge, bending in the moss,
Till he reached a dreadful desert that was feet and feet across.
Twas a dry, deserted desert, and a trackless land to tread;
He wished that he was home again and tucked-up tight in bed.
His little legs were wobbly, his strength was nearly spent,
And so he turned around again and here's the way he went -
Back away from desert lands feet and feet across,
Back along the bracken bridge bending in the moss,
Through the fearful forest grass, shutting out the sky,
Up a mighty mountain range seven inches high,
Down a gloomy gully, where he loathed to be alone,
Up and down a fern frond and round and round a stone.
A dreary ant, a weary ant, resolved no more to roam,
He staggered up the garden path and popped back home.



Students use a length of string to define an ant explorer trail and describe the trail to the other students telling them what they have discovered along the way.

■ Activity 1.21 | DRAMA

JUNIOR
MIDDLE

LANGUAGE
MUSIC &
MOVEMENT

- a. You are an ant living in a nest. Mime your ant nest as it is prodded by students with a stick.
- b. Mime your ant nest being threatened by a bush-fire.
- c. Role play aborigines hunting for food.
- d. Role play a group of European explorers describing and experiencing the bush for the first time.

■ Activity 1.22 | TEXTURE RUBBINGS

JUNIOR
MIDDLE

BUSHLAND

MATHEMATICS
LANGUAGE
ART & CRAFT
SCIENCE

Using paper and crayon, collect texture rubbings. Back in the classroom, classify these into different textures and label them. Headings could include rough, bumpy, spotted, lined etc.

■ Activity 1.23 | NATURE'S NOISES

JUNIOR
MIDDLE
UPPER

BUSHLAND

SCIENCE
MUSIC &
MOVEMENT

Students put on a blindfold and sit and listen for sounds. Emphasise the need to listen to the small sounds, the distant sounds as well as the close sounds.

Discuss the sounds.

Resource: *Blindfolds*

■ Activity 1.24 BLINDFOLD WALK

JUNIOR
MIDDLE
UPPER

BUSHLAND

SCIENCE

One student leads their partner to a tree or shrub and helps them to explore it through the senses of feeling and smell. They then take the blindfolded person back to the starting point. The blindfolded person is uncovered and tries to find the shrub or tree that they were led to by touch and smell. Partners change over.

Resource: *Blindfolds*

■ Activity 1.25 LIFE BEAT

JUNIOR

BUSHLAND

SCIENCE
LANGUAGE
MUSIC &
MOVEMENT

Students find a tree and put their ear to the bark.

Encourage the students to listen to the internal noises of the tree. Can they hear the branches creaking, or the sap moving inside the tree?

Have the students make the sounds they heard. With the other students in the class, or in a group, make a tree symphony.

■ Activity 1.26 SKETCH

JUNIOR
MIDDLE
UPPER

BUSHLAND

SCIENCE
MATHEMATICS
ART & CRAFT

Students sketch a tree, a shrub and a non-woody plant found in the bushland. They should include as much detail as possible eg: the leaf shape, the flower, the shape of the branches, the position of branches.

■ Activity 1.27 WEAVING

JUNIOR
MIDDLE

BUSHLAND

HEALTH
ART & CRAFT

Students weave using natural objects - sticks, leaves, gumnuts. Show the students how to care for the environment by collecting these items off the ground, rather than off the tree. Use wool to weave objects together. Students could be asked to bring in a small, forked branch to weave in.



■ Activity 1.28

SCRATCH AND SNIFF

JUNIOR
MIDDLE
UPPER

Students dip a piece of stick into a magic potion (water) and scratch the surfaces of leaves, bark and soil, and sniff.

Resource: *Twigs*

Magic potion (water) in an interesting bottle

BUSHLAND

SCIENCE

■ Activity 1.29

TEXTURE

JUNIOR
MIDDLE
UPPER

Students make a large line drawing of three different-shaped tall trees they can see and go to the trunk of each tree and do a bark rubbing on to the trunk in their drawing.

When colouring in the leaves, students should take notice of the variety of colours on the one tree.

BUSHLAND

ART & CRAFT
SCIENCE

■ Activity 1.30

SORTING OUT PLANTS

JUNIOR
MIDDLE
UPPER

Students sort a collection of fruits (nuts), or leaves, bark, flowers, buds into groups and discuss why they have grouped them in the way they did.

Resource: *Collection of fruits, leaves, bark, flowers, buds.*

Glossary under 'Fruit' and 'Flowers'

SCIENCE
MATHEMATICS

Extension: *Students match fruits, leaves, bark, flowers, buds.*

■ Activity 1.31

LEAF CLASSIFICATION

Resource Sheet 8 page 41

MIDDLE

Students randomly select 15 leaves from different places in the area and:

BUSHLAND

a. Record information on Resource Sheet 8.

b. Sort the 15 leaves according to their characteristics.

SCIENCE
MATHEMATICS

Resource: *15 leaves (measure them on the tree or collect them off the ground)*

■ Activity 1.32 ADJECTIVES POEM

MIDDLE
UPPER

BUSHLAND

LANGUAGE

In the bushland, students select a plant and choose two adjectives to describe each of the following:

♦ sight ♦ smell ♦ touch ♦ sound

Students write up the words as a sensory poem either individually or in groups.

■ Activity 1.33 SKELETONS IN THE BUSHLAND

MIDDLE
UPPER

BUSHLAND

SCIENCE
LANGUAGE

Students look for evidence of mini-beasts, eg: leaf skeletons from leaf cutters, galls from insects. Follow up your findings with some library research. Present your research to the class in a three minute talk.

■ Activity 1.34 FLOWER MATHS

MIDDLE
UPPER

SCIENCE
MATHEMATICS
ART & CRAFT

Students examine the flowers of a variety of plants in the study area and complete the following activities:

- a. Sketch the shape of each flower. List the geometric shapes that you can see.
- b. Count the number of petals in each flower.
- c. Do any of the flowers grow in clusters? How many flowers are there in each cluster?
- d. Can you find any flowers with lines of symmetry? Sketch and show the symmetry.
- e. Do the shapes of any of the flowers tessellate? Draw a tessellating pattern to prove this.

■ Activity 1.35 RARE SPECIES LETTER

UPPER

BUSHLAND

SCIENCE
SOCIAL STUDIES
LANGUAGE

Students research rare/endangered species of plants in Western Australia. Write a letter to the Kings Park Board, Department of Conservation and Land Management for information, posters, etc.

-
- **Activity 1.36** **BUSHLAND ADVENTURE IN KINGS PARK**
- MIDDLE
UPPER**
- SCIENCE
SOCIAL STUDIES*
- Students experience a guided sensory exploration of shrubs, trees, animals, insects, soil and fungi in a natural recycling environment which illustrates how a bushland develops.
- Contact Kings Park Board for details and bookings.
-
- **Activity 1.37** **"DISCOVERING HILLS FOREST" EXCURSION**
- UPPER**
- SCIENCE
SOCIAL STUDIES
HEALTH
LANGUAGE*
- The Department of Conservation and Land Management organises the "Discovering Hills Forest" activities which are designed for Year 6 and 7 students. Guided tours are conducted by CALM officers.
-
- **Activity 1.38** **TREE MATHS** *Resource Sheet 9 page 42*
- UPPER**
- BUSHLAND**
- MATHEMATICS*
- Students estimate the height of a tree using the following instructions:
- Take one friend, a pencil, a metre rule or a tape measure. Ask your friend to stand facing you in front of the tree which you want to measure.
- Stand quite a distance away from the tree and hold the pencil out in front of you. Line up the top of the pencil with the top of the tree. Place your thumb on the pencil to mark the bottom of the tree.
- Turn the pencil so that it is lying down. Keep your thumb lined up with the base of the tree. Ask your friend to walk to the side. Shout stop when your friend is in line with the top of the pencil.
- Measure the distance (or count the paces) from your friend to the base of the trees. This is how tall your tree is.
- Resource:** *Pencil
Tape measure/metre rule*
-
- **Activity 1.39** **CREATIVE WRITING**
- UPPER**
- BUSHLAND**
- LANGUAGE*
- Have the students prepare a piece of writing to show their appreciation of the beauty of the area that they have just visited. Choose haiku, cinquain or acrostic form.

■ Activity 1.40

DESIGN YOUR OWN NATURE TRAIL

UPPER

BUSHLAND

SCIENCE

SOCIAL STUDIES

MATHEMATICS

In groups, students identify important components of a National Park. They should think of at least five.

Students find an area in the bush with at least five interesting features, make a boundary with a large skipping rope and use popsticks to locate these features. Take a visitor on a guided tour of the park. Collect up all the popsticks and rope at the end of the activity.

Resource: *Ropes*

Popsticks

■ Activity 1.41

LEAF MATHS

UPPER

BUSHLAND

SCIENCE

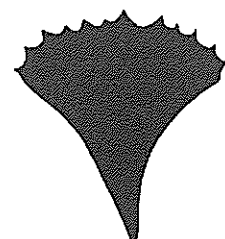
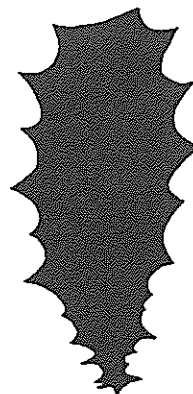
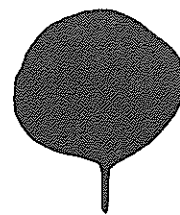
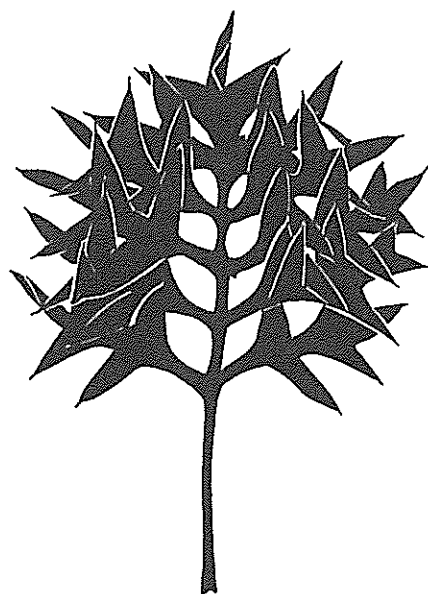
MATHEMATICS

ART & CRAFT

Students make a collection of leaves from the study area and complete the following activities:

- Sketch the shape of each leaf. List the geometric shapes they can see.
- Can you find any leaves with lines of symmetry?
- Do any of the leaves tessellate? Prove this with a drawing.
- Find the area and perimeter of each leaf. Use your calculator to work out the ratio of A:P (A divided by P). Investigate.
- Measure the length and width of each leaf.

leaves of
some wild
plants



Resource Sheet 1

■ Activity 1.4 WHAT IS MY BUSHLAND CODE OF CONDUCT? page 20

My Bushland Code of Conduct

1. I care for the bushland and want to save it for tomorrow (my future)!
2. I stay on tracks and never take "short cuts".
3. I look at the bushland, but try hard not to disturb any native animals, plants, rocks, timber and soil.
4. I never leave my rubbish in the bushland. I take out any litter that I find in the bushland if I can carry it.
5. I should report all fires, weeds, feral animals or dumped rubbish to the carer or owner.
6. All gates are left as they are found.
7. Before I enter the bushland area, I always get permission from the owner.

My Bushland Pledge:



Signed: _____

Date: _____

Resource Sheet 2

■ Activity 1.5 EARTH CHARTER FOR PLANT'S RIGHTS

page 20

The following passage has been adopted by the United Nations General Assembly to outline the fundamental rights of the child. Read the passage carefully and use it as a model for writing an Earth Charter for Plant's Rights.

United Nations Declaration of the Rights of the Child

THE General Assembly of the United Nations proclaims this Declaration of the Rights of the Child to the end that he may have a happy childhood and enjoy for his own good for the good of society rights and freedoms herein set forth, and calls upon parents, upon men and women as individuals, and upon voluntary organisations, local authorities and national Governments to recognise these rights and strive for their observance by legislative and other measures progressively taken in accordance with the following principles:

◆ PRINCIPLE 1.

The child shall enjoy all the rights set forth in this Declaration. All children, without any exception whatsoever, shall be entitled to these rights, without distinction or discrimination on account of race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status whether of himself or his family.

◆ PRINCIPLE 2.

The child shall enjoy special protection, and shall be given opportunities and facilities, by law and other means, to enable him to develop physically, mentally, morally, spiritually and socially in a healthy and normal manner and in conditions of freedom and dignity. In the enactment of laws for this purpose, the best interests of the child shall be the paramount consideration.

◆ PRINCIPLE 3.

The child shall be entitled from his birth to a name and a nationality.

Resource Sheet 2 *continued*

■ Activity 1.5 EARTH CHARTER FOR PLANT'S RIGHTS

page 20

◆ PRINCIPLE 4.

The child shall enjoy benefits of social security. He shall be entitled to grow and develop in health; to this end, special care and protection shall be provided both to him and to his mother, including adequate pre-natal and post-natal care. The child shall have the right to adequate nutrition, housing, recreation and medical services.

◆ PRINCIPLE 5.

The child who is physically, mentally or socially handicapped shall be given the special treatment, education and care required by his particular condition.

◆ PRINCIPLE 6.

The child, for the full and harmonious development of his personality, needs love and understanding. He shall, wherever possible, grow up in the care and under the responsibility of his parents, and in any case, in an atmosphere of affection and of moral and material security; a child of tender years shall not, save in exceptional circumstances, be separated from his mother. Society and the public authorities shall have the duty to extend particular care to children without a family and to those without adequate means of support. Payment of state and other assistance towards the maintenance of children of large families is desirable.

◆ PRINCIPLE 7.

The child is entitled to receive education, which shall be free and compulsory, at least in the elementary stages. He shall be given an education which will promote his general culture, and enable him on a basis of equal opportunity, to develop his abilities, his individual judgement, and his sense of moral and social responsibility, and to become a useful member of society. The best interests of the child shall be the guiding principle of those responsible for his education and guidance; that responsibility lies in the first place with his parents. The child

Resource Sheet 2 continued

■ Activity 1.5

EARTH CHARTER FOR PLANT'S RIGHTS

page 20

shall have full opportunity for play and recreation, which should be directed to the same purposes as education; society and the public authorities shall endeavour to promote the enjoyment of this right.

◆ PRINCIPLE 8.

The child shall in all circumstances be among the first to receive protection and relief.

◆ PRINCIPLE 9.

The child shall be protected against all form of neglect, cruelty and exploitation. He shall not be the subject of traffic, in any form. The child shall not be admitted to employment before an appropriate minimum age; he shall in no case be caused or permitted to engage in any occupation or employment which would prejudice his health or education, or interfere with his physical, mental or moral development.

◆ PRINCIPLE 10.

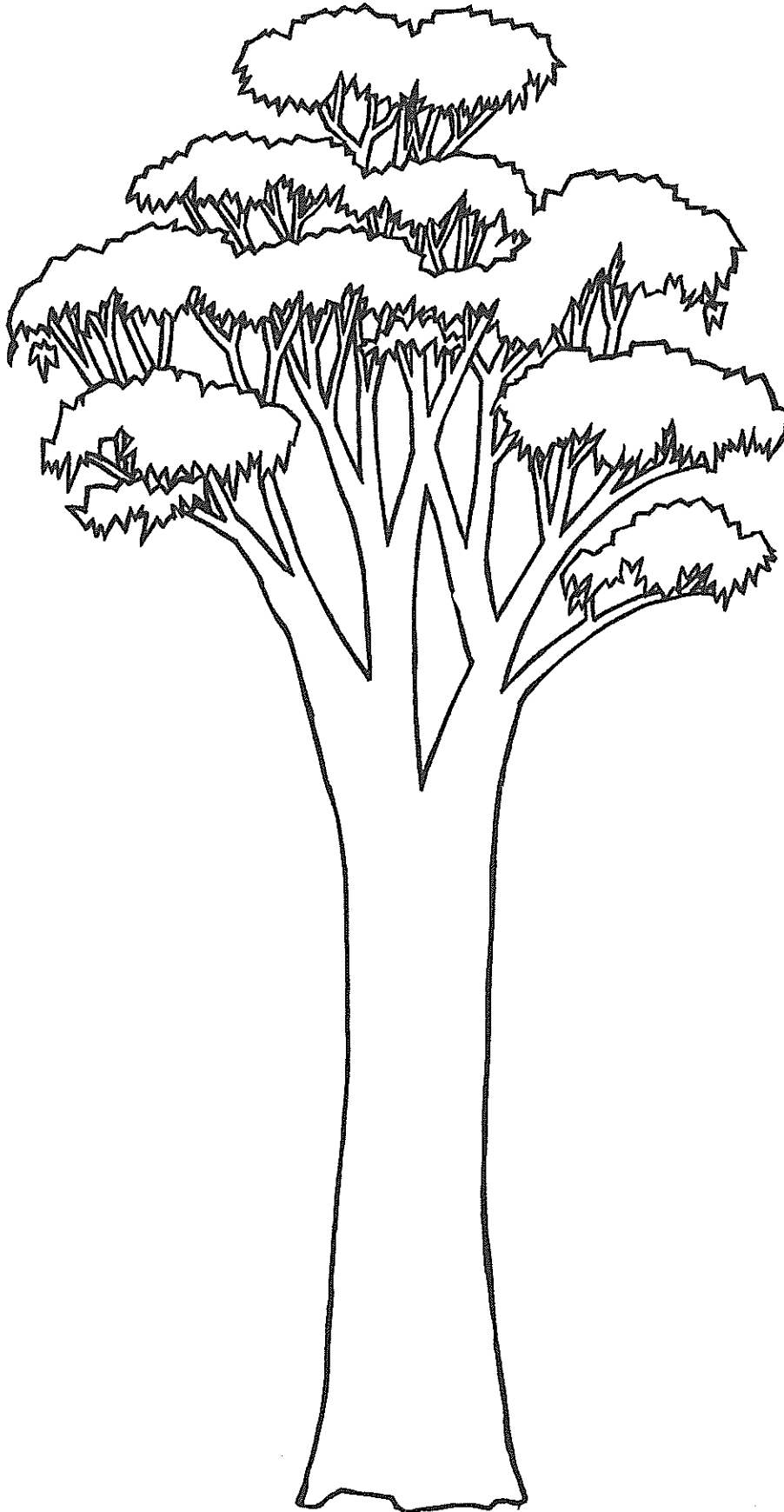
The child shall be protected from practices which may foster racial, religious and any other form of discrimination. He shall be brought up in a spirit of understanding, tolerance, friendship among peoples, peace and universal brotherhood, and in full consciousness that his energy and talents should be devoted to the service of his fellow men.

UN Yearbook 1959, pp. 192-199.

Resource Sheet 3

■ Activity 1.13 GETTING TO KNOW A WHAT?

page 22



Resource Sheet 4

■ Activity 1.14 WHAT'S A GUM TREE?

page 22

Before you start this ACTIVITY you need:

INFORMATION SHEET, a pen, coloured pencils
- and your eyes, ears and nose.

To do this ACTIVITY you need to:

1. FIND a gum tree.
2. LOOK at the tree's leaves, trunk and bark and its buds, flowers and fruit if it has these parts.

LEAVES

Crush a leaf with your fingers.

The crushed leaves smell like...

.....
(choose from eucalyptus oil or pine needles)

DRAW or STICK
a leaf here

BUDS

FIND the cup and the cap.

DRAW a fruit and colour
it correctly.

FLOWERS

The flowers on my gum tree are coloured...

RUB your cheek on some of the flowers.

My tree's flowers feel on my cheek.

Try to COLLECT some nectar from the cups in your hand.

The nectar tastes

..... I think the nectar

would be food for

FRUIT (gumnuts)

My gum tree's fruit are too

..... for me
to bite (choose from hard or soft). Parrots
have strong
to open them to get out the seeds
to eat (choose from beaks or feet).

DRAW them and colour them correctly.

TRUNK

HUG your tree.

I need to hug my tree

..... times to go
right around its trunk.

My tree is best described as a

.....
(choose from tree or mallee)

BARK

RUB your
hands over the bark.

The bark on my gum tree
feels

.....
(choose from rough, smooth, prickly or your
own words)

Reprinted with permission from "The Gum Tree Pack"
by M. Pieroni and B. Keighery (1989)

Resource Sheet 5

■ Activity 1.15 GETTING TO KNOW MY GUM TREE

page 23

Marri

Eucalyptus
calophylla

Marri is one of the tree's aboriginal names. An English botanist, Robert Brown, collected the plant near Albany in 1801 and later gave it its scientific name. Marri is named scientifically for its leaves *calos* (beautiful), and *phyllon* (leaf), that is *Eucalyptus calophylla* R. Br.

Appearance

Marri is a medium sized to tall tree, up to 40m, or a mallee with a dense, branched crown. The trunk is covered in a thick layer of short flaked, grey-brown bark. Fires leave black charred patches on the trunks which persist for many years. When the bark is damaged, the tree weeps a dark red "gum" (kino) which solidifies into a solid shiny mass (hence another common name, the Red Gum). The large leaves are glossy green on the upper surface and dull green on the lower. New growth has red branchlets and bronze-green leaves.

Buds and Flowers

A few months before flowering, masses of green buds form in large heads at the ends of the branches. In February to March the expanding cream, or more rarely pink, stamens push off the caps.

Fruit (gumnuts)

Marri fruit are very variable in size, ranging from 1cm to 5cm in diameter. The green fruit ripen to grey-brown and most drop their seed and fall before the next year's flowering. Much of the fruit is lost to parrots (twenty eights, red caps and black cockatoos) when it is still green. Many trees have carpets of half eaten green nuts under them after visits from parrots. Marri fruit are commonly known as honkey nuts.

Growing Marri

Seed falls readily from ripe fruit that is allowed to dry. The large fertile black seeds are the largest of any eucalypt (up to 2cm long). Seeds germinate in 7 to 14 days when two reddish-green leaves appear. Seedling leaves are skirted around the leaf stalk and covered in reddish hairs as are the stems. Marri leaves, especially young leaves, are eaten by a variety of insects. The most impressive of these are the spitfires (the caterpillars of sawflies) that congregate on branches during the day and move on to feed at night. Often as these clumps make their way to the ground to pupate, they spit at any disturbance. *Lyctus* borers (beetles) attack the wood just below the bark, leaving characteristic tracks.

Getting to know my gum tree ...

You will need:
a pen
coloured pencils
ruler

Use the information to complete most of the activity sheet then find one of your trees in the bush or garden to complete the activity.

My gum tree's name

My gum tree's common name (like your nickname) is

Its special botanical name is

because it has

What does my gum tree look like?

To COLOUR your picture, first find the parts below, ticking each box as you find the part.

I found these parts of my gum tree ...

leaves	<input type="checkbox"/>	buds	<input type="checkbox"/>	flowers	<input type="checkbox"/>	fruit	<input type="checkbox"/>
a cap	<input type="checkbox"/>	a cup	<input type="checkbox"/>	a baby tree or seedling	<input type="checkbox"/>		

The colours of these parts are ...

leaves
bud caps
bud cups
flowers (stamens)
bark
sprout leaves
seedling leaves

The ripe fruit are generally brown.

Now COLOUR your PICTURE correctly.

How does my gum tree grow?

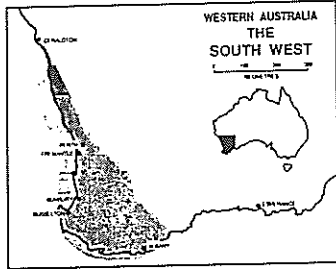
My gum tree grows to be metres tall. I am metres tall.

To be as tall as my tree I would need to stack people of my height.

My tree has trunks so it is best described as a

Reprinted with permission from "The Gum Tree Pack"
by M. Pieroni and B. Keighery (1989)

page 23



Using grid paper draw a map of the area in which you live, including your house. Mark with a ▲ your gum tree growing in a bushland area near you. Work out the scale of your map. To see if your tree is found in bush close to your house use a ruler and the scale on the map to complete the following.

**I would have to travelkms to find some of my gum trees growing in the bush. It would be best to travel by
(choose from foot, bicycle, car, train or aeroplane)**

TAKE your coloured drawings and these sheets and see if you can FIND ONE OF YOUR TREES in the bush or a garden.

I found my tree growing

My tree had grown from a seed that had

(choose from either "been planted by someone" or "fallen from a tree")

All trees are different — DRAW your tree here.

Many trees are planted in unsuitable places such as too near houses and under wires.

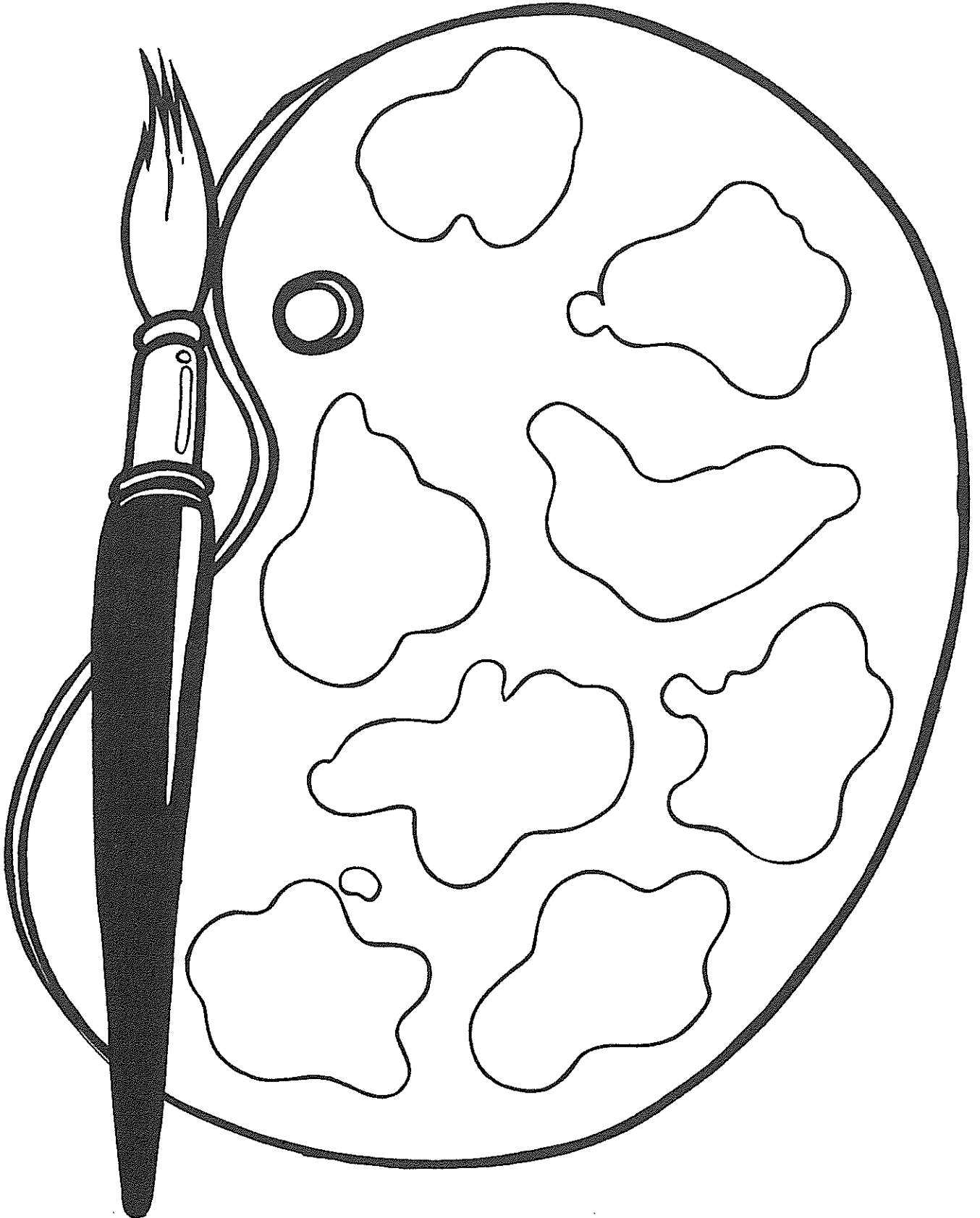
DESCRIBE any problems the tree may have as it grows.

Reprinted with permission from "The Gum Tree Pack"
by M. Pieroni and B. Keighery (1989)

Resource Sheet 6

■ Activity 1.17 ARTIST'S PALETTE

page 23



Resource Sheet 7

■ Activity 1.19 MINI-BEAST HUNT

page 24

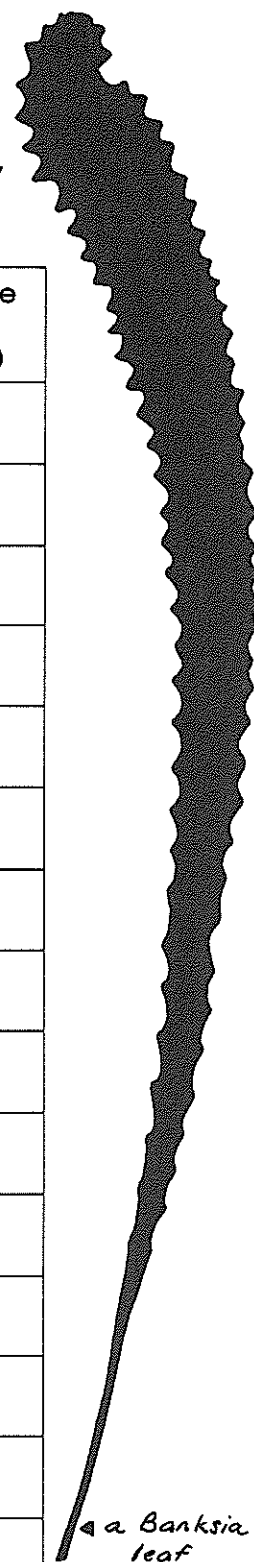
Name	Picture
Name	Picture
Name	Picture
Name	Picture
Name	Picture
Name	Picture

Resource Sheet 8

■ Activity 1.31 LEAF CLASSIFICATION

page 27

	leaf edge	colour	veins	shape	length (cm)	width (cm)	surface area (cm ²)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							



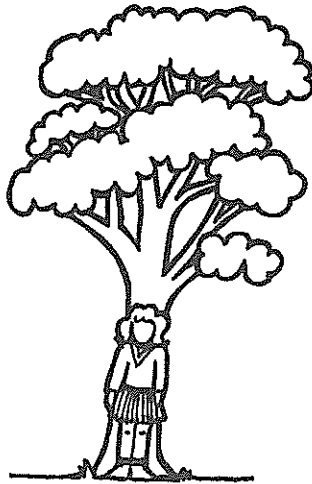
- Measure the length and width of the leaves.
- Sort 15 leaves according to their characteristics.
- How many different groups did you find?
- Are there some leaves that you cannot sort into groups?
- Can you think of any other ways to sort these 15 leaves?
What are they?

Return the leaves to the area they came from.

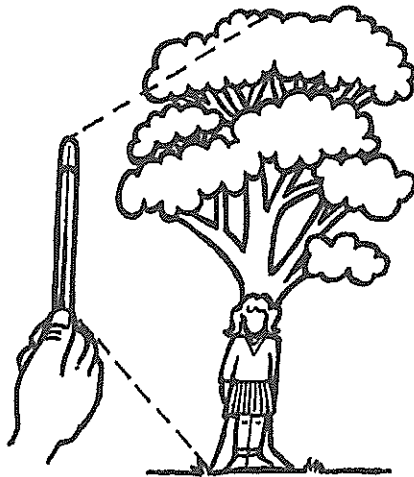
Resource Sheet 9

■ Activity 1.38 TREE MATHS

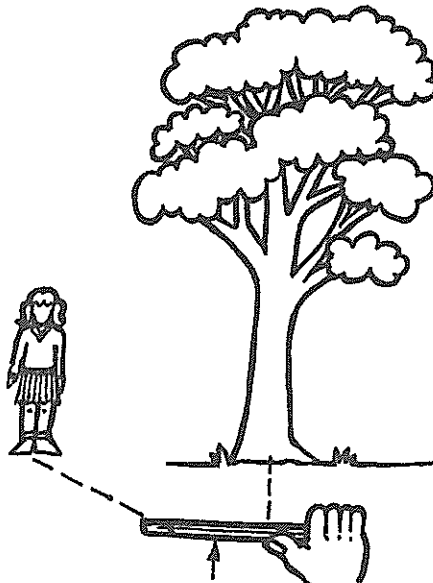
page 29



Take one friend, a pencil, a metre rule or a tape measure. Ask your friend to stand facing you in front of the tree which you want to measure.



Stand quite a distance away from the tree and hold the pencil out in front of you. Line up the top of the pencil with the top of the tree. Place your thumb on the pencil to mark the bottom of the tree.



Turn the pencil so that it is horizontal. Keep your thumb lined up with the base of the tree. Ask your friend to walk to the side. Shout stop when your friend is in line with the top of the pencil.

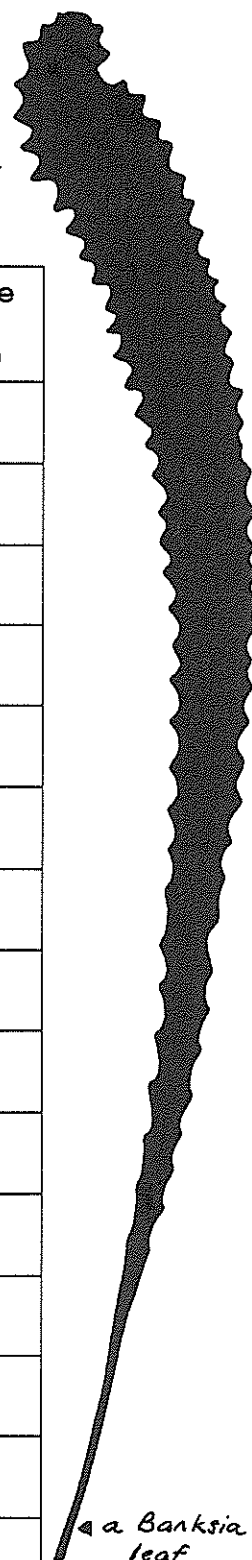
Measure the distance (or count the paces) from your friend to the base of the tree. This is how tall your tree is.

Resource Sheet 8

■ Activity 1.31 LEAF CLASSIFICATION

page 27

	leaf edge	colour	veins	shape	length (cm)	width (cm)	surface area (cm ²)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							



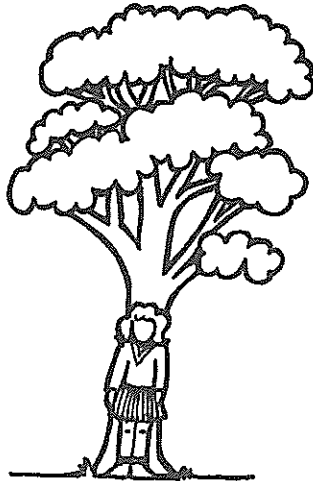
- Measure the length and width of the leaves.
- Sort 15 leaves according to their characteristics.
- How many different groups did you find?
- Are there some leaves that you cannot sort into groups?
- Can you think of any other ways to sort these 15 leaves?
What are they?

Return the leaves to the area they came from.

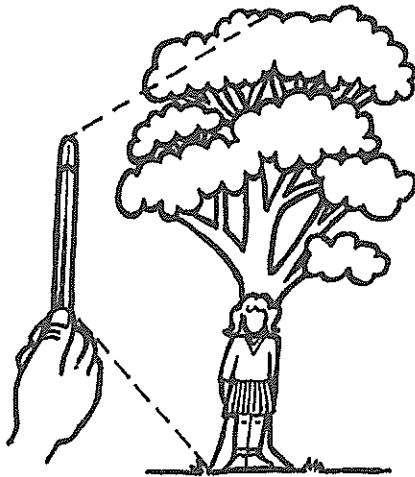
Resource Sheet 9

■ Activity 1.38 TREE MATHS

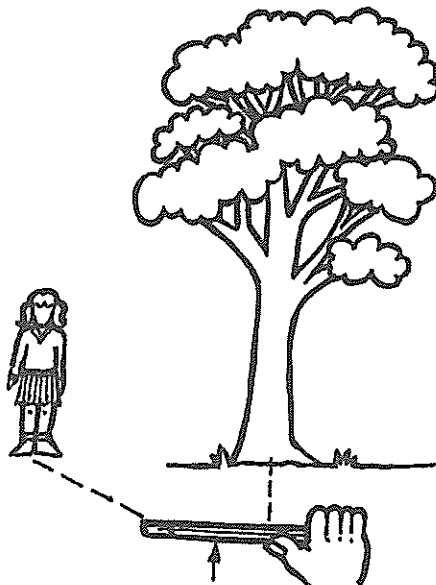
page 29



Take one friend, a pencil, a metre rule or a tape measure. Ask your friend to stand facing you in front of the tree which you want to measure.

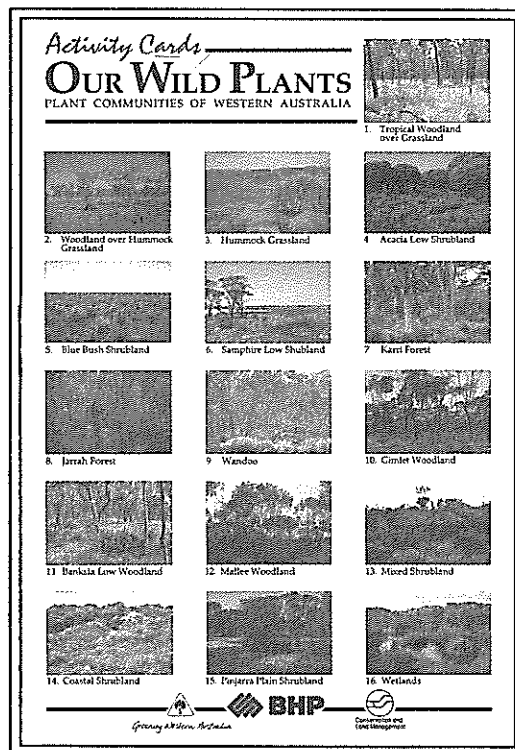


Stand quite a distance away from the tree and hold the pencil out in front of you. Line up the top of the pencil with the top of the tree. Place your thumb on the pencil to mark the bottom of the tree.



Turn the pencil so that it is horizontal. Keep your thumb lined up with the base of the tree. Ask your friend to walk to the side. Shout stop when your friend is in line with the top of the pencil.

Measure the distance (or count the paces) from your friend to the base of the tree. This is how tall your tree is.



PART TWO

WILD PLANTS LIVING TOGETHER

ACTIVITY			YEAR LEVEL			CURRICULUM						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
2.1	Movement	57	●								●	
2.2	Layers in the Bush	57	●	●		●			●			●
2.3	Thirds	57	●	●		●			●			●
2.4	Shapes	57	●	●					●			●
2.5	Concentration	58	●	●					●			
2.6	Story	59	●	●						●		
2.7	Mime	59	●	●							●	
2.8	Animal Homes	59	●	●		●			●			
2.9	Brainstorm	59	●	●	●					●		
2.10	Dictionary	60	●	●	●					●		●
2.11	Jigsaw	60	●	●	●	●						●
2.12	Woody or Non-Woody	60	●	●	●	●				●		
2.13	Cooking Up Some Bushland	60		●	●	●			●	●		●
2.14	Painting Words	61		●	●				●			●
2.15	Matching Statements	61		●						●		
2.16	Landscape Look Out	61		●		●			●			●
2.17	Research	61		●	●	●	●			●		
2.18	In The Bush	62		●	●	●						●
2.19	Kings Park Excursion	62		●	●	●	●					
2.20	Ratios	62		●	●	●			●			
2.21	Climate Maps	63		●	●	●	●			●		
2.22	Bio-Climates	63		●	●	●	●			●		
2.23	Fauna Research	63			●	●	●			●		
2.24	Vegetation Map	64			●	●	●		●	●		

ACTIVITY			YEAR LEVEL			CURRICULUM						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
2.25	Vege Game	64			●		●		●			
2.26	Soils Ain't Soils	65			●	●	●		●			
2.27	Compare and Contrast	65			●	●						
2.28	Kings Park Excursion	65			●	●	●					
2.29	Plot Sample	65			●	●	●					
2.30	Transect	66			●	●	●		●			●
2.31	Leaf Shapes	66			●	●			●			
2.32	Structured Line Drawing	66			●							●
2.33	Plant Coverings	66			●	●			●			

Activity Cards

OUR WILD PLANTS

PLANT COMMUNITIES OF WESTERN AUSTRALIA



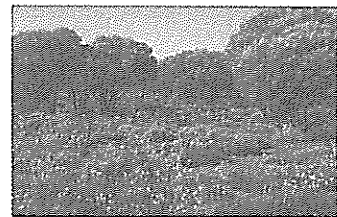
1. Tropical Woodland over Grassland



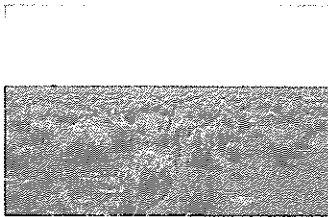
2. Woodland over Hummock Grassland



3. Hummock Grassland



4. Acacia Low Shrubland



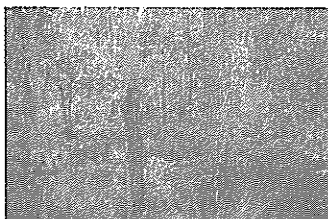
5. Blue Bush Shrubland



6. Samphire Low Shrubland



7. Karri Forest



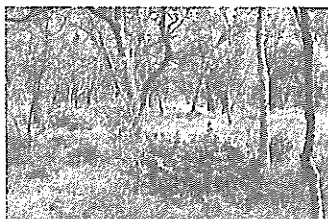
8. Jarrah Forest



9. Wandoo Woodland



10. Gimlet Woodland



11. Banksia Low Woodland



12. Mallee



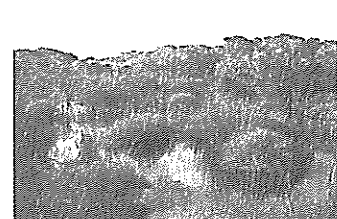
13. Mixed Shrubland



14. Coastal Shrubland



15. Pinjarra Plain Shrubland



16. Wetlands



Greening Western Australia

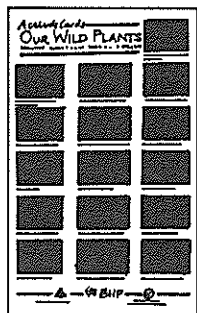


BHP



Conservation and
Land Management

Background



COMMUNITIES OF WILD PLANTS

A community of people is a group of different people living together in one locality, using the same shops, water supply, roads and so on. A community of wild plants is much the same; different plants living together in one locality, using the same soil, air, water supply and sunlight. All plants need sunlight, soil, air and water. The wild plant communities have been growing together for so long that they now live in harmony, efficiently using all available sunlight and water.

Our bushland is made up of communities of wild plants. To understand wild plant communities, we need to look at how the plants live and grow together. Botanists have decided that a good way to study plant communities is to look at:

1. PLANT LIFE FORM

How each plant grows, including its height, shape and life span.

2. PLANT DENSITY

How closely the plants grow together.

3. PLANT DIVERSITY

How many different plants grow together.

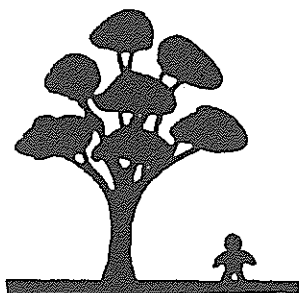
1. PLANT LIFE FORM

Wild plants can be divided into two groups:

- a. **Woody plants** - trees and shrubs, stems and branches strengthened with wood.
- b. **Non-woody plants** - herbs, sedges and grasses, soft and flexible stems and branches.

These groups can be further divided to give the most common life forms in Western Australia.

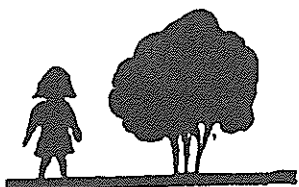
WOODY PLANTS



Trees: Plants with a trunk and canopy. The canopy is less than or equal to $\frac{2}{3}$ of the height of the trunk. No lignotuber.



Mallee: A plant with many trunks, arising from a lignotuber.



Shrubs: Plants with one or many woody stems. Foliage all or part of the total height of the plant.



Creepers and Climbers:
Plants that support on other plants or creep along the ground.
Can be woody or non-woody.

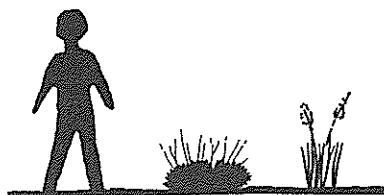
The trees and shrubs are further divided according to their height.

Trees: Tall Trees (greater than 30 metres tall) - Medium Trees (10 - 30 metres tall) - Small Trees (less than 10 metres tall)

Shrubs: Tall Shrubs (greater than 1 metre tall) - Low Shrubs (less than 1 metre tall)

These are represented in diagrammatic form on Resource Sheet 31 on page 90.

NON-WOODY PLANTS



Grass: A plant with jointed stems and long, narrow leaves. Grasses are uncommon in most south-west plant communities, but common in the north-west. All have inconspicuous flowers that are pollinated by wind.

Hummock Grass:

Perennial grasses forming dome-shaped hummocks.



Bunch Grass:

Annual or perennial grasses that spread or clump.



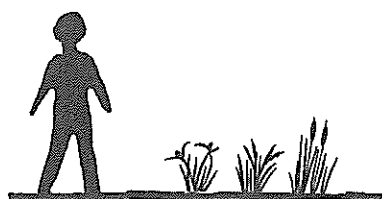
Herb:

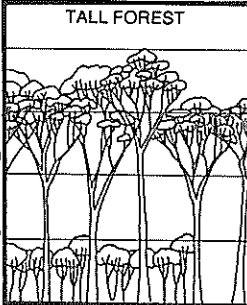
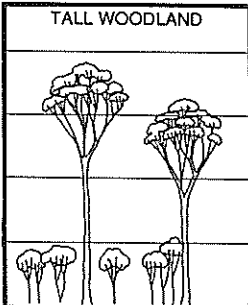
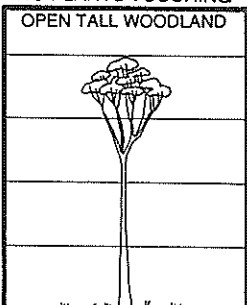
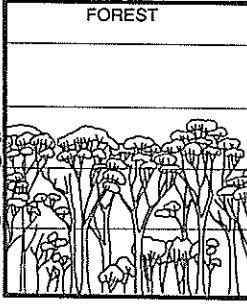
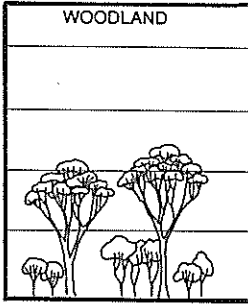
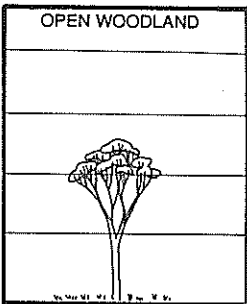
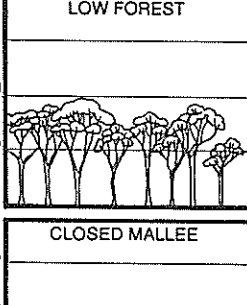
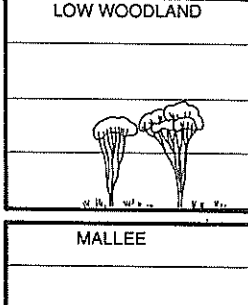
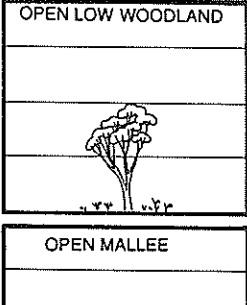
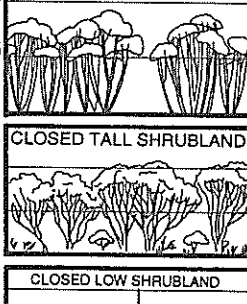
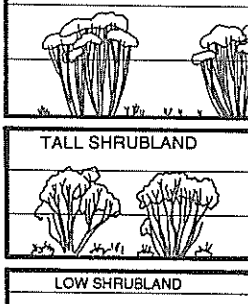
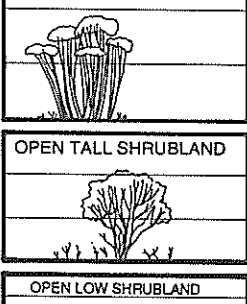
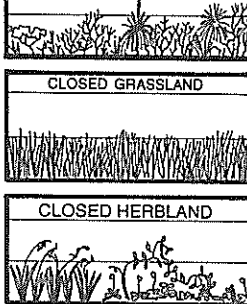
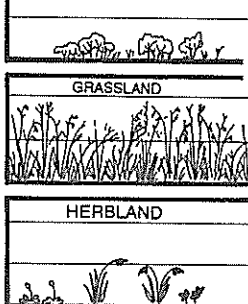
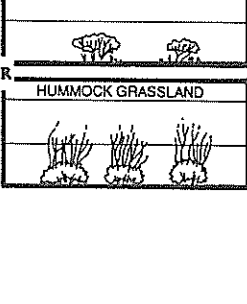
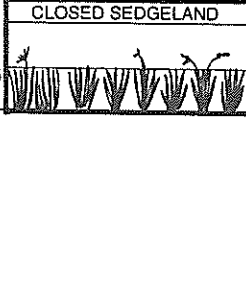
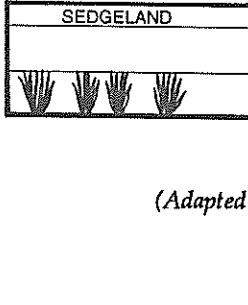
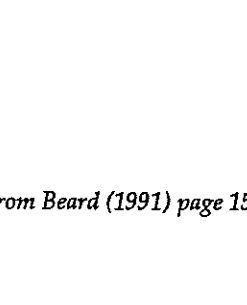



Annual or perennial plants with soft stems. Generally under one-half metre high. Includes most monocotyledons, except grasses, Palms and Grass Trees (Blackboys). Grass Trees are placed with Shrubs, and Palms are placed with Shrubs or Trees.



Sedge or Grass-Like Plants:

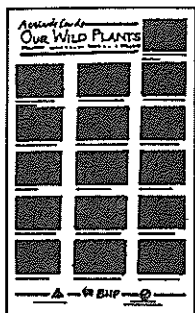
Tufted or spreading plants from the group Sedges, Rushes, Bullrushes and Xyridaceae. Many have inconspicuous flowers that are pollinated by wind.



PLANT COMMUNITIES - Choosing a name			
LIFE FORM OF TALLEST LAYER	HOW CLOSE THE WILD PLANTS GROW		
	MOST PLANTS TOUCHING	FEW PLANTS TOUCHING	NO PLANTS TOUCHING
TALL TREES Greater than 30m	TALL FOREST 	TALL WOODLAND 	OPEN TALL WOODLAND 
MEDIUM TREES 10-30m	FOREST 	WOODLAND 	OPEN WOODLAND 
LOW TREES Less than 10m	LOW FOREST 	LOW WOODLAND 	OPEN LOW WOODLAND 
MALLEE Less than 10m	CLOSED MALLEE 	MALLEE 	OPEN MALLEE 
TALL SHRUBS Greater than 2m	CLOSED TALL SHRUBLAND 	TALL SHRUBLAND 	OPEN TALL SHRUBLAND 
LOW SHRUBS Less than 2m	CLOSED LOW SHRUBLAND 	LOW SHRUBLAND 	OPEN LOW SHRUBLAND 
GRASSLAND Less than 1m	CLOSED GRASSLAND 	GRASSLAND 	OR HUMMOCK GRASSLAND 
HERBLAND Less than 0.5m	CLOSED HERBLAND 	HERBLAND 	
SEDGELAND Less than 0.5m	CLOSED SEDGELAND 	SEDGELAND 	

(Adapted from Beard (1991) page 15)

Background



In each plant community the different life forms tend to occur in layers. The tallest layer, or **overstorey**, is generally made up of a tree layer. The layers underneath are called the **understorey**. This may include layers of various sized shrubs and layers of herbs, grasses and sedges.

All life forms and all layers do not necessarily occur in each community.

2. PLANT DENSITY

When surveying plant density the leaf cover of each layer of the plant community or individual species is estimated. The following categories refer to the foliage cover of the plants in each layer of the community. This table has been modified from that of John Beard's Vegetation Survey of Western Australia (1991).

FOLIAGE COVER	
Practical Description	Percentage Cover
Foliage of most plants touching	30 - 70%
Foliage of few plants touching	10 - 30%
Foliage of no plants touching.	less than 10%

This is represented in diagrammatic form on the page opposite.

3. PLANT DIVERSITY

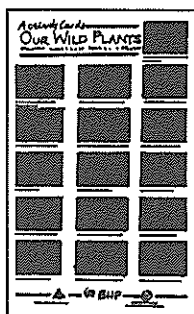
Many different plants grow in each community. However when describing a community in words only the names of the dominant plants are commonly included. The dominant plants are the tallest and/or most common plant in each layer. For example:

Karri Forest: Activity Card 7

or

Jarrah Forest: Activity Card 8

Background



ACTIVITY CARDS

A series of 16 Activity Cards have been produced to develop students understanding of the variety of plant communities and the associated ecosystems that occur within Western Australia.

They can be used alone or in conjunction with the activities of this section to investigate Wild Plants Living Together.

The specific objectives of the activities are to:

- ◆ understand the intrinsic value of the uniqueness of wild plants
- ◆ appreciate the aesthetic nature of our wild plants
- ◆ understand the interdependence between plants and animals
- ◆ understand the need for bio-diversity
- ◆ identify local flora and fauna
- ◆ identify the adaptations in the environment

HOW TO USE THE CARDS

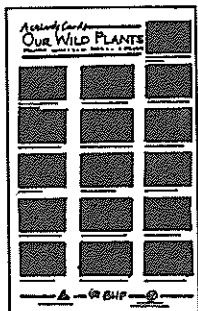
There are many ways to use these study cards in your educational program. Below are some suggestions.

- ◆ Select the card from your area as a starting point
- ◆ Focus questions and cards may be used as a guide - feel free to use the ones that suit the children's and your own needs
- ◆ Compare and contrast from your environment
- ◆ Use in groups/ whole class/ individuals
- ◆ Establish learning centres/ study stations
- ◆ Initiating research
- ◆ Focus on element, eg: colour, storey layer, diversity, habitats.

FOCUS POINTS FOR ACTIVITY CARDS

- ◆ Colours and shapes
- ◆ Diversity and interaction of plants
- ◆ Storey layer
- ◆ Links of vegetation to climate
- ◆ Plant density
- ◆ Soil
- ◆ Range of habitats
- ◆ Special features
- ◆ Compare and contrast with other plant communities

Background



TEACHERS' NOTES

Junior Primary

- ◆ Explain the concepts of the range of plants living in a community, and how they can provide homes for animals.

Middle Primary

- ◆ Explain *tree, shrub, vegetation, woody and non-woody plants*.
- ◆ Introduce the concept of vegetation layers and where they are found.

Upper Primary

- ◆ Discuss the words *storey, transect, vegetation*.
- ◆ Explain the terms: *Woody Plants, Tall Trees, Low Trees, Tall Shrubs, Low Shrubs*
Non-woody plants, Herbs, Grass-like Plants, Grasses.



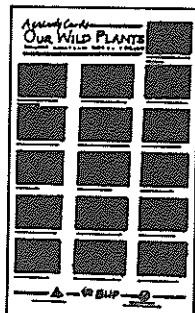
*a bushland silhouette ►
made using silhouettes
on pages 77-80
as in Activity 2.13*

FURTHER ACTIVITIES

The following series of activities have been developed to further the use of the Activity Cards in the classroom and in bushland.

Each activity develops the students' knowledge and attitudes in relation to the plant communities of Western Australia.

Background



ACTIVITY CARDS

Discussion Questions

These questions relate directly to the Activity Cards and can be used as a basis for class discussion or as a worksheet.

Colours and Shapes

- ◆ How many colours (or shades, hues of a colour) can you see in this photo?
- ◆ What colours (and shapes) can you see? Make a list.
- ◆ Identify the different sizes/colours/shapes in the plant community.
- ◆ Why do you think the plants are the sizes/colours/shapes they are?
- ◆ What evidence is there of colour/shape adaptation in this picture?

Diversity and Interaction of Plants

- ◆ Count the different plants. How many different plants can you find?
- ◆ How many different kinds of leaf shapes can you see?
- ◆ What kinds of animals (including insects and birds) do you think would like to live here? Support your argument.
- ◆ Look at the twigs and branches of a tree. Do they all come from the same spot? Are they all the same length and thickness?
- ◆ Name any of the plants in the picture.

Storey Layer

- ◆ Is there more sky or more land in the picture? Why?
- ◆ Do all plants grow to the same height?
- ◆ Identify the various vegetation layers on the card.
- ◆ What do you see in each vegetation layer? (upper/middle/lower).

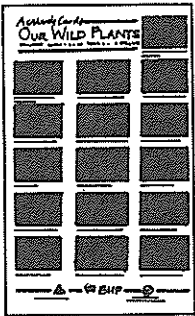
Plant Density

- ◆ Can you see a long way through the bush? Why?
- ◆ If you were an explorer would this be an easy piece of bush to explore? Give reasons for your answer.

Soil

- ◆ Can you see any bare soil? Why?

Background



Links of Vegetation to Climate

- ◆ If you were here what would you be wearing? Why?
- ◆ How do you think this scene would look during another season?
- ◆ Is the picture taken in the flowering season?
- ◆ When do plants normally flower? Why?

Range of Habitats

- ◆ What homes for animals can you see in this picture?

Special Features

- ◆ What strange or unusual thing can you see in this picture?
- ◆ What evidence can you see of human disturbances?
- ◆ The land formation affects the vegetation. Comment on what you can see.
- ◆ How do you think the plants feel to touch?
- ◆ What evidence is there of new growth?
- ◆ What evidence is there of the life cycle of plants?
- ◆ What living things could take advantage of the different stages of this cycle?

Compare and Contrast with Other Plant Communities

- ◆ What is different about the bush in this picture compared with the bush that you know?
- ◆ What is the same?
- ◆ Discuss areas where you have seen this type of vegetation before.

Knowledge

- ◆ Imagine that you are an animal in this environment. Where would you live and why?
- ◆ How would you prepare yourself to explore this bush?

Attitudes

- ◆ Is this a beautiful place? Why/why not?
- ◆ If you were in this picture, how would you feel?
- ◆ When you look at this picture, write down your feelings, using describing words that come into your mind.
- ◆ If you went camping in this area, how could you make sure that you took only photographs and left only footprints?



ACTIVITIES

■ Activity 2.1

JUNIOR

MUSIC
&
MOVEMENT

MOVEMENT

Students are the plants in the bush. They move at three levels (representing the three major levels of understorey). Some students are woody plants and others are non-woody plants. A group of students is the wind and the rest of the class react to the strength of the wind, remembering to keep their roots in the ground!

■ Activity 2.2

LAYERS IN THE BUSH

Resource Sheet 10 page 67

Photocopy Resource Sheet 10 and give one to each student. The picture has three layers of vegetation marked with a bold line. Select a group of students to colour in one layer only. Another group can do the second layer and the third group can do the third layer.

When the activity is complete, the students will be able to see the different layers in the bush.

■ Activity 2.3

THIRDS

Resource Sheet 10 page 67

JUNIOR
MIDDLE

Cut the outline on Resource Sheet 10 into three horizontal sections representing the three main vegetation layers. Students re-assemble the outline and colour them in when complete.

SCIENCE
MATHEMATICS
ART & CRAFT

Resource: *Activity Cards*

Extension: *Use more than one outline card, cut into vegetation layers and mix up. Students rebuild each card correctly. Note that there may only be one or two vegetation layers in some plant communities. Make mix and match books for other groups to try.*

■ Activity 2.4

SHAPES

Resource Sheet 11 page 68

JUNIOR
MIDDLE

Students cut and paste shapes from Resource Sheet 11 to create a collage of the environment shown in the Activity Cards and colour in the shapes.

MATHEMATICS
ART & CRAFT

Resource: *Activity Cards*

■ Activity 2.5

JUNIOR
MIDDLE

MATHEMATICS

CONCENTRATION

Resource Sheets 12 - 15, 20 - 23 pages 69, 77

Photocopy Resource Sheets 12, 13, 14 and 15 onto cards. You will need one sheet between two students. Cut out the cards which the students colour in. Divide the class into groups of four. Present each group with a pack of 16 cards, making sure there is an even number of each plant in each pack. Shuffle the cards and turn them upside down. Place them in rows of four.

Taking it in turns, each student picks up one card and then another. If they are the same, they keep them. If not, they are turned over, put back in exactly the same place and the next person has their turn. The aim is to remember where a card was so that they can make a match. The winner has the most pairs.

- Extension:**
1. *Using the cards made in the previous activity, the students play "Snap", based upon the vegetation layers. The pairs they make can be called Top, Middle and Bottom. These are the words they will need to call out to win a pair.*
 2. *Students play "Snap", based upon plant form (eg. Tree, Shrub, Herb, Sedge).*
 3. *Students play "Snap" matching the cards with silhouette cards (Resource Sheets 20 - 23)*
 4. *Make up a duplicate set of cards using photos of local plants or illustrations in the glossary under 'Trees', 'Shrubs' and 'Non-Woody' plants.*

■ Activity 2.6

STORY

Resource Sheet 16 page 73

JUNIOR
MIDDLE
LANGUAGE

Choosing an activity card, students write a story about an adventure in the bushland. Focusing on that particular type of bushland. Encourage them to think about where the bushland is and what the weather would be like. Some of the students may have visited these places and could tell the class about it.

Extension: Discuss the Interesting Words Chart (Resource Sheet 16). Students make an acrostic poem from these words.

■ Activity 2.7

MIME

JUNIOR
MIDDLE

MUSIC
&
MOVEMENT

Mime the following plants in the given situations. Use facial expressions to show the feelings of the plants.

- ◆ timber being felled
- ◆ a fire occurs
- ◆ dieback enters the community
- ◆ weeds replace all the herbs
- ◆ the area is bulldozed
- ◆ the area is grazed by rabbits
- ◆ the area is grazed by cattle
- ◆ people trample the plants

○ Activity 2.8

ANIMAL HOMES

Resource Sheet 17 page 74

JUNIOR
MIDDLE

SCIENCE
MATHEMATICS
MOVEMENT

Students match the animals to their homes.

■ Activity 2.9



BRAINSTORM

JUNIOR
MIDDLE
UPPER

LANGUAGE

Students brainstorm descriptive words under headings: size, colour, shape, texture, density.

■ Activity 2.10 JUNIOR MIDDLE UPPER LANGUAGE ART & CRAFT	DICTIONARY <i>Resource Sheet 18 page 75</i> Make a class dictionary/ glossary of key words from the Dictionary on Resource Sheet 18. Students illustrate the meaning of the word and define. Display as chart or book in class.
■ Activity 2.11 JUNIOR MIDDLE UPPER SCIENCE ART & CRAFT	JIGSAW <i>Resource Sheets 19 page 76</i> Each student is to have a picture outline of an Activity Card. One piece will be missing. Students draw the missing vegetation by looking at the Activity Cards and colour in the finished outline. <i>Extension: Use this activity to cover more than one card at a time. Choose the correct piece for each card.</i>
■ Activity 2.12 JUNIOR MIDDLE UPPER BUSHLAND SCIENCE LANGUAGE	WOODY OR NON-WOODY Students collect a small part of a plant from a woody plant and a non-woody plant. Sticky tape these onto two charts labelled Woody Plants and Non-Woody Plants. (Licences, if required, are available from CALM.) <i>Resource: Glossary under 'Trees', 'Shrubs' and 'Non-Woody' plants.</i>
■ Activity 2.13 MIDDLE UPPER SCIENCE MATHEMATICS LANGUAGE ART & CRAFT	COOKING UP SOME BUSHLAND <i>Resource Sheets 20 - 24 page 77 - 81</i> Cut out a recipe for a pair or group of students from Resource Sheet 24. Students cut out the appropriate plants from the silhouettes (Resource Sheets 20 - 23) and glue them onto a sheet. Include the title. When all are complete, students will have examples of all the Activity Cards. <i>Resource: Activity Cards</i> <i>A4 sheet with 20cm base line</i> <i>Extension: (Class Activity) Using Resource Sheets 20 - 23 photocopy one sheet per student. Ask them to cut out the silhouette. Discuss the sizes and compare the shapes of those of the Activity Card. Look for the resemblances. On a few large sheets of paper, ask the students to glue their silhouette to the bottom of the page. The students may work in groups. When finished, ask one student per group to hold up the completed picture. Discuss why they do not all look exactly the same and relate this to the Activity Cards. Students may draw themselves on a separate piece of paper and place themselves in the bushland scenery.</i>

-
- **Activity 2.14** **PAINTING WORDS** *Resource Sheet 25 page 84*
- MIDDLE
UPPER**
- MATHEMATICS
ART & CRAFT*
- Using water colours, students paint the scene from an Activity Card, focusing on shape and colour.
- Students use words from Resource Sheet 25 to write a sentence about their painting.
- Resource:** *Activity Cards*
paint and brushes
-
- **Activity 2.15** **MATCHING STATEMENTS**
- MIDDLE**
-  **LANGUAGE**
- In groups, students work out five statements based on an Activity Card. eg: Wildflowers grow here in spring.
- The teacher collects all the statement sheets and places the Activity Cards along the blackboard ledge.
- Choose a student from each group to read out the statements on their card. The class must try and guess which card it is after all the statements have been read out.
- Resource:** *Activity Cards*
-
- **Activity 2.16** **LANDSCAPE LOOK OUT**
- MIDDLE**
-  **SCIENCE
MATHEMATICS
ART & CRAFT**
- Place the Activity Cards along the blackboard ledge. Look through magazines or calendars to find scenes/pictures that resemble the Activity Cards. Try to make up a class set of new Activity Cards based on magazine pictures.
- Resource:** *Activity Cards*
Magazines
Calendars
-
- **Activity 2.17** **RESEARCH**
- MIDDLE
UPPER**
- SCIENCE
SOCIAL
STUDIES
LANGUAGE**
- In groups, look at an Activity Card and try to work out what type of animals might live in that habitat. Go to the library and research that creature to see if it belongs to the area. If it does, then draw a picture of the creature and write some information about it on a page. When each student has completed their page, make a class booklet and title it "Animals of Western Australian Plant Communities."
- Resource:** *Activity Cards*
-

■ Activity 2.18 IN THE BUSHLAND *Resource Sheets 20 - 23 page 77 - 81*

MIDDLE
UPPER

BUSHLAND

SCIENCE
ART & CRAFT

Students find a place to sit in the bushland. Students look at the bushland and transpose the bushland they see onto an A3 sheet, using the silhouettes on Resource Sheets 20, 21, 22, and 23. Boundaries in the bushland will need to be decided so that a manageable area is covered.

Give your bushland a name. Make a mural of all the A3 sheets on returning to your school.

Resources: *Glue*
Scissors
Paper
A3 sheet of card
Drawing page 53

■ Activity 2.19 KINGS PARK EXCURSION

MIDDLE
UPPER

SCIENCE
SOCIAL
STUDIES

Visit Kings Park Botanic Gardens to study plants from different regions in the gardens and plants from different communities in the glasshouses. Guided tours and activities are provided. Contact Kings Park Board for details.

■ Activity 2.20 RATIOS *Resource Sheets 26 page 85*

MIDDLE
UPPER

SCIENCE
MATHEMATICS

Using a transparent grid overlay, calculate the plant density of different species within the plant community.

Lay the overlay over an activity card and count the squares covering different plant species. Tally results.

Once recorded students can calculate the ratios between the different plant species.

Resource: *Activity Cards*
Overhead of grid overlay

■ Activity 2.21 CLIMATE MAPS *Resource Sheet 27 page 86*

MIDDLE
UPPER

Students map the climatic regions of Western Australia using an atlas. Students find each card location on the bioclimate map and describe the climate features of that area, eg: seasonal change, rainfall, temperature range.

SCIENCE
SOCIAL
STUDIES
LANGUAGE

Research the features of climatic regions.

Resource: *Atlas*

■ Activity 2.22 BIOCLIMATE *Resource Sheet 27 page 86*

MIDDLE
UPPER

Wild plants depend on natural rainfall and sunlight for their survival. The time of the year when the rain comes is very important to how plants grow, flower, set seed and what communities of plants result.

SCIENCE
SOCIAL
STUDIES
LANGUAGE

Photocopy Resource Sheet 27 (Bioclimate Map) and students answer the following questions:

- a. Find the location of your school on the map.
- b. When do you expect rain in your area?
- c. How do you think the rainfall affects plants in your area?
- d. What would happen if there was a flash flood or excessive rainfall?
- e. Study the different areas on the map legend. Discuss.
- f. Using an atlas, turn to the climatic map of the world. Find other countries with similar climate to your own.

Resource: *Atlas*

■ Activity 2.23 FAUNA RESEARCH

UPPER

Students select one card and research the fauna to be found there. They may need help from organisations such as the Department of Conservation and Land Management, Western Australian Naturalist's Club or Western Australian Museum.

SCIENCE
SOCIAL
STUDIES
LANGUAGE

■ Activity 2.24 VEGETATION MAP *Resource Sheet 28 page 87*

UPPER

SCIENCE
SOCIAL
STUDIES
MATHEMATICS
LANGUAGE

John Beard and a few helpers mapped the most common plant communities found throughout Western Australia, prior to clearing. This work took him 25 years! This seems a long time, but when you consider that there are 2,500,000 square kilometres in Western Australia, its not really such a long time.

A vegetation map identifies the most common plant community according to the overstorey in an area. At each place on the map, you would find many different communities.

Photocopy Resource Sheet 28 for students to answer the following questions:

- Discuss latitude and longitude with the class. Choose a few towns from the map and ask the students to work out the latitude and longitude.
- Discuss the map legend. Run through the legend and let the students find an example of each type of vegetation on the map.
- Discuss the points of the compass. Look at NE, SE, NW, SW also. Find your school's location on the map. What would the compass bearing reading be?
- What is the vegetation type for your area? Discuss.
- Discuss the vegetation types in other areas from the students experiences.
- Find the location of the Activity Cards on the Vegetation Map. Compare the photograph with the description.

■ Activity 2.25 VEGE GAME *Resource Sheets 28, 29 pages 87, 88*

UPPER

SOCIAL
STUDIES
MATHEMATICS

Students play the Vege Game.

Rules:

- Station your marker in your home town or city.
- Throw the dice. Whatever number it lands on is the number of centimetres you are to travel across the map.
- Spin the spinner.
- Move the distance shown by the dice in the direction that the spinner stopped.
- On the map legend, tick off the vegetation that you have landed in.

The aim is to see who can cover the most vegetation areas using chance processes.

Resource: *dice spinner (photocopy Resource Sheet 29 on to cardboard. Use a split pin in the centre.*

-
- **Activity 2.26** **SOILS AIN'T SOILS** *Resource Sheet 30 page 89*
- UPPER**
- SCIENCE
SOCIAL
STUDIES
MATHEMATICS
- The soil that plants grow in is important. The soils are just as complicated as the plants and the climate. As a class, look at one small area of the State, ie: the Perth Metropolitan Area.
- With the class:
- discuss the layout of the map
 - find the position of your school on the map
 - go outside and have a look at the natural soils
 - discuss the various soil types and the sorts of plants that might like to live on these soils.
-
- **Activity 2.27** **COMPARE AND CONTRAST** *Resource Sheet 31 page 90*
- UPPER**
- SCIENCE
- Using Resource Sheet 31, students identify the major plant community of each Activity Card.
- Resource:** *Activity Cards*
- Extension:** *Using magazine or calendar pictures, collect examples of each type of plant community.*
-
- **Activity 2.28** **KINGS PARK EXCURSION**
- UPPER**
- SCIENCE
SOCIAL
STUDIES
- Visit Kings Park Glasshouses to study plants from different climate regions. Guided tour and activities provided. Contact Kings Park Board for details.
-
- **Activity 2.29** **PLOT SAMPLE** *Resource Sheet 32 page 91*
- UPPER**
- BUSHLAND
- SCIENCE
MATHEMATICS
LANGUAGE
ART & CRAFT
- Students identify a plot sample by throwing a hoop ahead of them in the bushland. Students list/sketch the different types of plants they find inside the hoop. Students make up their own names to describe the plants and tally the number of each species that can be seen inside the hoop-plot.
- Resource:** *Hoops*

■ Activity 2.30 TRANSECT *Resource Sheet 33, 34 page 92,93*

UPPER

BUSHLAND

SCIENCE

SOCIAL
STUDIES

MATHEMATICS

ART & CRAFT

Make a transect as described in "Mapping a Transect" (Resource Sheet 34). Make a tape measure line from area of low land to high land, or from the ocean's edge or into a wetland.

Sketch/identify/name any species that the string crosses. Teachers may assign groups to different parts of the transect.

■ Activity 2.31 LEAF SHAPES

UPPER

BUSHLAND

SCIENCE

MATHEMATICS

Each student collects two different shaped leaves from the school garden. In groups, they compare the different shapes, sizes, colours, textures and leaf edges and sort the leaves into groups using the above criteria.

Students make a tree graph of their results.

Extension: Make a leaf key. (See *Transition Science*, pp 66-67 and 68-69)

■ Activity 2.32 STRUCTURED LINE DRAWING

UPPER

BUSHLAND

ART & CRAFT

Students make a line drawing of an area of bush. See backs of the Activity Cards for an example. Use coloured pencils to capture the hues of this bushland.

■ Activity 2.33 PLANT COVERINGS *Resource Sheet 35 pages 95,96*

UPPER

BUSHLAND

SCIENCE

MATHEMATICS

Estimate the percentage of plant cover using a Bitterlich Gauge.

Resource: *Bitterlich Gauge*

Resource Sheet 10

- Activity 2.2 LAYERS IN THE BUSH
- Activity 2.3 THIRDS

page 57

page 57

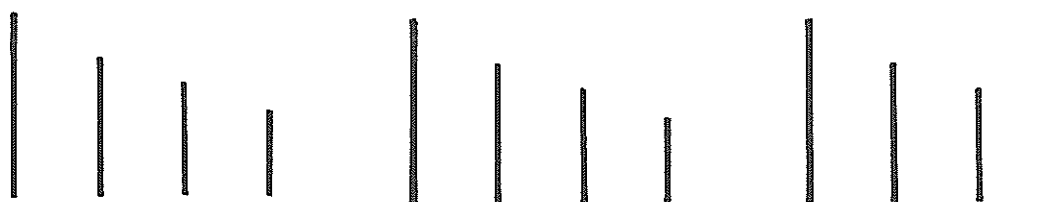
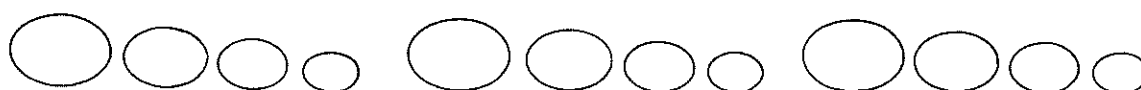
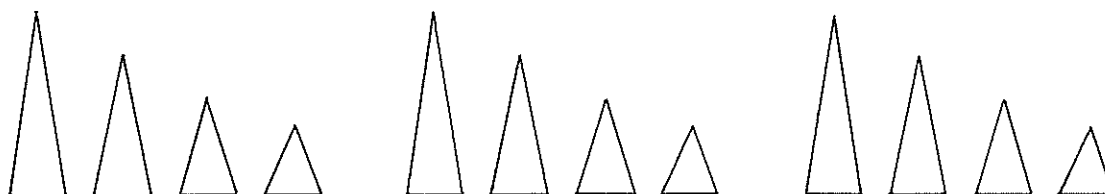
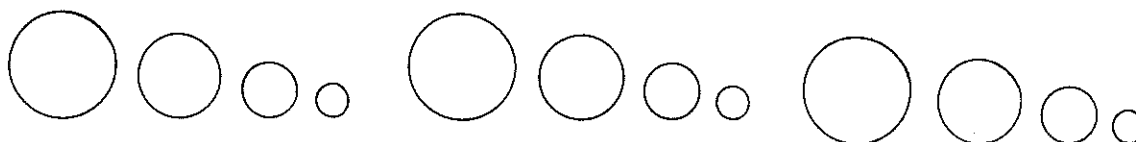
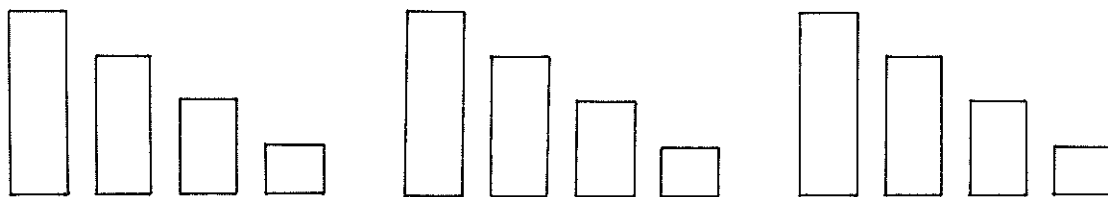


(Activity Cards: Plant Communities of Western Australia – # 7 Karri Forest)

Resource Sheet 11

■ Activity 2.4 SHAPES

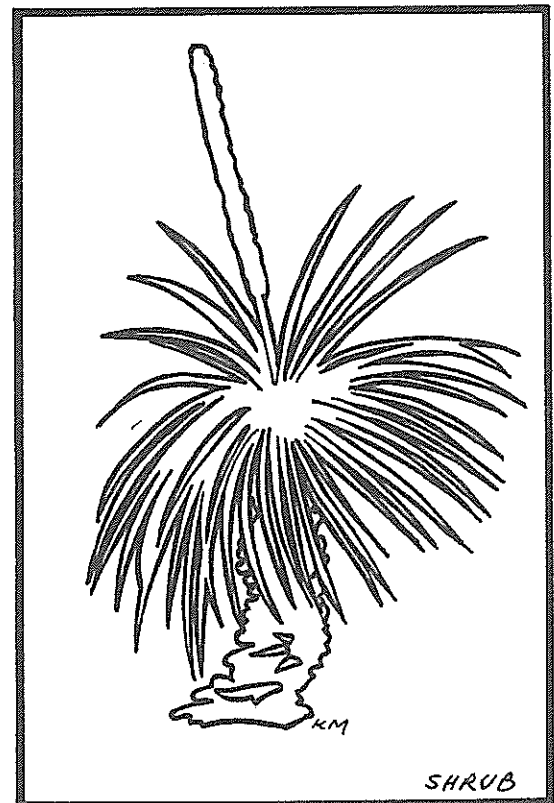
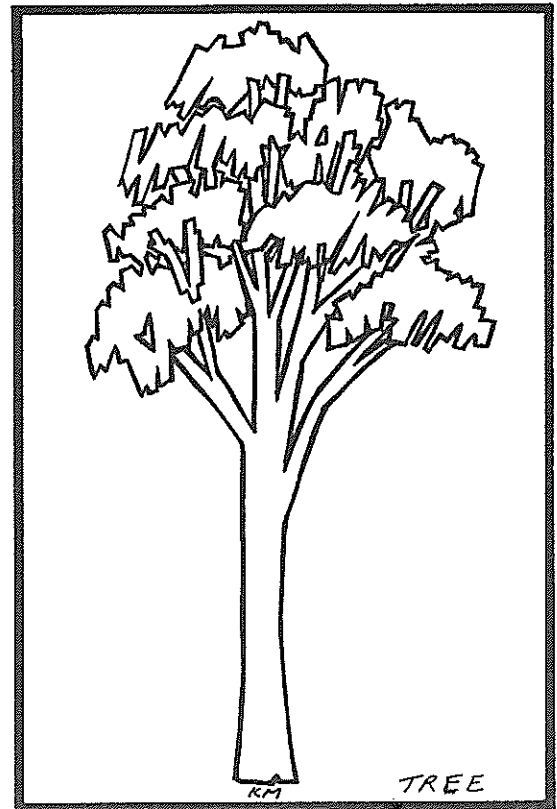
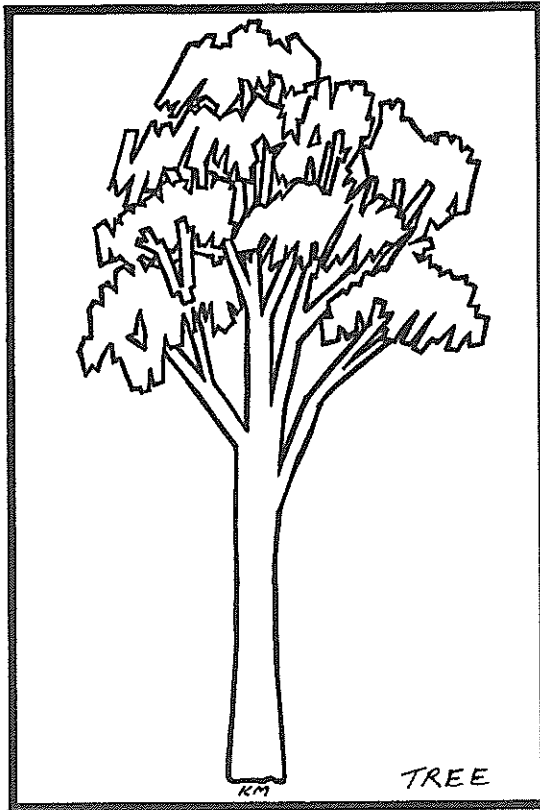
page 57



Resource Sheet 12

■ Activity 2.5 CONCENTRATION

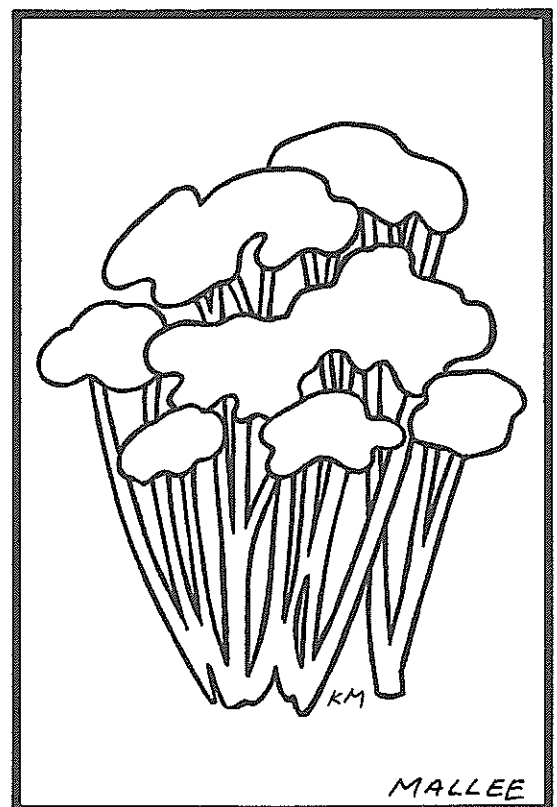
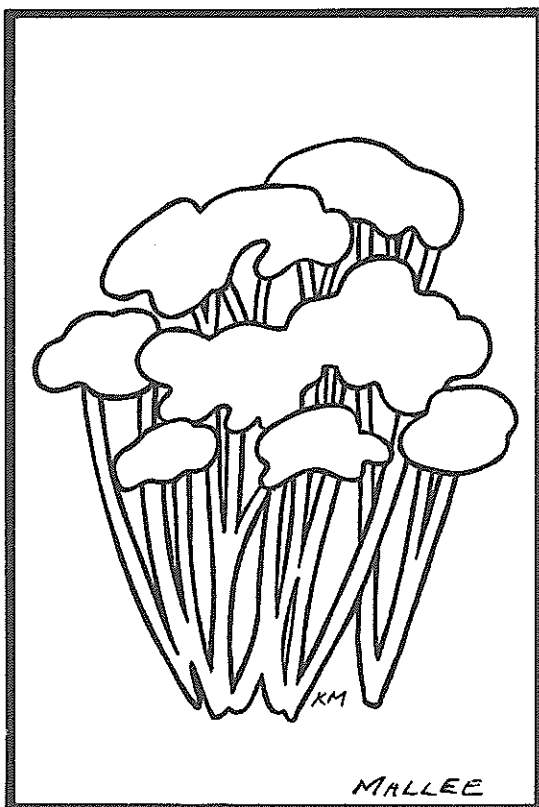
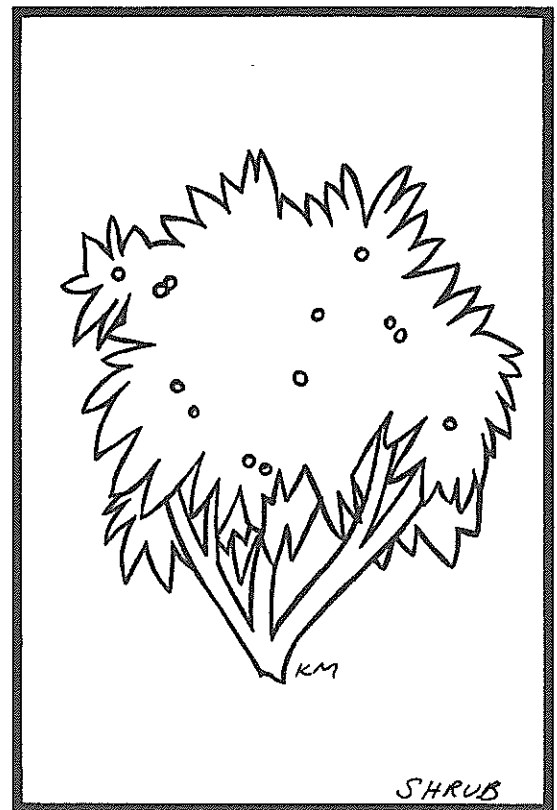
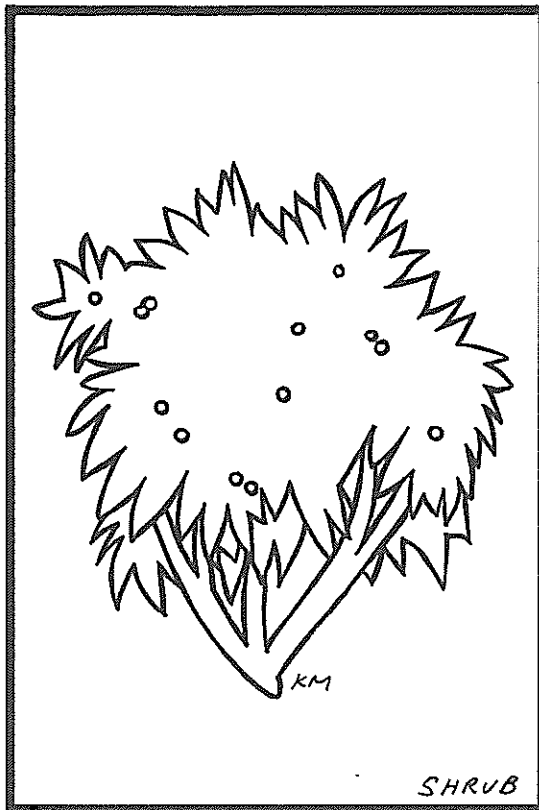
page 58



Resource Sheet 13

■ Activity 2.5 CONCENTRATION

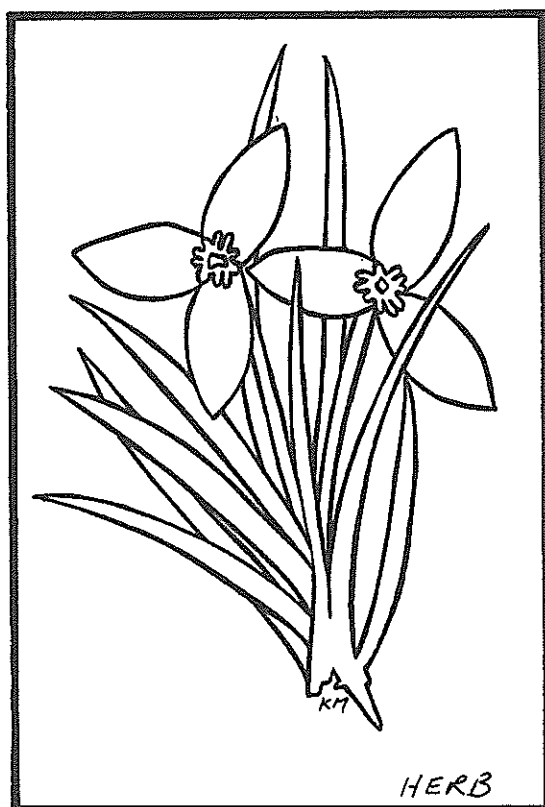
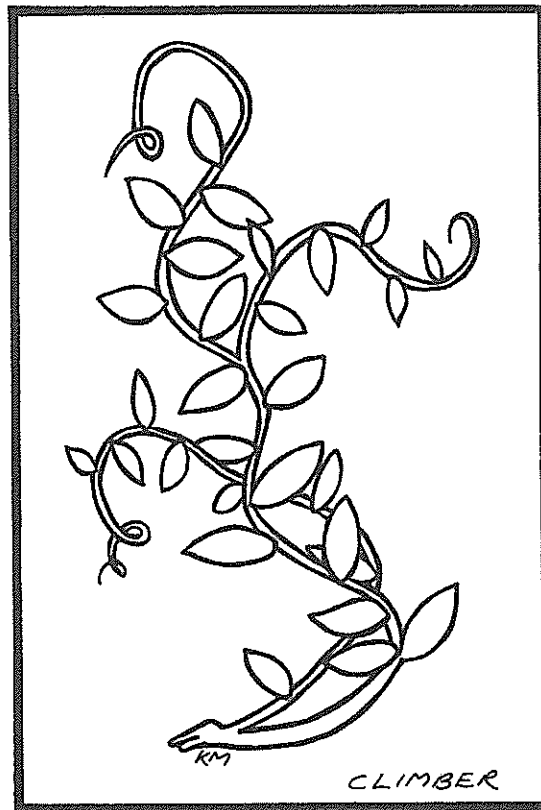
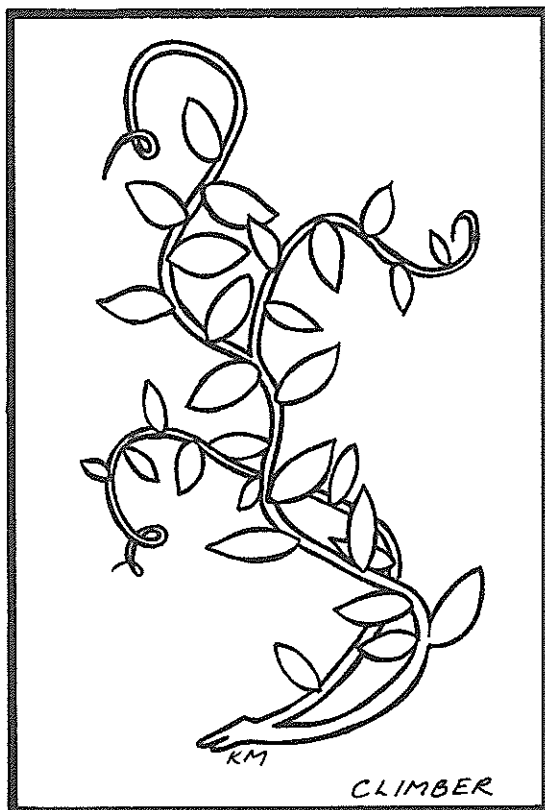
page 58



Resource Sheet 14

■ Activity 2.5 CONCENTRATION

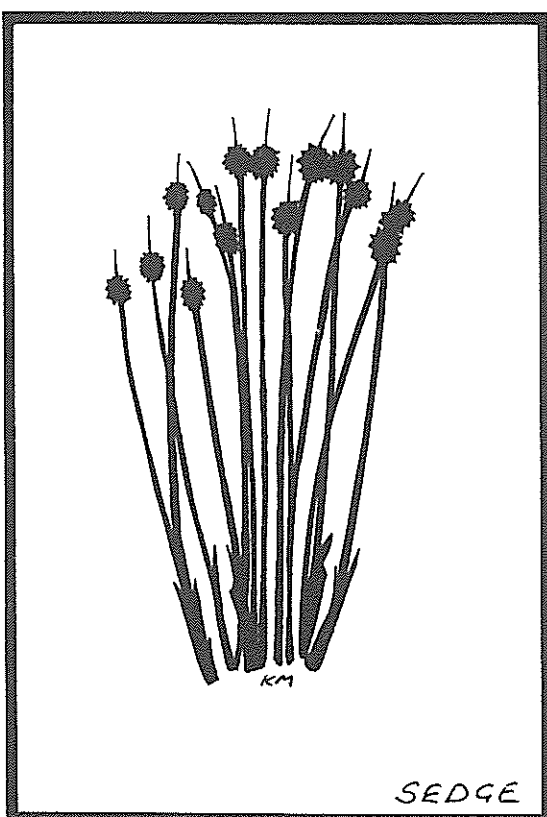
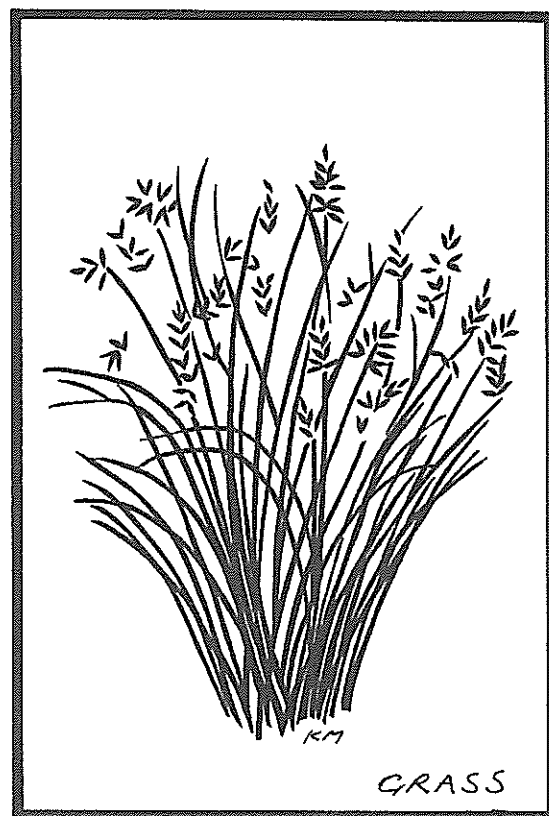
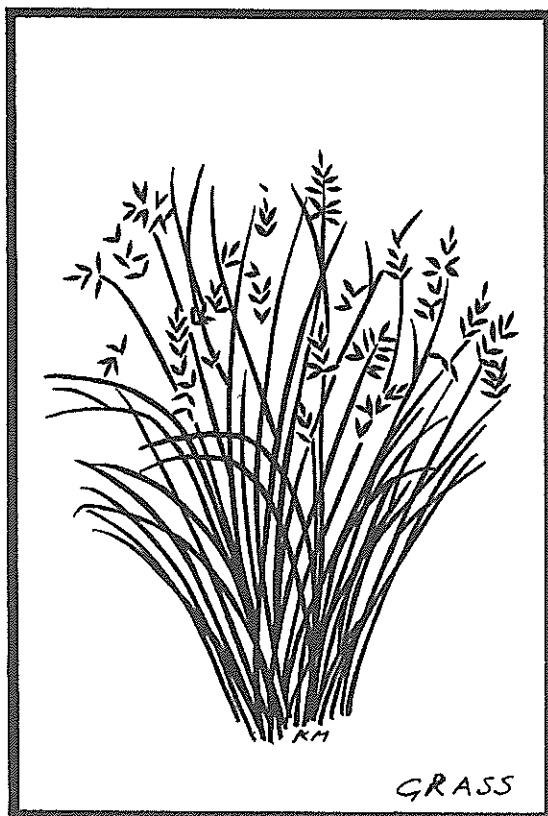
page 58



Resource Sheet 15

■ Activity 2.5 CONCENTRATION

page 58

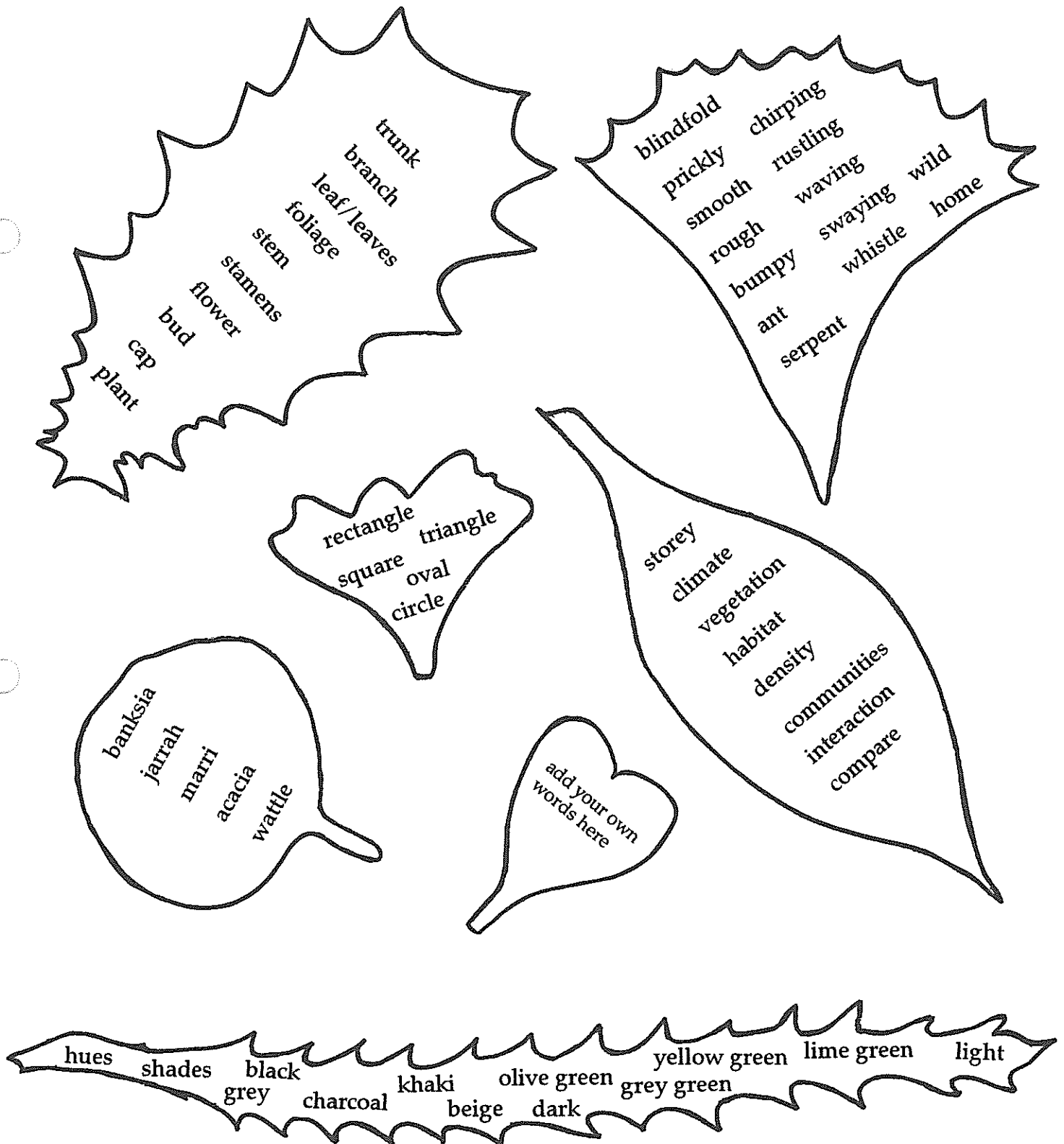


Resource Sheet 16

■ Activity 2.6 STORY

page 59

INTERESTING WORDS CHART



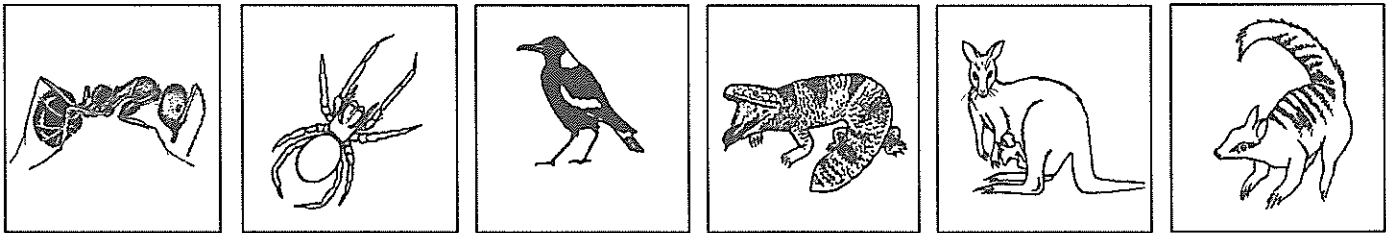
Resource Sheet 17

■ Activity 2.8 ANIMAL HOMES

page 59

Glue the animal picture in the layer in which it would be found.

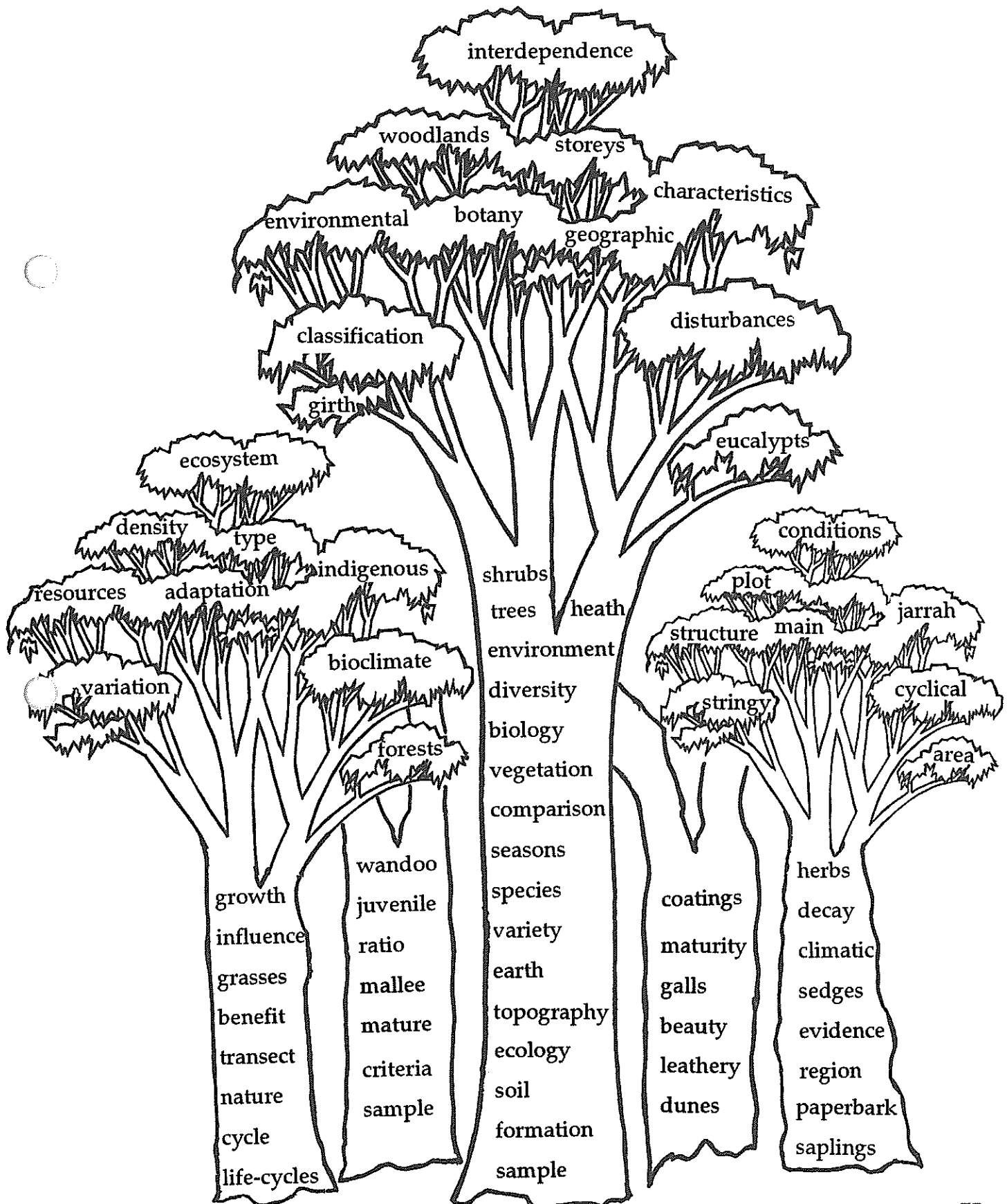
	ant	spider	magpie	goanna	kangaroo	numbat
upper layer						
middle layer						
lower layer						



Resource Sheet 18

■ Activity 2.10 DICTIONARY

page 60

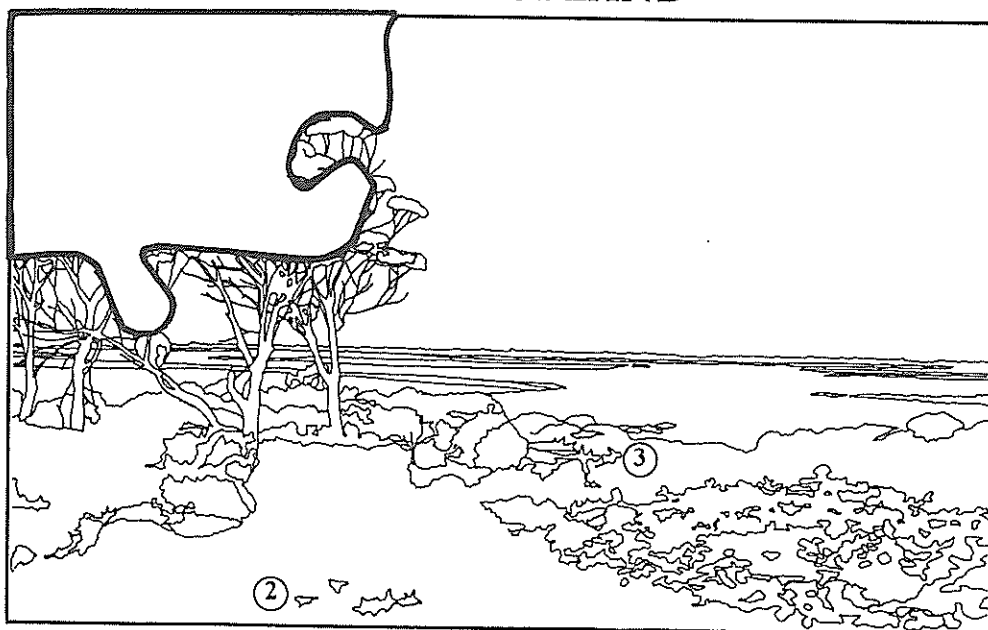


Resource Sheet 19

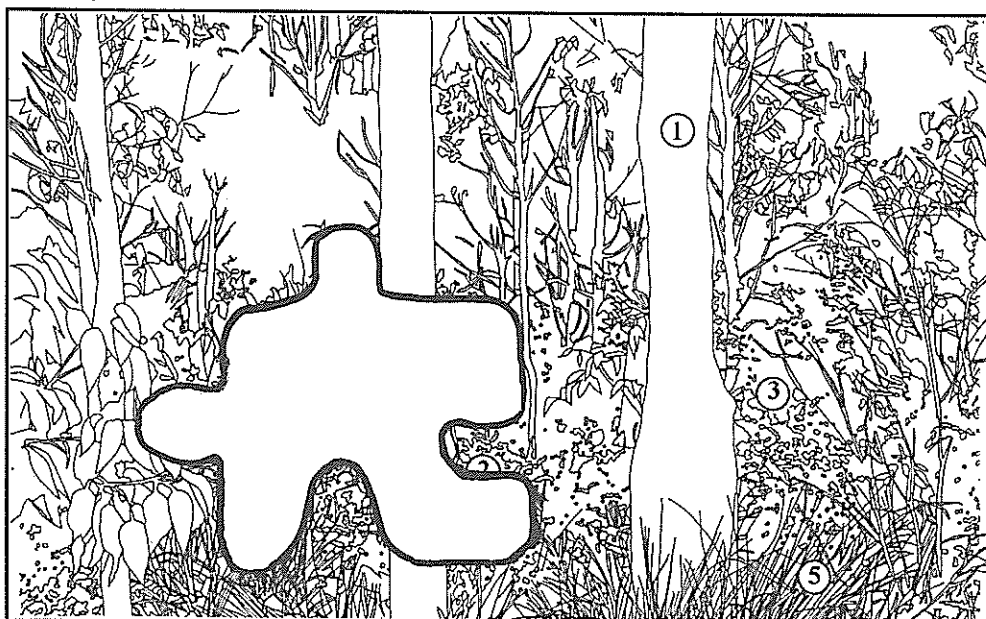
■ Activity 2.11 JIGSAW

page 60

6 PLANT COMMUNITIES OF WESTERN AUSTRALIA SAMPHIRE LOW SHRUBLAND



8 PLANT COMMUNITIES OF WESTERN AUSTRALIA JARRAH FOREST



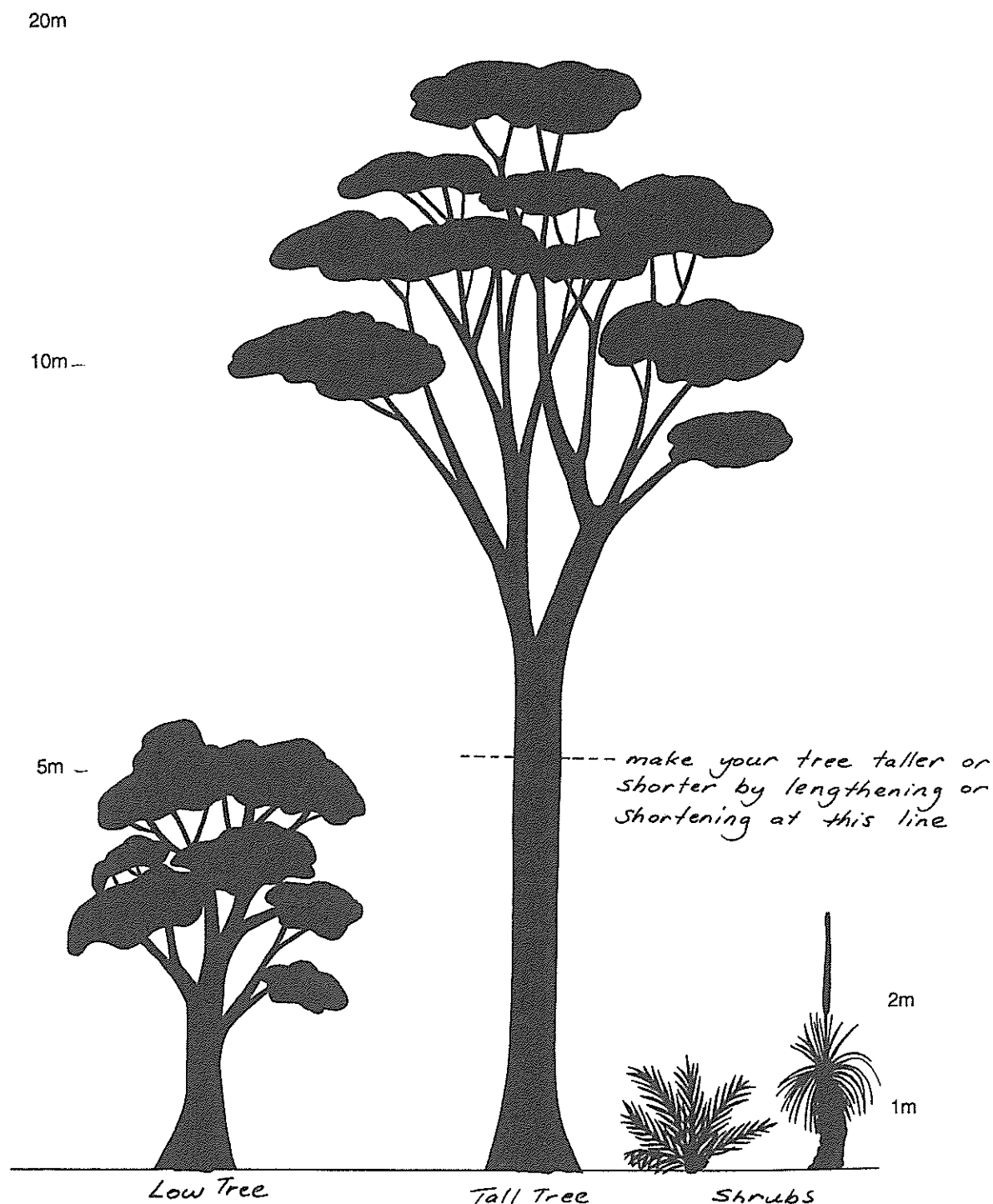
Resource Sheet 20

- Activity 2.5 CONCENTRATION
- Activity 2.13 COOKING UP SOME BUSHLAND
- Activity 2.18 IN THE BUSH

page 58

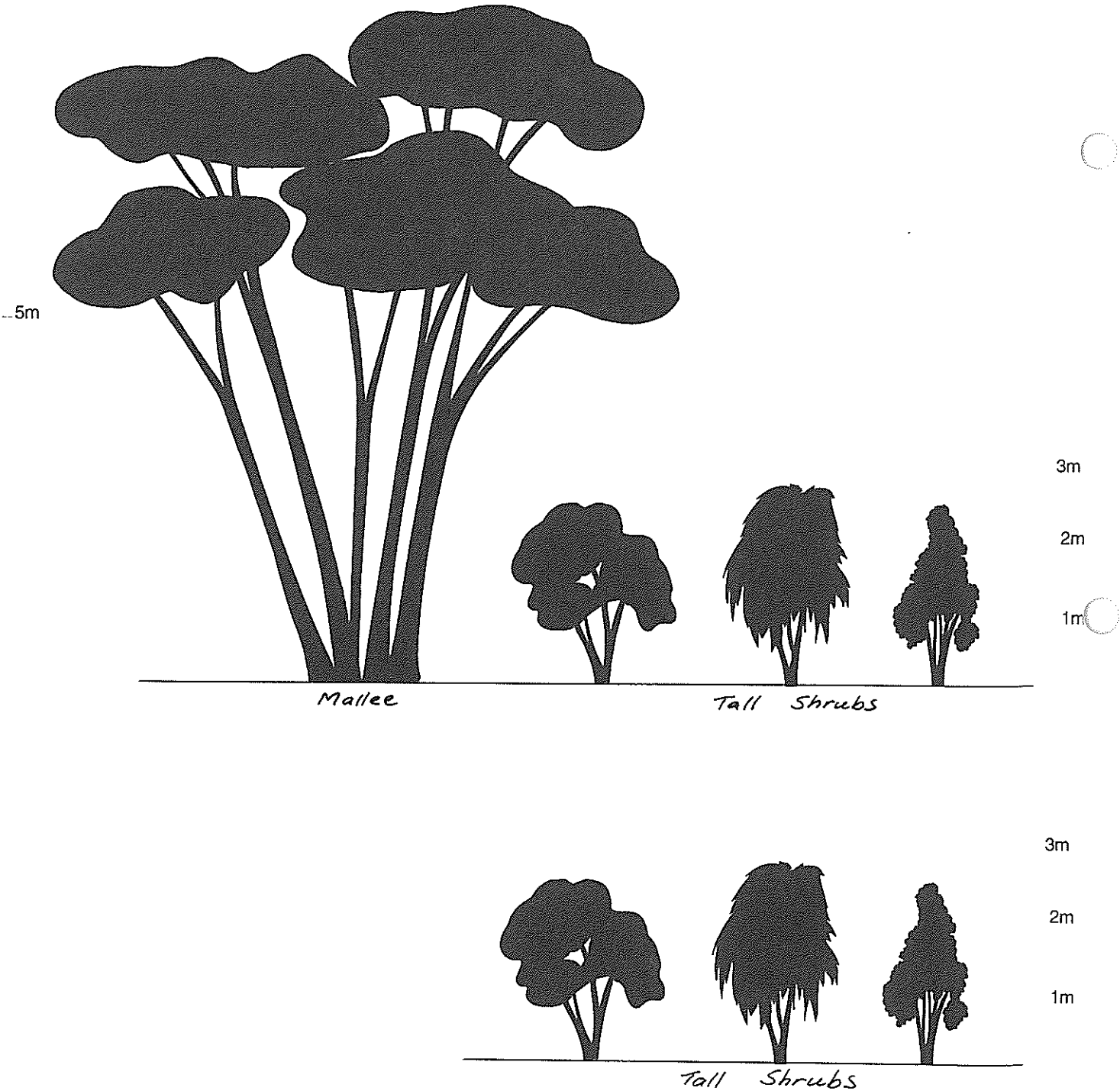
page 60

page 62



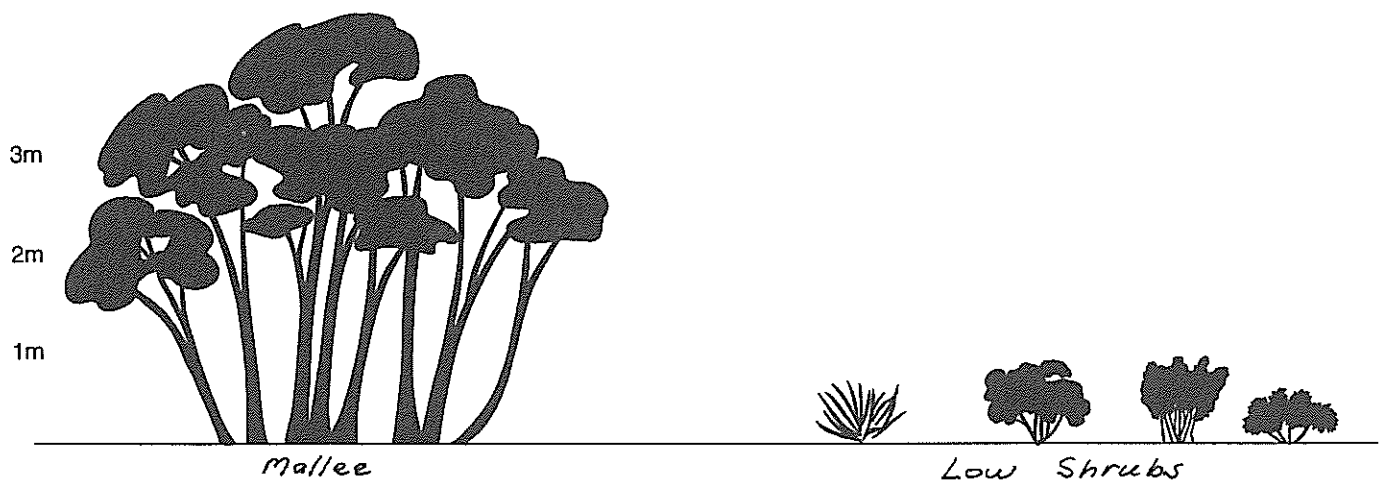
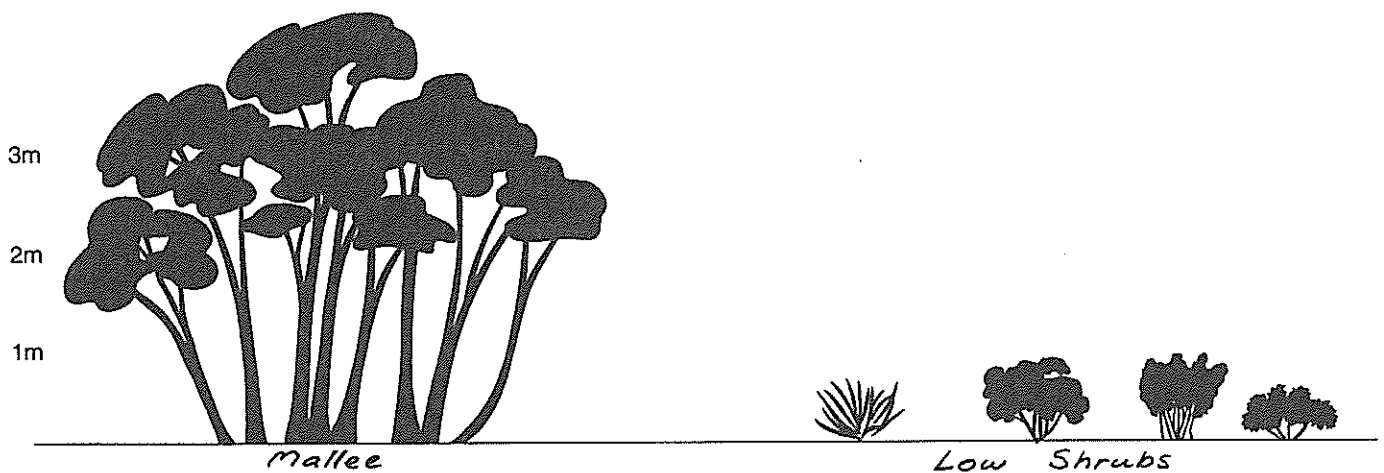
Resource Sheet 21

■ Activity 2.5	CONCENTRATION	page 58
■ Activity 2.13	COOKING UP SOME BUSHLAND	page 60
■ Activity 2.18	IN THE BUSH	page 62



Resource Sheet 22

■ Activity 2.5	CONCENTRATION	page 58
■ Activity 2.13	COOKING UP SOME BUSHLAND	page 60
■ Activity 2.18	IN THE BUSH	page 62



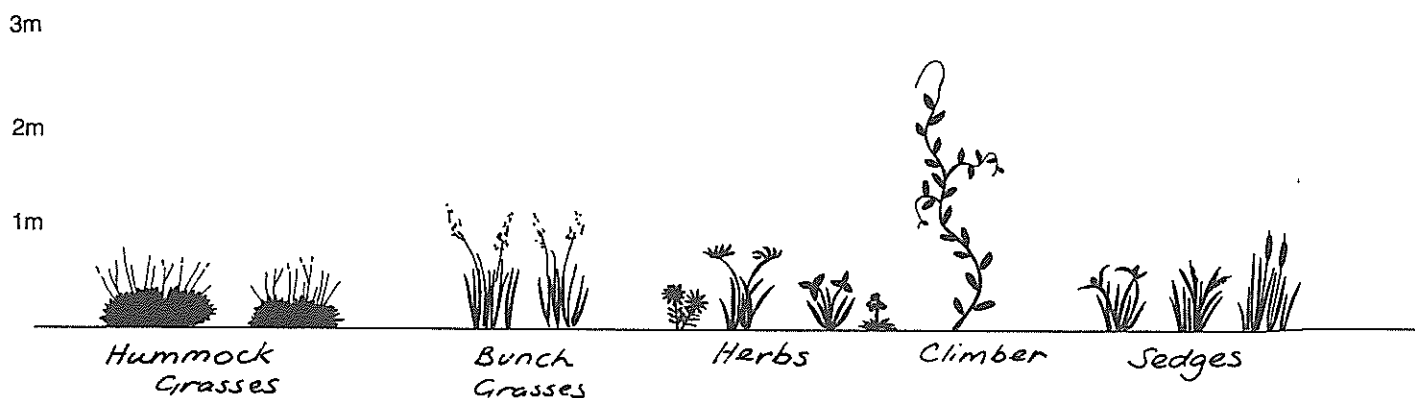
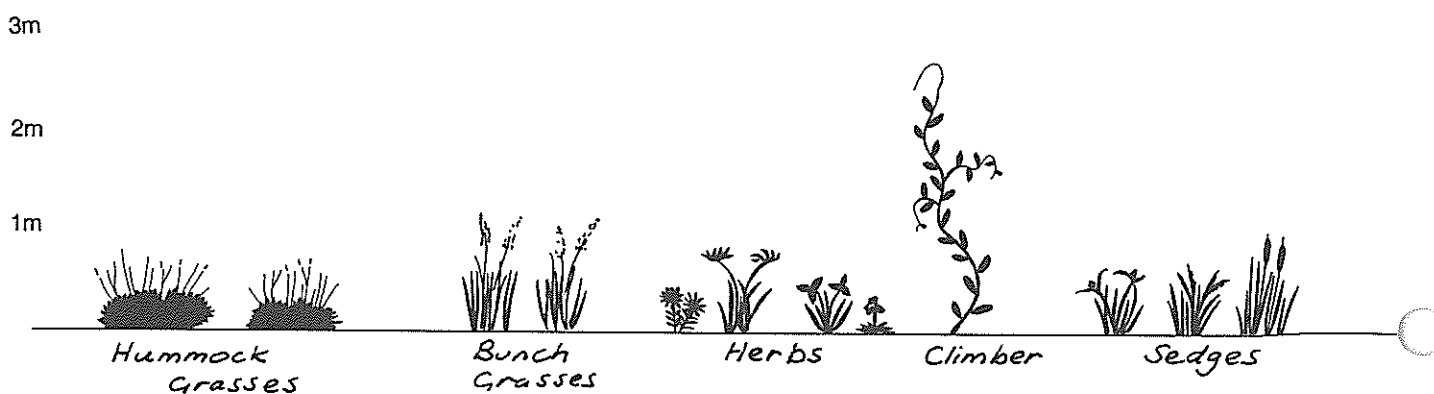
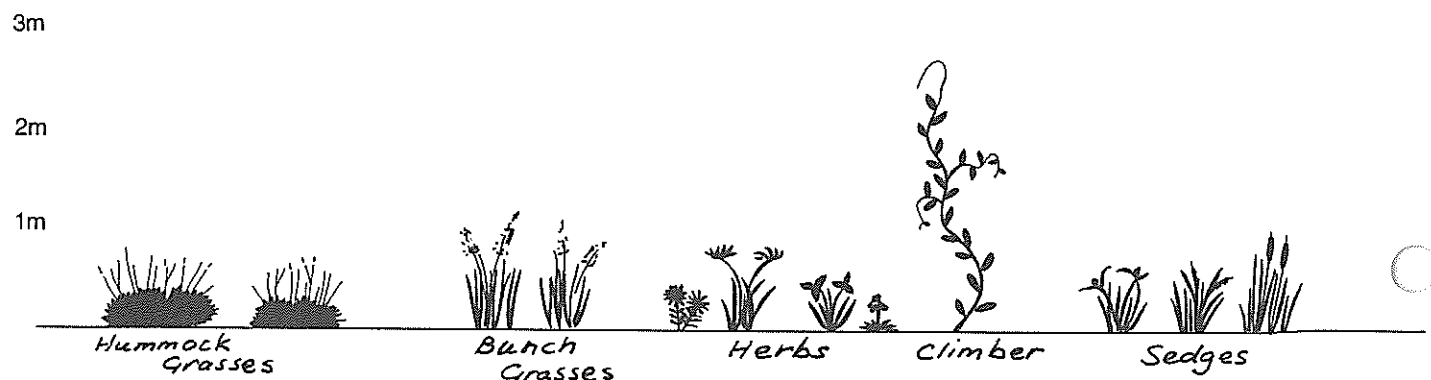
Resource Sheet 23

- Activity 2.5 CONCENTRATION
- Activity 2.13 COOKING UP SOME BUSHLAND
- Activity 2.18 IN THE BUSH

page 58

page 60

page 62



Resource Sheet 24

■ Activity 2.13 COOKING UP SOME BUSHLAND

page 60

RECIPE CARDS

1. Tropical Woodland over Grassland

1 Tall Tree

1 Tall Shrub

20 Grasses

30 Herbs

2. Woodland over Hummock Grassland

1/2 Low Tree

8 Hummock Grasses

3. Hummock Grassland

8 Hummock Grasses

4. Acacia Low Shrubland

1 Low Tree

5 Hummock Grasses

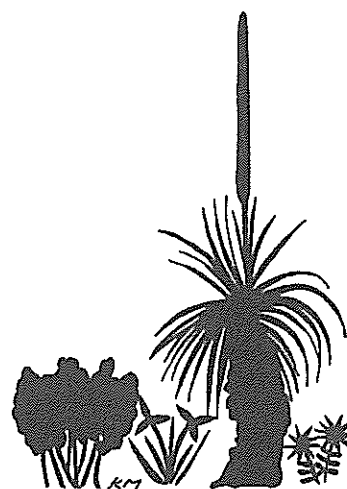
9 Herbs

5. Blue Bush Shrubland

4 Low Shrubs

6. Samphire Low Shrubland

10 Low Shrubs



Resource Sheet 24 continued

Activity 2.13 COOKING UP SOME BUSHLAND

page 60

RECIPE CARDS

7. Karri Forest

3 Tall Trees
2 Tall Shrubs
15 Low Shrubs
5 Herbs

8. Jarrah Forest

1 1/2 Trees
15 Low Shrubs 9 Herbs
9 Sedges

9. Wandoo Woodland

1 Tree
5 Low Shrubs
4 Herbs

10. Gimlet Woodland

1/2 Tall Tree
3 Low Shrubs

11. Banksia Low Woodland

2 Low Trees
6 Low Shrubs
6 Herbs
6 Sedges

Resource Sheet 24 continued

■ Activity 2.13 COOKING UP SOME BUSHLAND

page 60

RECIPE CARDS

12. Mallee

1 Mallee Tree
13 Low Shrubs

13. Mixed Shrubland

3 Tall Shrubs
16 Low Shrubs
10 Sedges

14. Coastal Shrubland

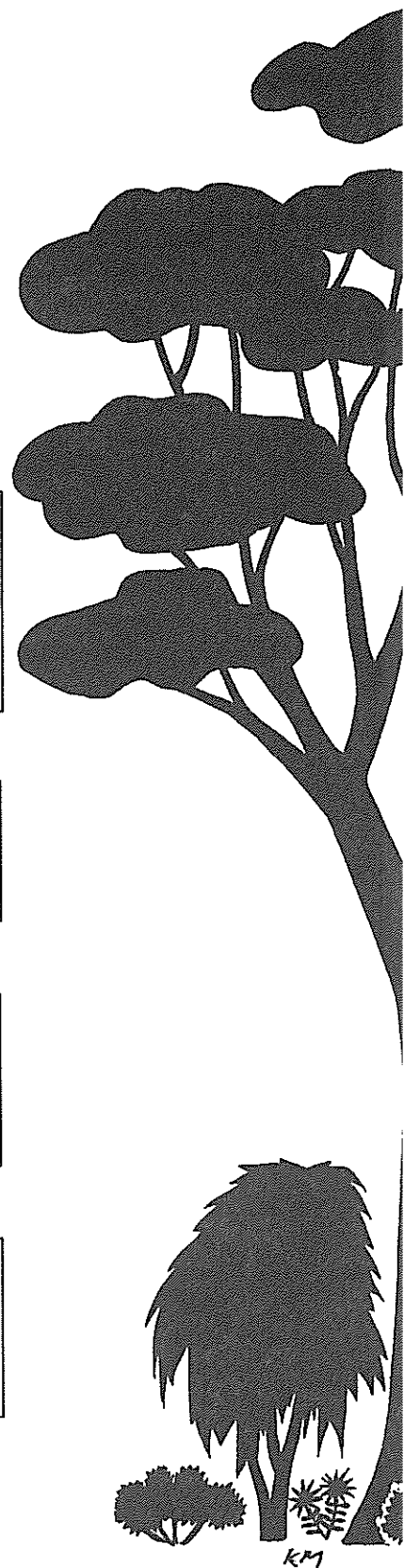
10 Low Shrubs

15. Pinjarra Plain Shrubland

2 Tall Shrubs
25 Herbs

16. Wetlands

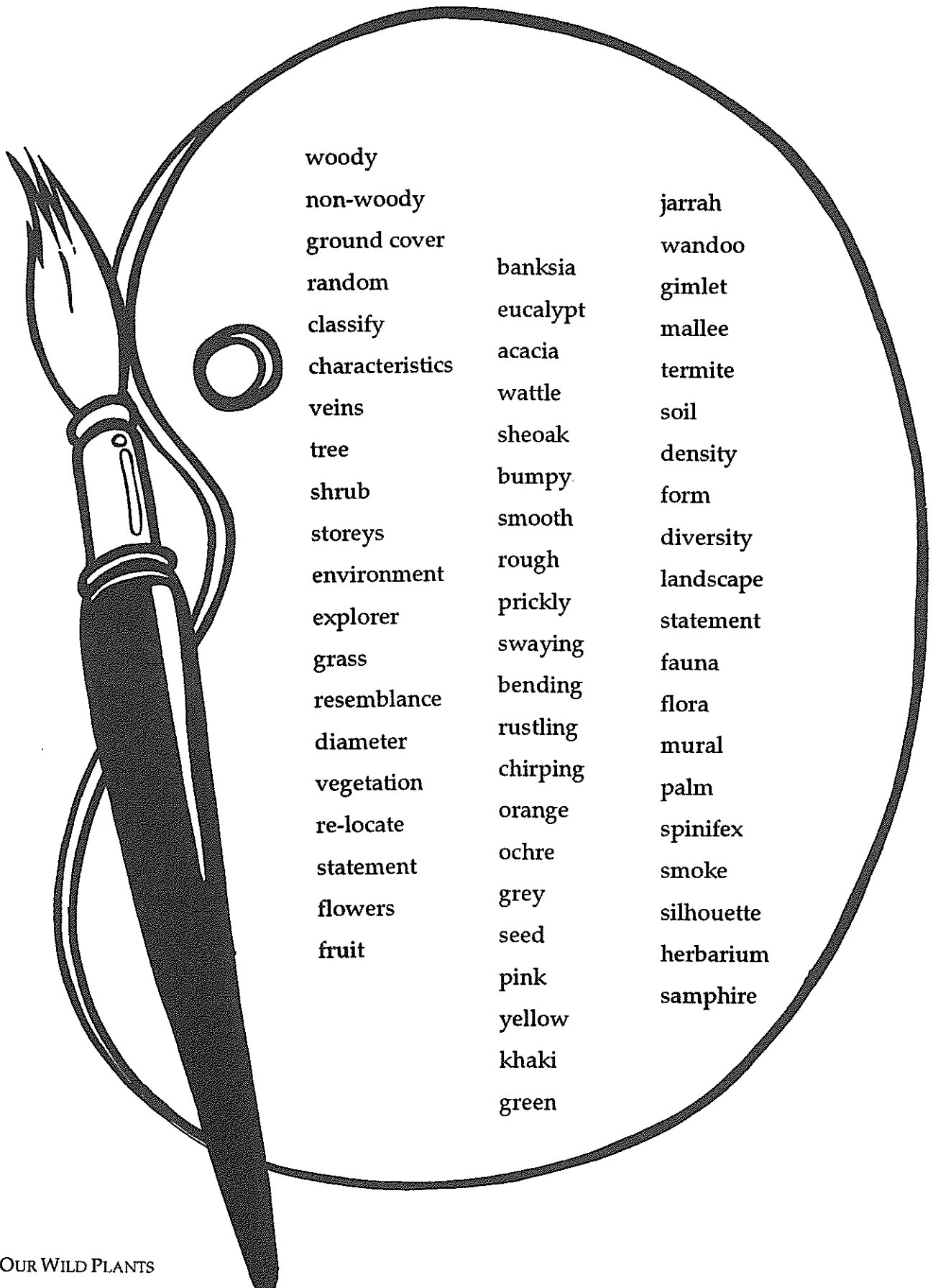
8 Low Shrubs
15 Sedges (clumped)



Resource Sheet 25

■ Activity 2.14 PAINTING WORDS

page 61



Activity 2.20 RATIOS page 62

[illegible]

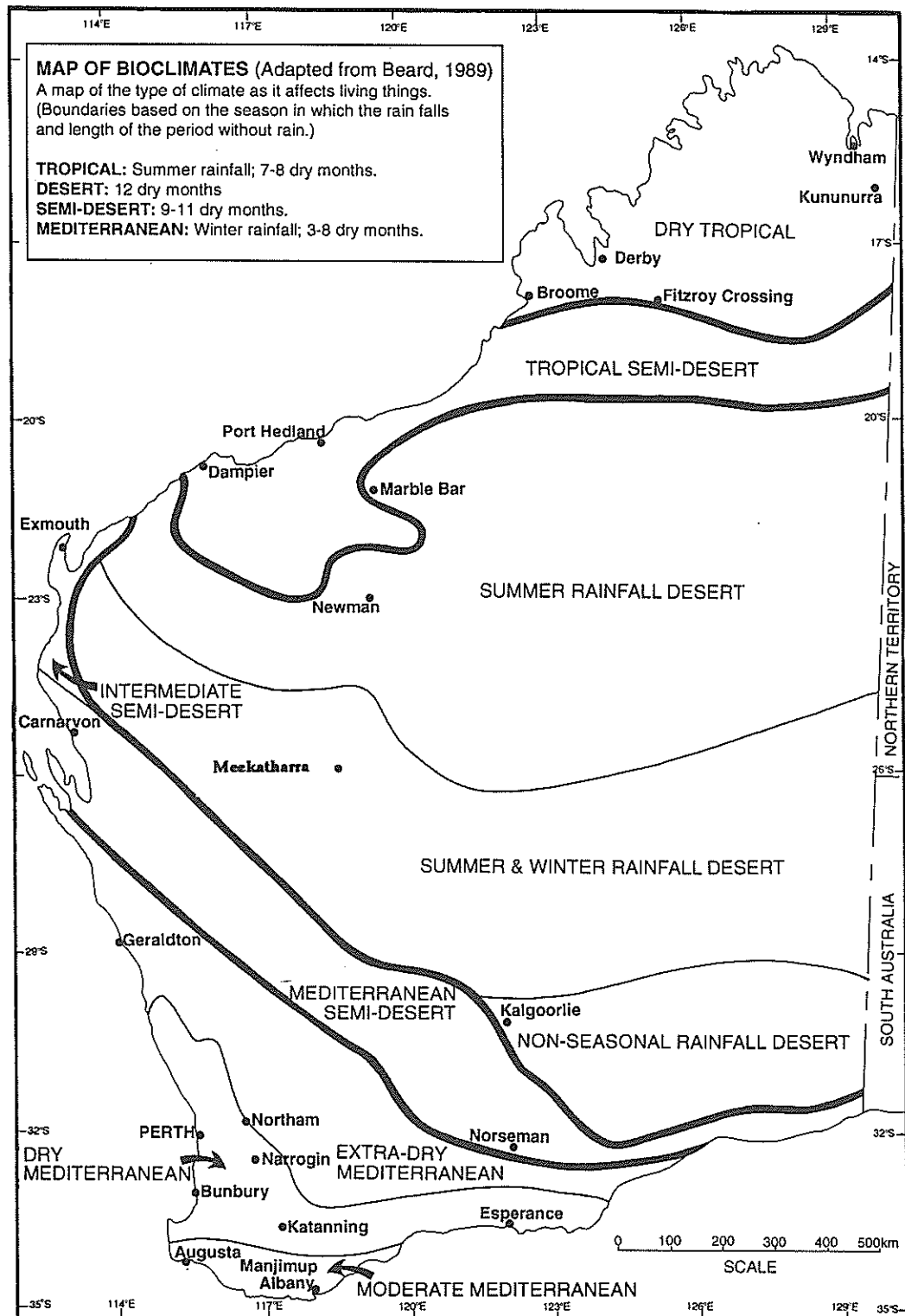
Resource Sheet 27

■ Activity 2.21 CLIMATE MAPS

page 63

■ Activity 2.22 BIOCLIMATES

page 63



Activity 2.24 VEGETATION MAP page 64

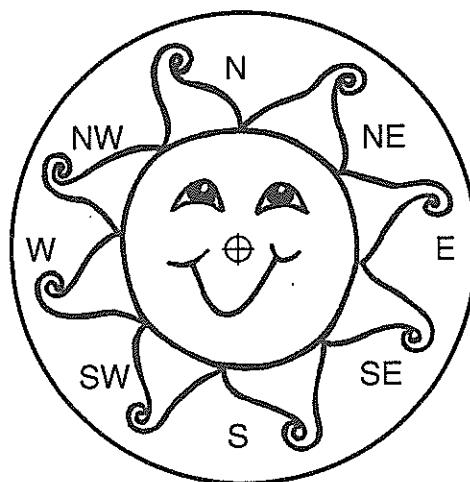
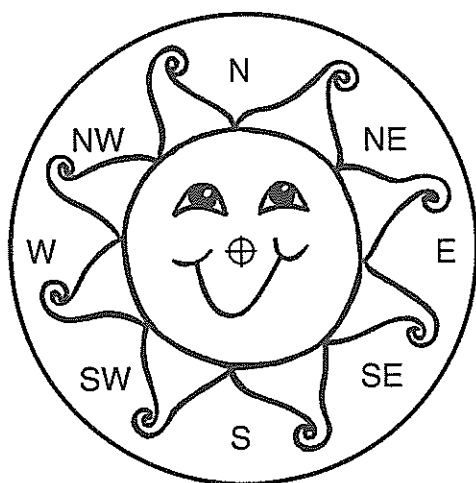
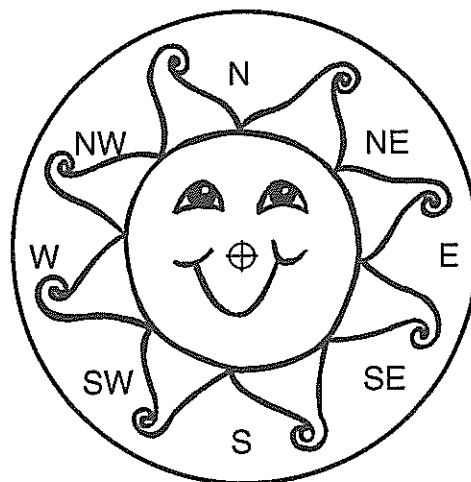
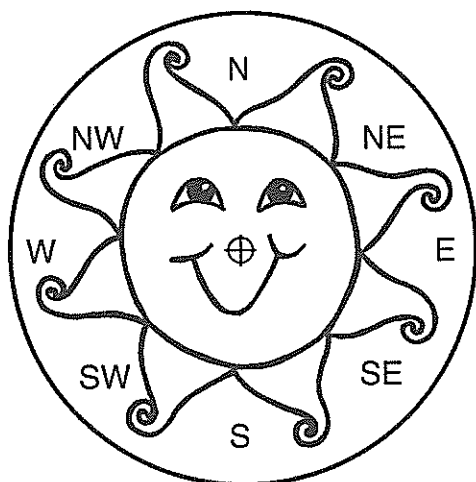
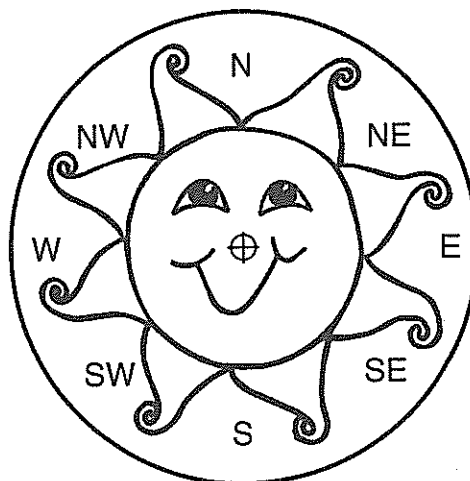
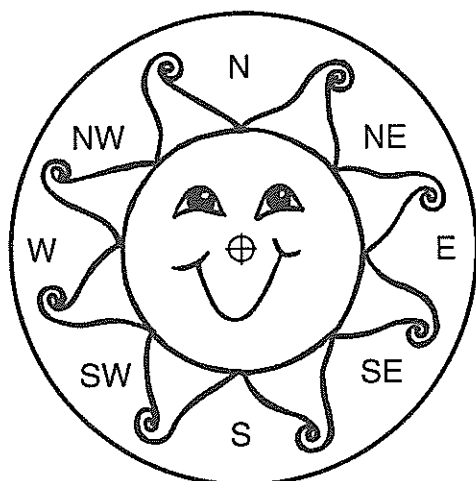
Activity 2.25 VEGE GAME page 64



Resource Sheet 29

Activity 2.25 VEGE GAME

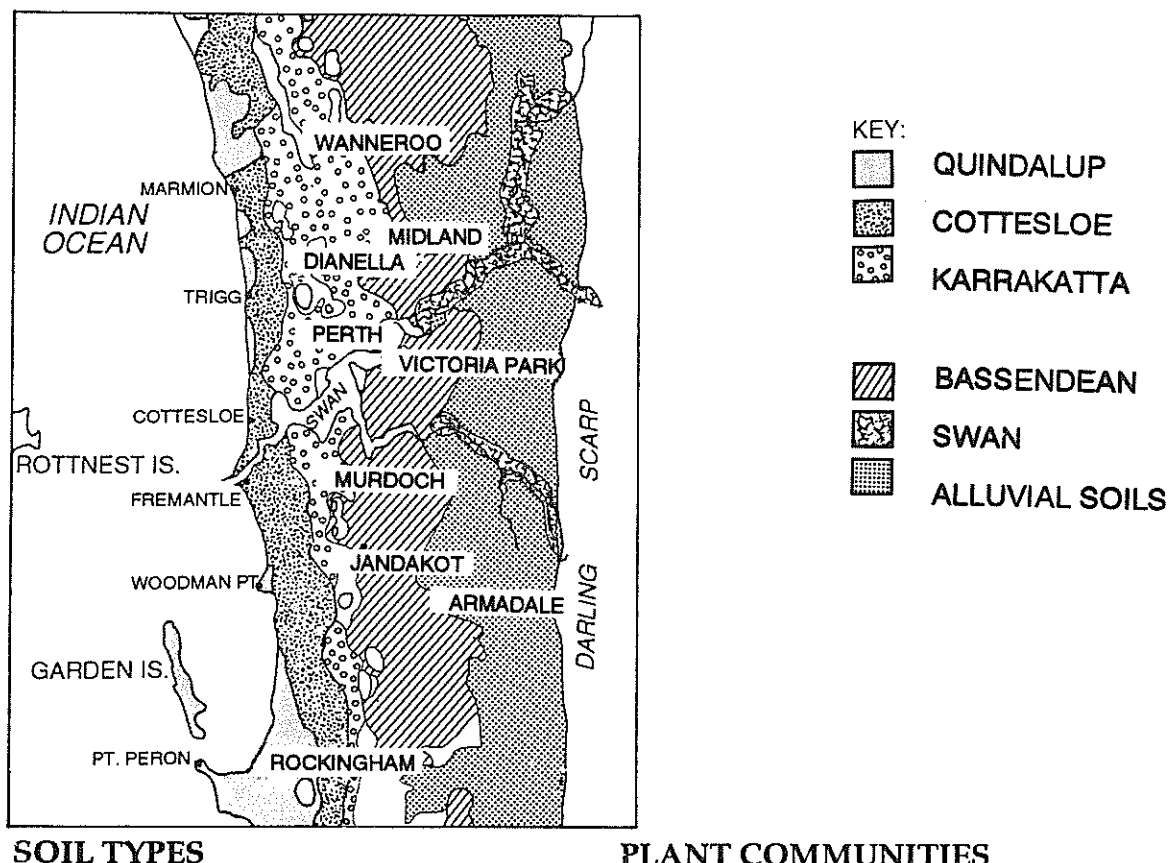
page 64



Resource Sheet 30

■ Activity 2.26 SOILS AIN'T SOILS

page 65



AEOLIAN SOILS

(sands deposited by the wind)

QUINDALUP

white sands

Grasslands, Shrublands and Tuart Woodlands.

COTTESLOE

grey sand over limestone

Forests and Woodlands of Tuart sometimes with Marri and Jarrah; Shrublands on shallow soils.

KARRAKATTA

grey sand over yellow sand

Woodlands of Jarrah with Marri or Tuart with an understorey of Banksia and Sheoak.

BASSENDEAN

grey sand over grey sand

Low Woodland of Banksia with Prickly Barks or with Jarrah, south of Wanneroo.

ALLUVIAL SOILS

(heavier soils deposited by water)

SWAN

brown alluvium

Forests and Woodland of Flooded Gum; Low Woodlands and Forest of Paperbarks and Salt Sheoak.

PINJARRA PLAIN

brown alluvium

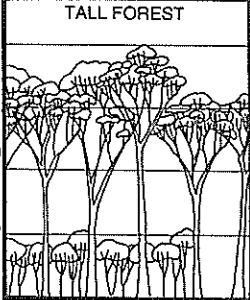
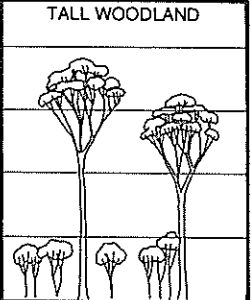
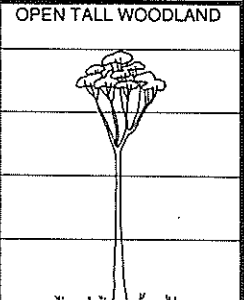

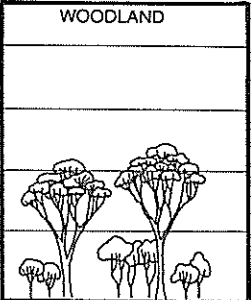
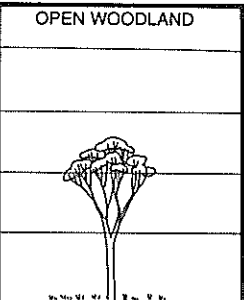
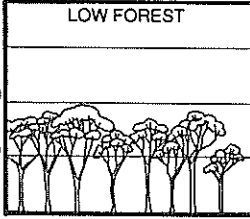
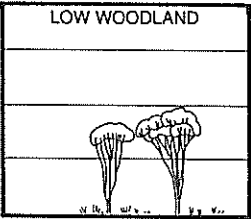
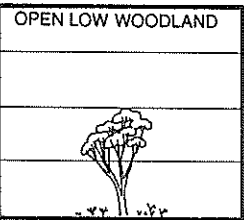
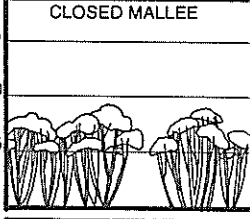
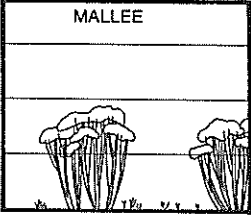
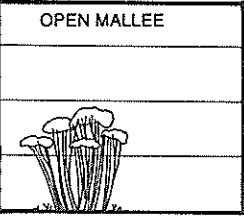

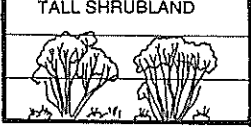
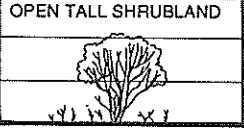
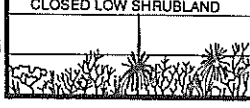
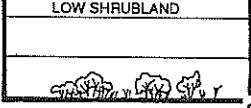
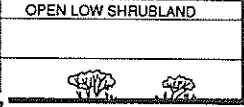


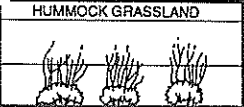




Forests and Woodland of Marri, Flooded Gum and Salt Sheoak; some Melaleuca Shrublands.

Modified with permission from the Department of Conservation and Land Management (CALM), WA.

Resource Sheet 31

■ Activity 2.27 COMPARE AND CONTRAST

page 65

PLANT COMMUNITIES - Choosing a name			
LIFE FORM OF TALLEST LAYER	HOW CLOSE THE WILD PLANTS GROW		
	MOST PLANTS TOUCHING	FEW PLANTS TOUCHING	NO PLANTS TOUCHING
TALL TREES Greater than 30m	TALL FOREST 	TALL WOODLAND 	OPEN TALL WOODLAND 
MEDIUM TREES 10-30m	FOREST 	WOODLAND 	OPEN WOODLAND 
LOW TREES Less than 10m	LOW FOREST 	LOW WOODLAND 	OPEN LOW WOODLAND 
MALLEE Less than 10m	CLOSED MALLEE 	MALLEE 	OPEN MALLEE 
TALL SHRUBS Greater than 2m	CLOSED TALL SHRUBLAND 	TALL SHRUBLAND 	OPEN TALL SHRUBLAND 
LOW SHRUBS Less than 2m	CLOSED LOW SHRUBLAND 	LOW SHRUBLAND 	OPEN LOW SHRUBLAND 
GRASSLAND Less than 1m	CLOSED GRASSLAND 	GRASSLAND 	HUMMOCK GRASSLAND 
HERBLAND Less than 0.5m	CLOSED HERBLAND 	HERBLAND 	Adapted from Beard (1991), page 15
SEDGELAND Less than 0.5m	CLOSED SEDGELAND 	SEDGELAND 	

Resource Sheet 32

■ Activity 2.29 PLOT SAMPLE

page 65

Materials

One hoop per group

Paper

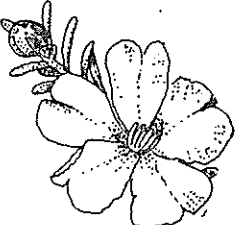
Pencils

Clipboard

Activity

- ◆ Find an interesting piece of bush.
- ◆ Place the hoop ahead of you on the ground.
- ◆ Sketch the different species of plant you see within the hoop.
- ◆ Make up names to describe your plants.
- ◆ Tally the number of each species that can be seen in your hoop.

Record Your Findings

NAME	SKETCH	TALLY
Example: Yellow Buttercup <i>(Hibbertia)</i>		

Resource Sheet 33

■ Activity 2.30 TRANSECT

page 66

Read Resource Sheet 34, then map plants along your transect.

Materials

Tape measure or string marked off in one metre lengths

Paper

Pencil

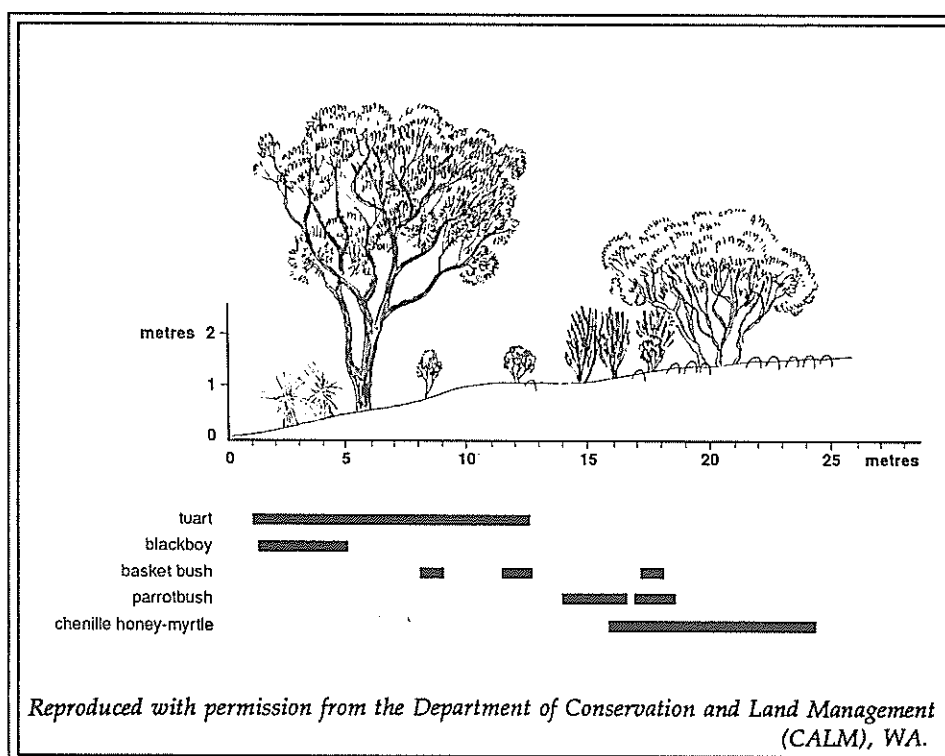
Clipboard

Activity

Choose an area of bushland with a range of vegetation.

Stretch tape measure in a straight line. For best results place the tape from waters edge up a slope or up a hill, etc.

Walk along the tape and record by sketching the plants at each metre mark.



Is there any vegetation trend along the transect (eg: in vegetation height or type or density)?

Compare your transect with another group.

Resource Sheet 34

■ Activity 2.30 TRANSECT Page 66
 Read the CALM Resource Notes Number 22 February 1991
 'Mapping Plants along a Transect' and complete Resource Sheet 33
 Resource Notes Number 22

 Department of Conservation and Land Management, WA.

Mapping Plants along a Transect

An excellent way to learn about plants and their environment, and habitats for animals, is to map plant species along a line, or 'transect'. This activity is useful for students at any level from upper primary to tertiary.

Choosing A Site

Almost any bush area that is not too disturbed is suitable for a transect. The best areas are those that are not uniform. By locating the transect where vegetation changes - for example, in crossing from one soil-type to another, or from valley to hilltop - more can be learnt about the effects of the environment.

The following environments are particularly suitable for transects:

- * **the coast**
 If you head inland from the top of the beach, the vegetation changes markedly over a short distance, and there are comparatively few species to map.
- * **wetlands**
 If you head outwards from the edge of a lake, several different vegetation types may be encountered.
- * **the Darling Scarp**
 A transect that includes both granite and laterite, or a drainage line, or soils of different depths, will encounter very varied vegetation.

Conservation

A class of students can degrade vegetation by trampling, particularly where the soils are sandy. Repeated excursions to the same transect line should be avoided. One useful approach is to run the transect along an established path and confine students to that path as far as possible.

Transect Length

The length of a transect can vary from, say, 20 m to as much as 500 m, according to whether the changes in the vegetation are abrupt or gradual.

Equipment

You will need a measuring tape (or string with flagging at measured intervals), stakes, a trowel, plant-identification guides (books or mounted specimens) and recording-sheets. If elevation along the transect is to be measured, then you will also need an Abney level (Fig. 4).

Preparation

Decide where to lay the transect and how long to make it. A licence from the Department of Conservation and Land Management is needed to collect any plant specimens on public land, and approval is needed from the body that controls the land to conduct the excursion and to collect plant specimens.

Prepare the recording-sheets (Fig. 1). Decide what plant species are to be recorded. They can be limited to those that can be readily identified from reference books, such as those listed on this page. Even a small number of species will often show up trends in the vegetation (see Fig. 2b). Arrange for adequate copies of the reference books or other guides (e.g. mounted specimens) for the identification of the plant species. Some plants can be left unidentified, or identified at a later date. Decide on temporary names for these (e.g. 'prickly pea'), to be used consistently throughout the exercise. Field folders (one for each group) can be provided for specimens collected and named on the day. The name of each species must be the same in each folder.

Instruct the students on the use of equipment and the process of recording.

Field Work

The field work begins by placing a stake at one end of the transect, attaching the tape to it and stretching it out along the route. The students then divide up to undertake the following activities. Disturbance to the environment can be minimized by assigning student groups to particular sections of the transect, marked out with additional stakes.

Activity 1: Plant Distribution

This is the main task: to record where plants of the chosen species occur along the transect within a specified width to one side of it. The width can be varied according to the density of the vegetation and the particular task; for dune vegetation, 1 m is usually suitable. For each species, bars are marked on the recording-sheets to link the distance along the transect at which the cover (canopy) begins to where it ends (Fig. 2).

Activity 2: Life-Forms

For each species, record the life-forms (e.g. tree, shrub, climber - see definitions, Fig. 3) and the usual height and width. Quick sketches can be made of each species to show its shape and basic structure (Fig. 3).

Activity 3: Environmental Factors

To help relate the changes in vegetation to the changes in the environment, the soil-type and the slope of the land can be recorded at intervals along the transect.

The main soil-types of the Perth Metropolitan Region are in Information Sheet No. 1/88, listed under **References**. To determine the characteristic colour of sandy soils, examine the soil brought up around ants' nests; the surface soil is usually discoloured by humus. Or, if necessary, dig a small hole through the surface soil; make sure all such holes are carefully refilled.

The slopes can be measured with an Abney level by students in pairs (see Fig. 4). Tertiary or upper-school students may wish to record additional factors along

the transect, such as the pH, temperature and profile of the soil.

Compilation

After the excursion, the transect diagram is drawn by combining the graphs of the different plant species, in the order in which they first appeared along the transect (see Fig. 2). A profile of the land surface can be drawn using the slope readings; the vertical scale will need to be exaggerated. From the recordings of the life-forms and sizes of the different plant species, the vegetation can be represented pictorially (Fig. 2b).

Analysis

Once the transect diagram is completed, discussion of the results should cover:

- * the general character of the vegetation and how it is influenced by the general environmental conditions at the site (e.g. soil, aspect (the direction a slope faces), ground-water, salt spray, fire, soil-disturbance)
- * changes in the vegetation along the transect and how they correspond to changes in the above conditions.

References

- The Bushland Plants of Kings Park, Western Australia*, by Eleanor M. Bennett (Kings Park Board, 1988)
- Eucalypts of Perth: Field Keys*, Resource Note No. 21 (Department of Conservation and Land Management, 1990)
- A Guide to the Coastal Flora of South-Western Australia*, by G.G. Smith (Western Australian Naturalists' Club; Handbook no. 10. Revised edition, 1985)
- Leaf and Branch: Trees and Tall Shrubs of Perth*, by Robert Powell (Department of Conservation and Land Management, 1990)
- Sense of Place: A Response to an Environment: The Swan Coastal Plain, Western Australia*, by George Seddon (University of W.A. Press, 1972)
- Some Trees of the Jarrah Forest*, Resource Note No. 17 (Department of Conservation and Land Management, 1987)
- Trees and Tall Shrubs of Perth*, Information Sheet No. 1/88 (Department of Conservation and Land Management, 1988)

FIG. 1. GUIDE TO RECORDING-SHEETS

■ ACTIVITY 1: Plant Distribution



plant species

distance from starting point (m)

The figure shows a blank coordinate grid for data collection. The vertical axis (y-axis) is labeled 'plant species' and the horizontal axis (x-axis) is labeled 'distance from starting point (m)'. The grid consists of 10 major squares along the x-axis and 100 minor squares along the y-axis. The origin (0,0) is marked at the bottom-left corner of the grid.

FIG. 1. (cont'd)

■ ACTIVITY 2: Life-Forms

SPECIES	TYPICAL SIZE		LIFE-FORM ¹	BRIEF DESCRIPTION ²	SKETCH
	height	width			
grey stinkwood	5 m	4 m	large shrub	sparse, irregular; usually has single stem	
chenille honey-myrtle	2 ½ m	3 m	large shrub	spreading, smooth outline, has several stems arising from ground	

¹ See Fig. 3.

² Consider:

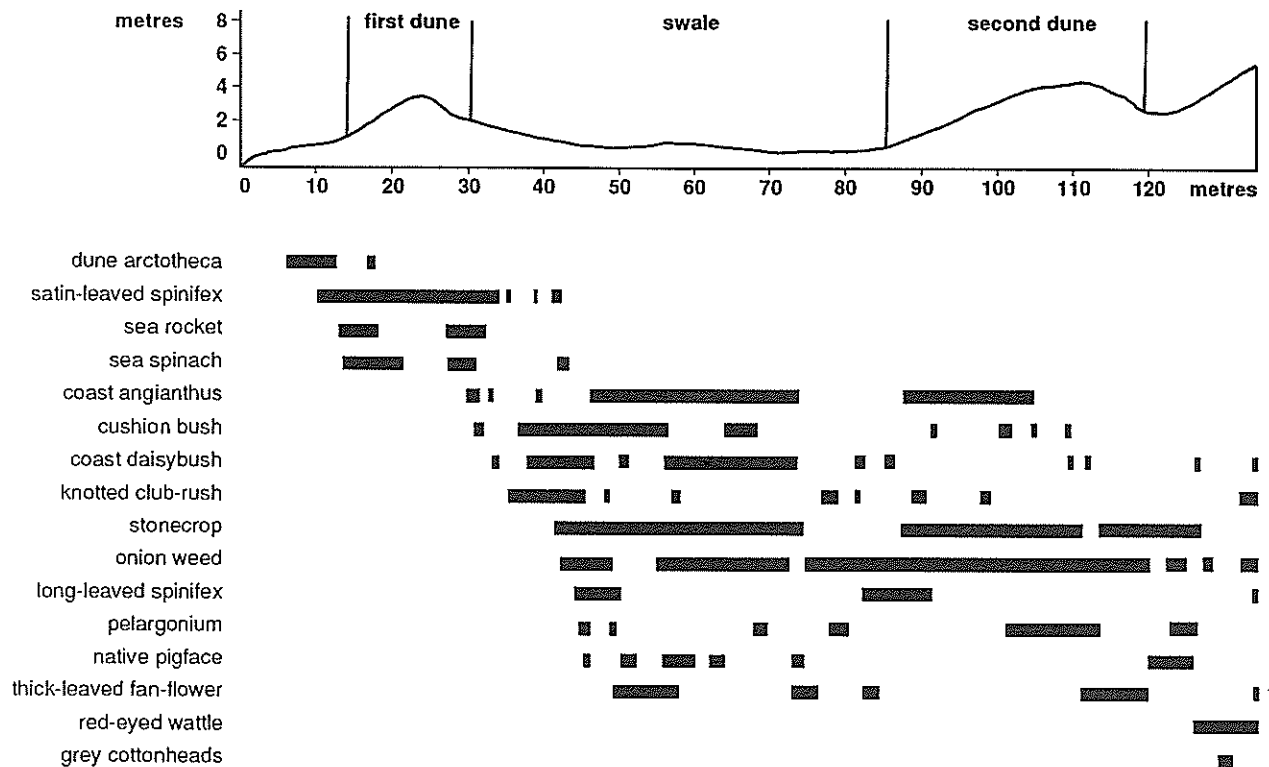
- shape, e.g. slender, upright, spreading, compact, sparse;
- outline, e.g. smooth, irregular;
- structure, e.g. has single stem, has short trunk splitting into many branches, has several stems arising from ground;
- effects of environment, e.g. burnt in recent years, asymmetrical as result of sea winds.

■ ACTIVITY 3: Environmental Factors

DISTANCE ALONG TRANSECT (m)	0	10	20	30	40	50	60
SOIL							
SLOPE							

FIG. 2. EXAMPLES OF TRANSECT DIAGRAMS

- a) Transect through dune vegetation, City Beach - adapted from *A Guide to the Coastal Flora of South-Western Australia* (see References). Note the change in vegetation in the lee of the first dune.



- b) Short transect up limestone hill using only trees and tall shrubs. Shows change in vegetation from tuart and blackboy to parrotbush and chenille honey-myrtle as soil gets shallower (∩ = outcrops of limestone).

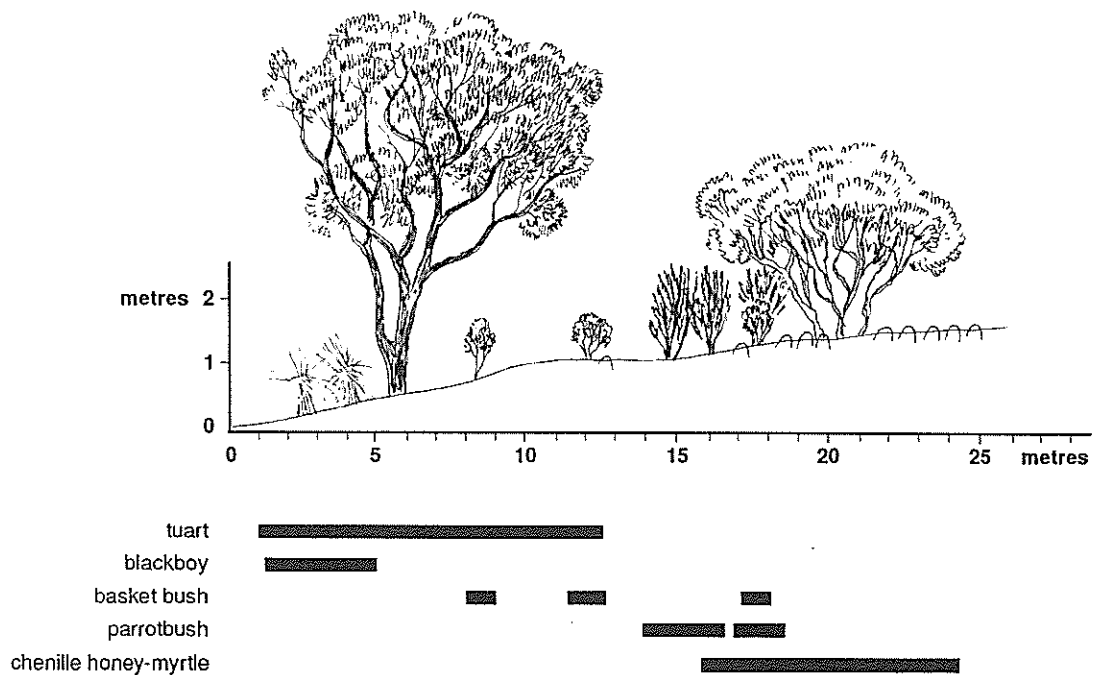


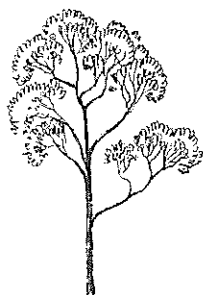
FIG. 3. PLANTS: LIFE-FORMS AND SHAPES

■ MAIN LIFE-FORMS OF PLANTS*

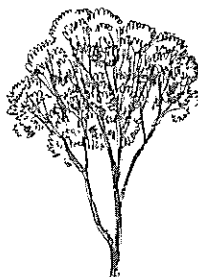
Tree	More than 3 m tall, with a single stem that does not divide at the base into fairly equal stems.
Mallee	A eucalypt (gum tree) with several, fairly equal stems arising from the ground.
Shrub	Bushy, usually less than 5 m tall, dividing at or near the base into several, fairly equal stems. Shrubs can be classified according to size: <ul style="list-style-type: none"> • large (over 2 m tall) • medium (1-2 m tall) • small (less than 1 m)
Climber	Climbs over other plants.
Mat-Plant	Has woody stems that spread along the ground.
Herb	Has no woody stem (e.g. grasses, sedges, kangaroo paws).

* The plants covered here are vascular plants (which have vessels for conducting fluid and materials).
Non-vascular plants such as mosses and lichens may be worth recording too.

■ SHAPES AND STRUCTURES OF SOME TREES AND SHRUBS



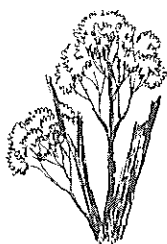
tree with trunk and
side-branches
(shaft structure)



tree splitting into
several major
branches



tree moulded by sea winds:
leaning, with foliage concentrated
into clumps or layers



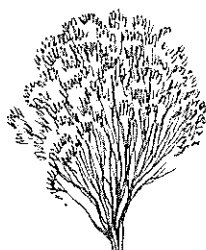
tree or shrub burnt in
recent years, resprouting
from underground rootstock



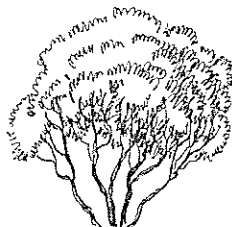
a young native cypress:
flame-shaped,
densely foliated



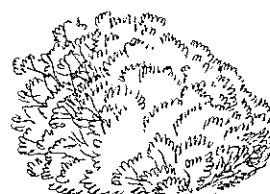
single-stemmed shrub,
upright with irregular outline



shrub splitting into
many thin, straight
branches

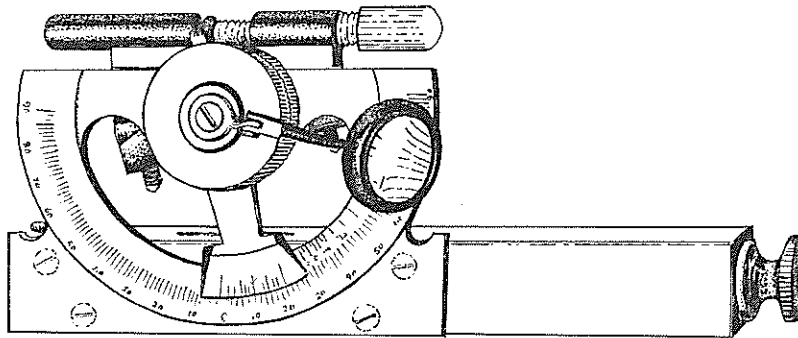


shrub with several stems
arising from the ground



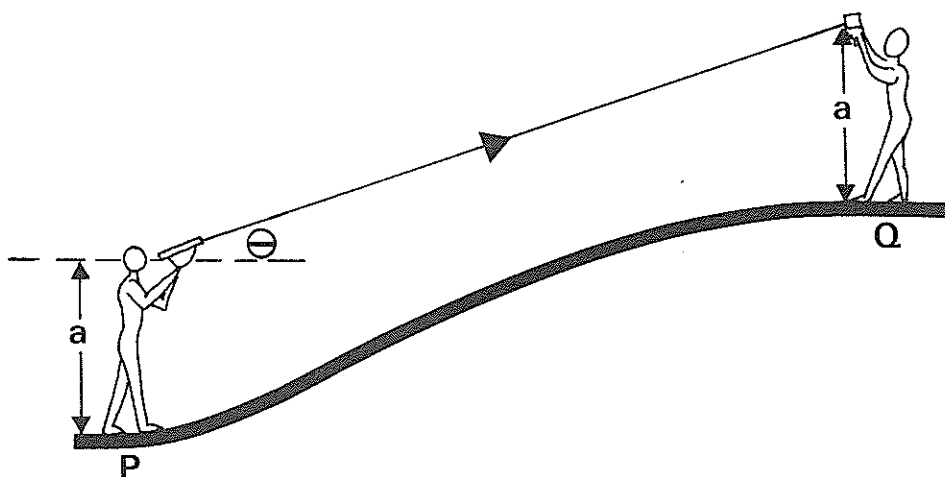
shrub moulded by sea
winds: bushy, dome-
shaped, asymmetrical

FIG. 4. MEASURING SLOPES



Abney level

To measure slopes, divide the transect into intervals 5 m or 10 m long. One student, with an Abney level, stands at the starting point of the first interval; and the other, with a bright object, stands at its end point. The first student records the reading of the object, held by the second student at the same height above ground as the first student's eyes. The instrument measures the angle Θ in the diagram below, which is the average slope from P to Q. Repeat for each interval.



Using the Abney level to measure slopes

*Written by Robert Powell, who has had a long interest in Perth's vegetation,
with assistance from Dr Boyd Wykes, who runs the Perth Wildlife Watch.*

Illustrations by Margaret Pieroni.

*This Resource Note has been produced as a contribution to the Perth Wildlife Watch,
a public education project of the World Wide Fund for Nature (WWF) Australia.*

*WWF Australia, one of 28 such bodies in different parts of the world, was formed in 1978 to provide a greater
awareness of the needs of conservation. It raises funds for projects to conserve endangered species of wildlife,
and has successfully funded over 200 projects throughout Australia.*

Donations to WWF Australia are tax-deductible. Please write to:



WWF Australia
GPO Box 528
SYDNEY NSW 2001
Tel. (02) 261 5572

Resource Sheet 35

■ Activity 2.33 PLANT COVERINGS

page 66

Bitterlich Gauge

A Bitterlich Gauge is used to work out plant density in any area. It can be used to estimate the total canopy cover present by any vegetation layer or species that can be consistently identified at any distance.

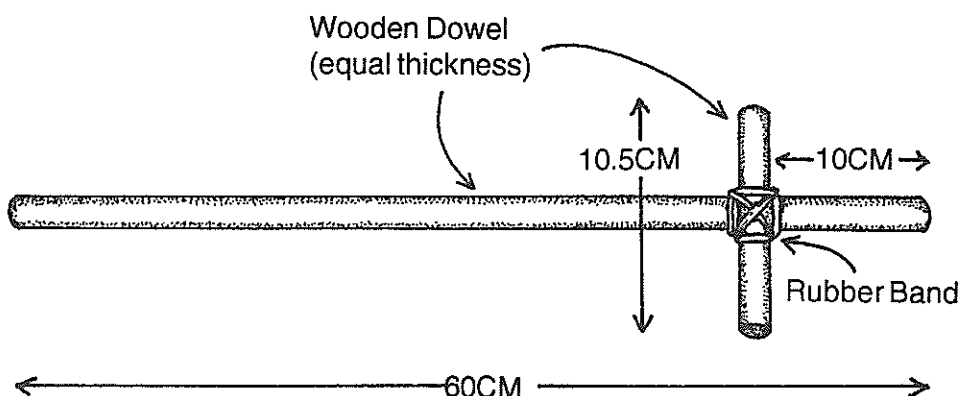
This is a quick, one-person system which is used by botanists and researchers to estimate the percentage of an area covered by the crown foliage of woody plants. It is usually called the variable-plot method because you do not need to mark out any plot boundaries and the measurements are made at random points. The observer views every plant visible along a very simple gauge (diagram below) from that point. Trees and/or shrubs whose horizontal crown spread appears larger than the gauge cross-piece are counted as a hit. Plants whose crown spread is less are ignored. We are assuming that the area of bush or woodland, when viewed from above, consists of randomly distributed circular crowns of different sizes.

Instructions for Use

Carefully hold the gauge to your eye and look all around you from the point you are standing at. The total number of individual plants that appear bigger than the width of the cross-piece multiplied by the angle percentage of the cross-piece is the cover estimate from that point. Many other plants will be visible, but only those that exceed the width of the cross-piece make up your estimates.

Take 6 - 10 observations and work out the average number of hits from that.

continued on page 96



Resource Sheet 35 continued

■ Activity 2.33 PLANT COVERINGS

page 66

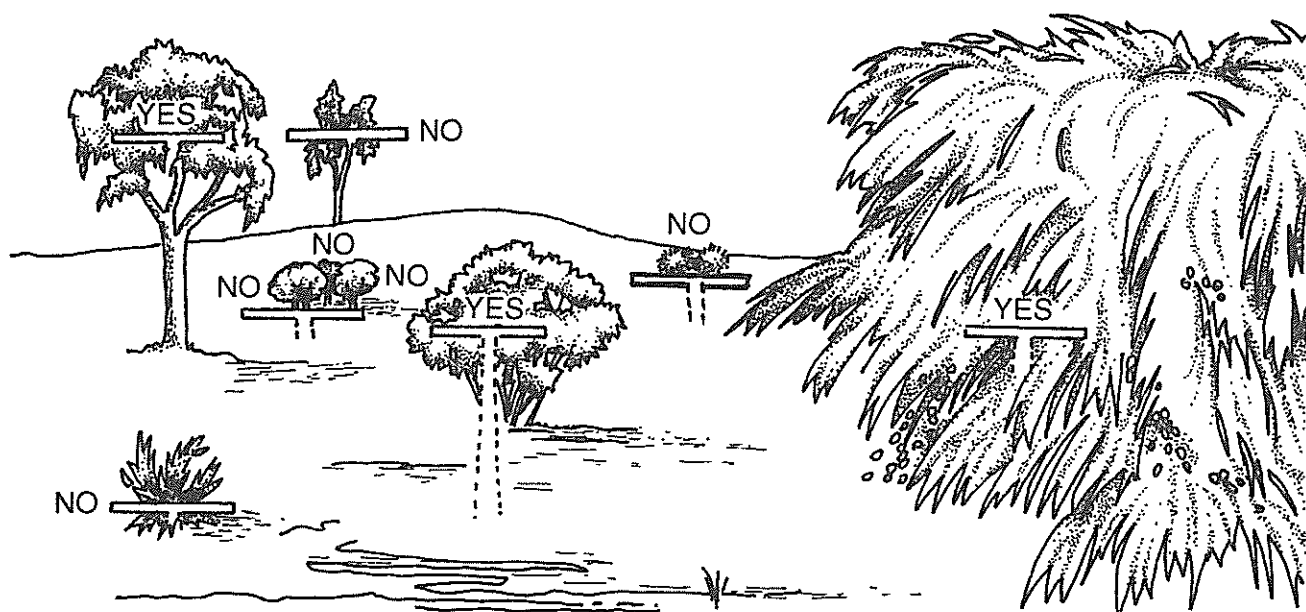
To make a Bitterlich Gauge, you will need:

60cm length of dowel

10.5cm length of dowel

Rubber band to join the dowel together

In the bushland hold your Bitterlich Gauge up to your eyes. This is an example of what you might see.



Any plant canopy that is wider than your cross-piece counts as one "hit". Count and record the number of "hits" from where you are standing.

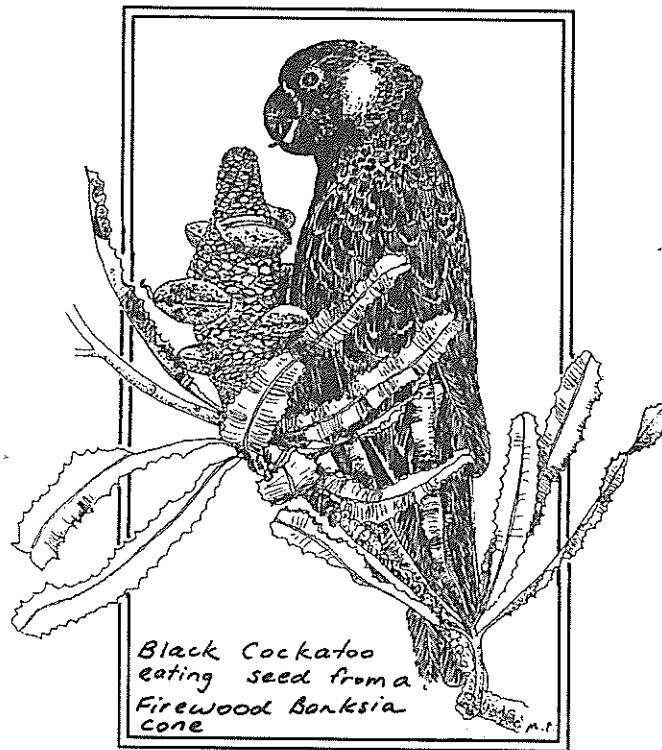
Go to another spot and do the same.

Repeat another 6-10 times.

Work out the average number of hits.

This is the percentage of canopy cover in your bushland.

Choose one particular plant and estimate the percentage cover of that plant.



PART THREE

WILD PLANTS AND ANIMALS LIVING TOGETHER

LIFE IN THE HERBS - A CATERPILLAR'S EYE VIEW

ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
3.1	Butterfly Poetry	105	●							●		●
3.2	Movement and Mime	106	●								●	
3.3	Brainstorm	106	●							●		
3.4	Life Cycle	106	●			●						
3.5	Sign Language	106	●							●	●	
3.6	Mime	107	●							●	●	
3.7	Caterpillar Model	107	●									●
3.8	Story Writing	107	●							●		
3.9	Insect Study	107	●			●						●
3.10	Museum Visit	107	●	●	●	●						
3.11	Cinquain	108		●						●		
3.12	Six Questions	108		●						●		
3.13	Question Time	108		●	●	●				●		
3.14	Life Cycle	108		●		●						
3.15	Word Sleuth	108		●						●		
3.16	Music Appreciation	109		●							●	
3.17	Interesting Words	109		●						●		
3.18	Breeding Butterflies	109	●	●	●	●						
3.19	Time Line	109			●		●		●			
3.20	Poster	109			●	●				●		●
3.21	Crossword	110			●					●		
3.22	Acrostic Poetry	110			●					●		
3.23	Choices	110			●		●			●		
3.24	Strappy Leaf Plant	111			●					●		●

ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
3.25	Plant Search	111			•	•						
3.26	Poster	111			•					•		
3.27	Butterfly Life Cycle	111			•	•						
3.28	Natural History Study	112			•	•						
3.29	Comparing Two Butterflies	112			•	•						

LIFE IN THE LOW SHRUBS - A BOBTAIL'S EYE VIEW

ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
3.30	A Bobtail's Eye View - in Pictures	133	•							•		
3.31	Drama	133	•								•	
3.32	Sensory Poem	133	•							•		
3.33	Model Making	133	•	•	•							
3.34	A Bobtail's Eye View - in Words	134		•						•		
3.35	Syllable Poems	134		•						•		
3.36	Research	134		•	•					•		
3.37	Question Time	134		•	•					•		
3.38	Structured Overview	135			•					•		
3.39	Comic Strip	135			•					•		
3.40	Letter	135			•					•		

LIFE IN THE TALL SHRUBS - HOW THE WOOLLY BUSH LIVES

ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
3.41	Drama	145	●								●	
3.42	Ant Art	145	●									●
3.43	The Ant Explorer	146	●	●	●					●		
3.44	Dot-to-Dot	146	●						●			●
3.45	Bushland Visit	147		●		●						
3.46	Dictionaries	147		●						●		
3.47	Woolly Bush Description	147		●	●	●				●		
3.48	Ant Count	148		●	●	●						
3.49	Question Time	148			●					●		

LIFE IN THE LOW TREES - HOW THE FIREWOOD BANKSIA LIVES

ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
3.50	Drama	155	•								•	
3.51	Matching	155	•							•		
3.52	3D Art	156	•									•
3.53	Sentence Finish	156		•	•					•		
3.54	Cockatoo Capers	156		•	•					•		
3.55	Word Sleuth	156		•	•					•		
3.56	Making a Banksia Cone	157		•	•							
3.57	Question Time - the Firewood Banksia	157		•	•					•		
3.58	Question Time - Black Cockatoos	157		•	•					•		
3.59	Question Time - the Honey Possum	157		•	•					•		
3.60	Question Time - the Singing Honeyeater	158		•	•					•		
3.61	Fruit Stages	158				•	•					•
3.62	The Great Debate	158				•				•		

LIFE IN THE BANKSIA WOODLAND

ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
3.63	Match The Animals	179	●							●		
3.64	Spot the Difference	179	●						●			
3.65	Home Sweet Home	179	●	●		●						
3.66	Camouflage	179	●	●		●						●
3.67	Creature Feature	180	●	●	●	●						
3.68	Feeding Habits	180	●	●	●	●						
3.69	Night and Day	181	●	●	●	●			●			
3.70	What Am I?	181	●	●	●					●		
3.71	Research	182	●	●	●	●				●		
3.72	Paint a Poster	183	●	●	●							
3.73	Word Power	183	●	●	●					●		
3.74	Predictions	183	●	●	●					●		
3.75	Sociogram	183		●	●	●	●					
3.76	Discuss	184		●	●	●	●					●
3.77	Debate	184		●	●					●		
3.78	Court Room Crime	184		●	●					●		
3.79	Recording Information	184		●	●					●		
3.80	Cloze	185		●	●					●		
3.81	Poster Design	185			●							●

Background



This section explores the inter-relationships between native plant communities and the animals that live within them.

The plant community explored here is Banksia Woodland found on the sandy soils of the Swan Coastal Plain around Perth. The information and activities are based upon the poster Banksia Woodland included with this package.

The activities relate to animal life found in each vegetation layer:

Life in the Herbs - A Caterpillar's Eye View

Life in the Low Shrubs - A Bobtail's Eye View

Life in the Tall Shrubs - How the Woolly Bush Lives

Life in the Low Trees - How the Firewood Banksia Lives

Life in Banksia Woodland - Animal Interactions in the Plant Community

Many of the activities are modelled on the First Steps format and can be used as additional resource material for the First Steps program.



A line drawing from the Banksia Woodland Poster in Harold Sandon Reserve, Melville WA

Background



LIFE IN THE HERBS

A CATERPILLAR'S EYE VIEW

There is a small herb called the *Phlebocarya ciliata* (flea-bow-karr-ee-a, sill-ee-ah-ta) living in the Banksia Woodland. This herb is very common in the Woodland, but people often think that it is a grass until they see its heads of tiny cream flowers hidden in the leaves. Also hidden in the leaves for most of the year is the caterpillar of the Three Spotted Skipper Butterfly.

This butterfly has been known for a long time but where the caterpillar lived was not known until a naturalist called Matthew Williams was studying the butterfly and how it lived. With Matthew's permission, the life cycle is presented here for the first time ever in print. The diary presented is not the naturalist's real diary, but one made up from the observations he recorded.



ACTIVITIES:

A patch of colour
in the sky

A flutter of wings
soft as a sigh

A gentle visitor
passing by

A sign of spring
a butterfly

■ Activity 3.1

JUNIOR

LANGUAGE
ART & CRAFT

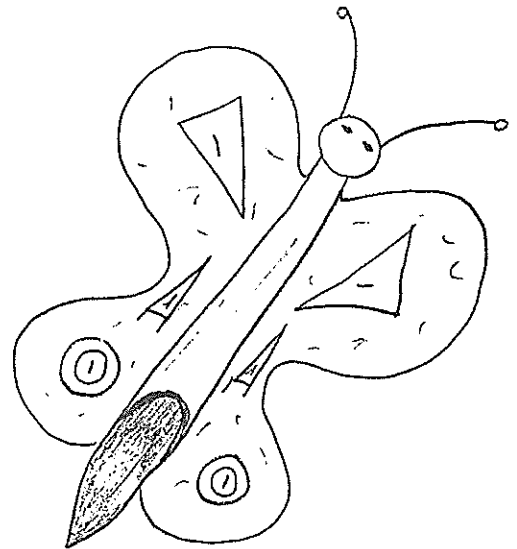
BUTTERFLY POETRY

1. Teach the class this poem about butterflies.
2. Discuss the poem and students can express their thoughts about butterflies. Students then can write their own poem about butterflies and draw a picture of a butterfly on a herb. Display these together.
3. Teacher charts the poem. Students draw and colour a butterfly to decorate poem which they have shared.
4. Refer to other poems about butterflies. Read these to the class then the students can choose titles that are appropriate to the poem.

(from Liddelow, L. (1984). "Talk With Me" Longman Cheshire, Sydney)

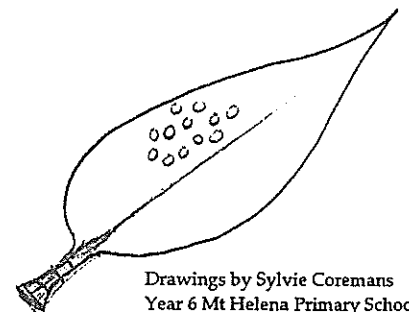
BUTTERFLIES by Alicia Webb Year 6 Mt Helena Primary School

Butterflies are such beautiful things.
With slender bodies and lovely wings.
They fly free in our native land
With lots of trees and light coloured sand.
Females make leaf-homes every year
There they are safe, they have no fear.
For lots of birds want them to eat.
There's not much chance, they're too petite.
A pupae contains some eggs that they lay,
The butterfly has babies, well - she may.
But wait, these babies aren't like their mum.
They're caterpillars, but only some.
They eat and grow and make a cocoon
There'll be even more butterflies, very soon.



Tami-Lee Sorensen and Belinda Stotter Year 6 Mt Helena Primary School

Rain sloshing on the ground
as caterpillars make their way around.
The silk they are making is whiter than white.
They're making sure it's perfectly right.
The caterpillars are all hidden away
waiting to come out on a nice spring day.
The weather is fining up so soon.
The caterpillars will be coming out of their cocoon.
The caterpillars have started a new life.
There are lots of new dangers that could lead to strife.
The butterflies have laid their eggs in a tree.
So now they can fly away and be free.
People we hope will be aware
To look after butterflies and give them good care.



Drawings by Sylvie Coremans
Year 6 Mt Helena Primary School

■ Activity 3.2

MOVEMENT & MIME

JUNIOR

Students are a butterfly in search of food. Play suitable music to accompany the search. What happens to the butterfly when it rains, when it is windy, or when a bird wants to eat it?

MUSIC &
MOVEMENT

■ Activity 3.3

BRAINSTORM

Resource Sheet 36 page 113

JUNIOR

Brainstorm words about butterflies.

Display this list in the class.

LANGUAGE

Students choose words from the Vocabulary List and place on Resource Sheet 36.

■ Activity 3.4

LIFE CYCLE

Resource Sheet 37 page 114

JUNIOR

Students discuss the life-cycle of the Three Spotted Skipper Butterfly.

SCIENCE

■ Activity 3.5

SIGN LANGUAGE

JUNIOR

Students experience the life cycle through action by representing the stages with their hands.

LANGUAGE
MUSIC &
MOVEMENT

caterpillar

little finger



shelter

a flat hand



pupa

a closed hand



butterfly

fingers outstretched



Pineapple Lily flower

join finger tips together on one hand



-
- **Activity 3.6** **MIME** *Resource Sheet 38 page 115*
- JUNIOR**
- As a class, read Karla's Diary (Resource Sheet 38), then re-read the section of the diary dated 3rd February. Have the students act out what is happening as teacher reads each entry.
- LANGUAGE
MUSIC &
MOVEMENT
-
- **Activity 3.7** **CATERPILLAR MODEL**
- JUNIOR**
- Using old stocking legs, students tie up one end and stuff with balls of newspaper. When full, tie up the other end. Trim both ends and place two eyes at one end. You now have a larger-than-life sized caterpillar!
- ART & CRAFT
- Resource:** Used tights/stockings
Newspaper
-
- **Activity 3.8** **STORY WRITING**
- JUNIOR**
- Students write about being a caterpillar or a butterfly. Make a class book to share with another class.
- LANGUAGE
-
- **Activity 3.9** **INSECT STUDY**
- JUNIOR**
- Use magnifying glasses and search around the playground for caterpillars and butterflies. Draw what you have seen.
- SCIENCE
ART & CRAFT
- Resource:** Magnifying glasses
-
- **Activity 3.10** **MUSEUM VISIT**
- JUNIOR
MIDDLE
UPPER**
- Visit the Western Australian Museum to view the butterfly display.
- SCIENCE

■ Activity 3.11 CINQUAIN

MIDDLE

Write a cinquain poem about butterflies using the format below:

LANGUAGE

Line 1	one word	title
Line 2	two words	describe the title
Line 3	three words	expressing action
Line 4	four words	expressing feeling
Line 5	one word	a synonym for the title

■ Activity 3.12 SIX QUESTIONS *Resource Sheet 38 page 115*

MIDDLE

Read Karla's Diary (Resource Sheet 38) to the class.

Note the relationship of time to the activity/ observation.

LANGUAGE

Students make up six questions based on the text to ask their partner.

Swap with partner.

■ Activity 3.13 QUESTION TIME *Resource Sheets 38 - 40 pages 115 - 120*

MIDDLE

Read Karla's Diary (Resource Sheet 38) to the class. Present questions about the diary orally (Resource Sheet 39), or as a worksheet (Resource Sheet 40).

UPPER

LANGUAGE

■ Activity 3.14 LIFE CYCLE *Resource sheet 41 page 122*

MIDDLE

Students draw up their own version of the life cycle.

SCIENCE

Students compare with Resource Sheet 41 on an overhead projector, and modify their own diagram if necessary.

Discuss representation of size (proportion) of the diagrams.

■ Activity 3.15 WORD SLEUTH

MIDDLE

Brainstorm words learnt from Activity 3.14 life cycle and Karla's diary.

LANGUAGE

Students make a word-sleuth based on these words and try it out on a partner when complete.

■ Activity 3.16 MUSIC APPRECIATION

MIDDLE

Play different examples of music without lyrics.

Students choose which one would be most appropriate for a butterfly.

MUSIC &
MOVEMENT

Resource: Music

■ Activity 3.17 INTERESTING WORDS *Resource Sheet 42 page 123*

MIDDLE

Students complete the Interesting Words Chart (Resource Sheet 42) and discuss in class.

LANGUAGE

■ Activity 3.18 BREEDING BUTTERFLIES

JUNIOR
MIDDLE
UPPER

Breed butterflies in the classroom. Contact the Western Australian Museum for assistance.

SCIENCE

■ Activity 3.19 TIME LINE *Resource Sheets 38, 43 pages 115, 124*

UPPER

Show an overhead of Karla's Diary (Resource Sheet 38).

Discuss as a class the use of time lines.

SOCIAL
STUDIES
MATHEMATICS

Teacher highlights sections to be included in time line.

Students plot this on time line (Resource Sheet 43).

■ Activity 3.20 POSTER *Resource Sheet 38 page 115*

UPPER

Using information from Karla's Diary (Resource Sheet 38), students draw up the life cycle of a butterfly including extensive notes about each stage.

SCIENCE
LANGUAGE
ART & CRAFT

Students may choose another species of butterfly and research before drawing.

Present on A3 paper and display.

■ Activity 3.21 CROSSWORD *Resource Sheet 44 page 125*

UPPER

Brainstorm words about butterflies.

LANGUAGE

Students plot the words on the crossword (Resource Sheet 44) and make up questions based on these words.

■ Activity 3.22 ACROSTIC POETRY

UPPER

Write an acrostic poem on caterpillars or butterflies.

LANGUAGE

eg: B beautiful
 U unusual
 T
 T
 E
 R
 F
 L
 Y

■ Activity 3.23 CHOICES *Resource Sheet 45 page 126*

UPPER

Students to sequence Karla's Diary which has been jumbled up. The first and last three items are correct. Students to work in pairs or small groups.

SOCIAL
STUDIES
LANGUAGE

Bring the class together to share the students' ideas. The students explain why they have made the choices.

Show the correct form and discuss.

Extension: Students to work on a class diary. Each entry is cut out and placed on a page. Below each entry, a student draws a sketch about the day's events. When complete, the entries are stapled together to form a diary.

■ Activity 3.24 STRAPPY LEAF PLANT *Resource Sheet 42 page 123*
UPPERLANGUAGE
ART & CRAFT

Students complete the Interesting Words Chart (Resource Sheet 42). Using the words from the chart, students write a story suitable for Year 1 about living in the strappy leafed plant from the caterpillars' eye view.

Students illustrate the story and take it to the Year 1 class to read to them.

■ Activity 3.25 PLANT SEARCH
UPPER

SCIENCE

If your school is on the Swan Coastal Plain, find some Banksia Woodland which has shrub and herb layers. See if you can find a *Phlebocarya ciliata* (flea-bow-karr-ee-sill-ee-ah-ta). Carefully search these for the stage of the butterfly that would be found at this time of the year. From your observations in the bushland and these notes, design a poster to show the life cycle of the Western Three Spotted Skipper Butterfly.

■ Activity 3.26 POSTER
UPPER

LANGUAGE

Students design a poster about preserving their local habitat, make a slogan or caption for their poster and display.

■ Activity 3.27 BUTTERFLY LIFE CYCLE *Resource Sheet 46 page 129*
UPPER

SCIENCE

Using the Butterfly Life Cycle diagram, students fill in the information needed to show how the butterflies use the plant at various stages of their lives.

■ Activity 3.28 NATURAL HISTORY STUDYUPPER
SCIENCE

Students make a natural history study. Select a plant in the bushland nearby. Try to identify it. Regularly visit the plant and record what you observe about the plant and animals living in it. Be careful to treat the plant and the animals living in it gently so that they can be studied throughout their whole life cycle. Research the plant using natural history books of Australia and Western Australia.

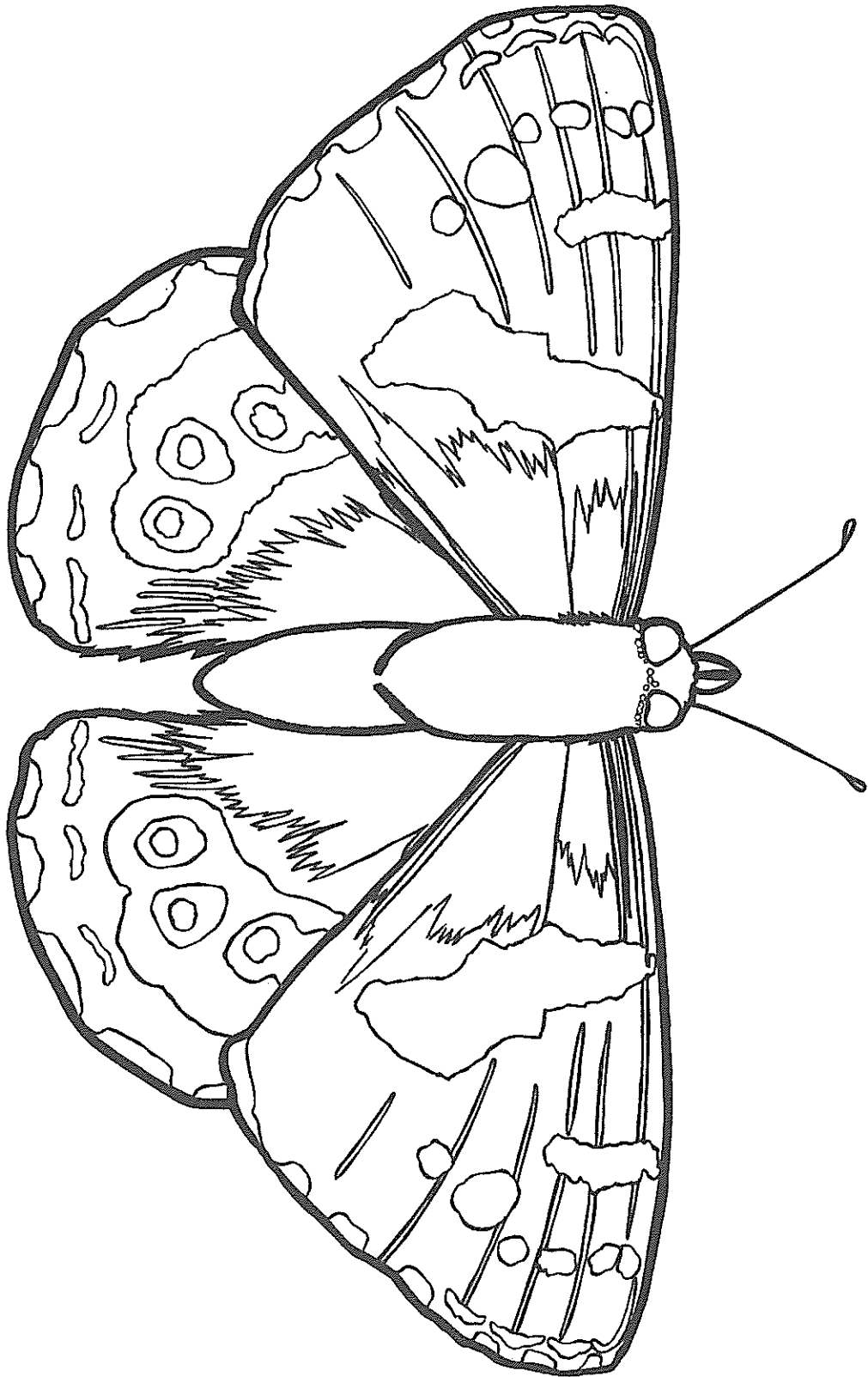
■ Activity 3.29 COMPARING TWO BUTTERFLIES*Resource Sheet 47 page 130*UPPER
SCIENCE

Discuss as a class how to compare two butterflies and complete Resource Sheet 47.

Resource Sheet 36

■ Activity 3.3 BRAINSTORM

page 106

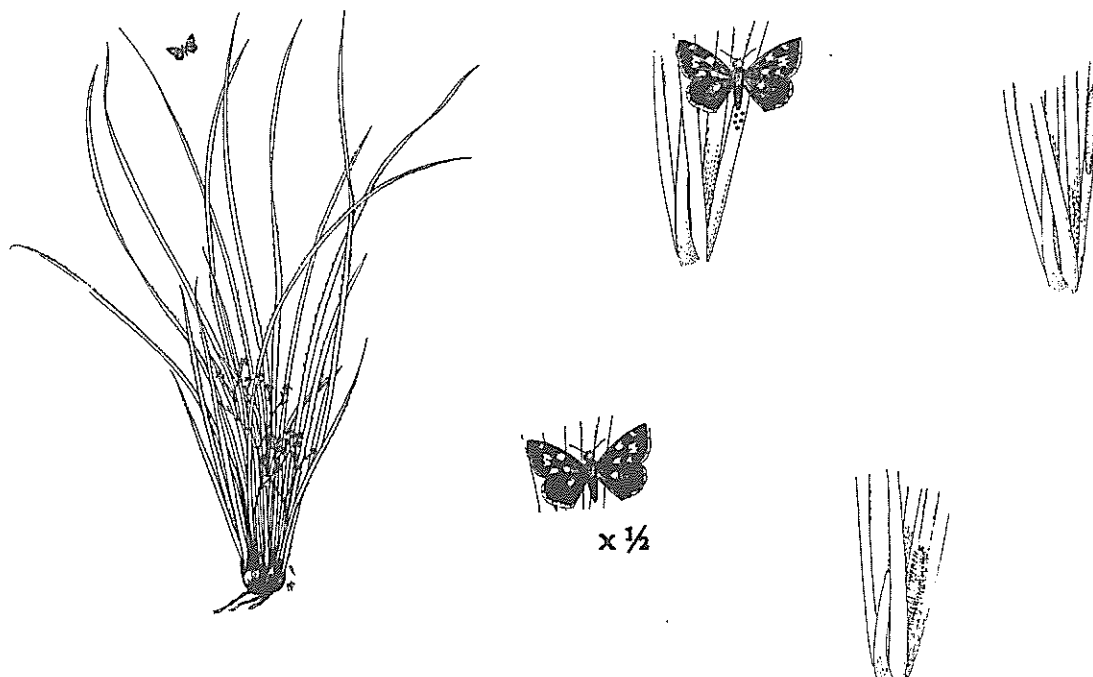


Resource Sheet 37

■ Activity 3.4 LIFE CYCLE OF A BUTTERFLY

page 106

Cut out the parts of the life cycle of a butterfly.
Glue them onto a blank page to complete the life cycle.



1. Butterfly visits the *Phlebocarya ciliata* plant.

2. Butterfly lays eggs on the leaves of the plant.

3. Caterpillars hatch from the eggs and eat the plant leaves.

4. Caterpillars spin a cocoon to become a pupa.

5. Inside the pupa the caterpillar changes into a butterfly.

6. The pupa splits open and the butterfly emerges.

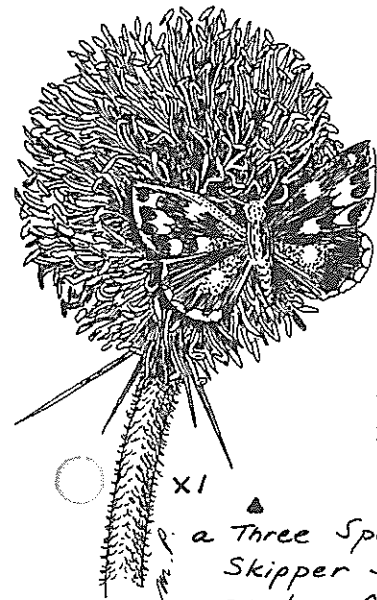
Resource Sheet 38

■ Activity 3.6 MIME page 107 ■ Activity 3.12 SIX QUESTIONS page 108
 ■ Activity 3.13 QUESTION TIME page 108
 ■ Activity 3.19 TIME LINE page 109 ■ Activity 3.20 POSTER page 109

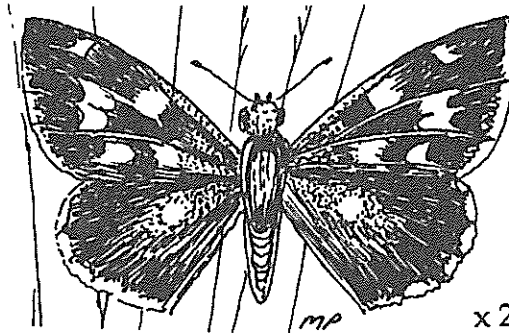
KARLA'S DIARY

5pm 25th October 1990

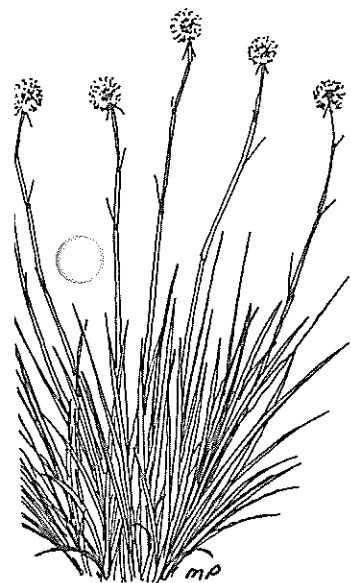
While walking in the bushland listening to the birds, I saw a small three spotted skipper butterfly. It was sipping nectar from the tiny cream flowers in the drumstick-like flower heads on a Pineapple Lily (*Dasypogon bromeliifolius*).



▲ a Three Spotted Skipper sipping nectar from Pineapple Lily Flowers



▲ a Three Spotted Skipper laying eggs on a *Phlebocarya* leaf



▲ a Pineapple Lily plant

After drinking the nectar with its long tongue, the skipper flew to a small, strappy leafed plant and laid some eggs on the leaves. The butterfly laid eggs on about ten of these plants in the patch and then flew away. I've drawn a mud-map of the location of the plants and placed some pieces of wood around the plants. Now I will be able to find the plants when I return to see the eggs hatch. The eggs are so small that it won't be easy to find them again.

I don't know what the strappy leafed plant is. When it flowers next year, I'll take a photograph of it and see if I can find out what it is.

3pm 10th November 1990

This is the third time I've been back to look for the butterfly eggs. The first time I looked, I could not find any eggs. The second time I found them but they did not seem to have changed. Now they are just shells. There are no caterpillars to be seen. I'll look again in a few weeks, the caterpillars may have grown big enough to be seen by then.

3pm 25th November 1990

There are still no caterpillars to be found. Maybe they have been eaten, or they have left the strappy leafed plant for another plant.

continued next page

Resource Sheet 38

■ Activity 3.6 MIME page 107 ■ Activity 3.12 SIX QUESTIONS page 108
 ■ Activity 3.13 QUESTION TIME page 108
 ■ Activity 3.19 TIME LINE page 109 ■ Activity 3.20 POSTER page 109

6pm 5th December 1990

I've found some!! I was having no luck finding the caterpillars so I went to the library and found a few books on Australian butterflies. It seems that some only feed at night, so I came as late as I could to check this out. The book gave me the right idea because when I went to look at my plants, three caterpillars were sitting on the young leaves of the strappy leafed plants. I searched the plants for more but was unable to find any more. What I did find were some caterpillar homes. The caterpillar uses silk-like threads to bind the strappy leaves together to make a little tunnel in the leaves. I will have to come back in the day time and see if this is where the caterpillars hide. Perhaps this will explain why I could not find the caterpillars when I looked before.

3pm 5th January 1991

At last I was able to go back to look for my caterpillars today. I looked carefully through the plant and found a little tunnel and inside was the caterpillar.



It had grown since I last saw it and is about 2 centimetres long now. During the day when it is hot, the caterpillar must stay in its shelter. At night, when it is cool and there are not so many birds about, it comes out to feed.

7pm 20th January 1991

I went to the bushland again tonight just at the right time to see the caterpillar come out of his home. It was fun to see it munching away at a leaf. The caterpillar is always on a young leaf. I think it must like its food fresh and juicy, not old and tough. It would be great to have eyes like the video cameras have, and see the caterpillar magnified.

Resource Sheet 38

- Activity 3.6 MIME page 107 ■ Activity 3.12 SIX QUESTIONS page 108
 ■ Activity 3.13 QUESTION TIME page 108
 ■ Activity 3.19 TIME LINE page 109 ■ Activity 3.20 POSTER page 109

7pm 3rd February 1991

Tonight I noticed the caterpillar behaving very strangely. As it eats, the caterpillar flicks its body. I sat and watched for a while and noticed it was flicking its droppings. The droppings drop quite a distance away from where it is eating. This seems to stop them falling into its tunnel and making its home grubby. Maybe it also stops any animal from finding it by seeing its droppings. The plant might lose some leaves as the caterpillar eats them, but it gets some fertiliser from the droppings.

6pm 5th April 1991

I haven't been able to come to the bushland for a while but I finally got there today. The caterpillar is nearly 4 centimetres long now. The weather is getting much cooler. It is still very dry in the bushland as the rains are yet to arrive. The strappy leafed plant seems to cope all right in summer, it doesn't grow but it stays green and doesn't look half dead like some of the bushland plants.

May, June and July 1991

We are having a great wet season. It is raining every few days. I've only been to the bushland a few times over the last few months. I've only seen my caterpillars out of their homes once. They don't seem to like coming out when it is cold and wet. They are not getting any bigger but they are not getting smaller, so I guess they are OK.

9pm 10th August 1991

The weather was great today; rain in the early morning, sunny by midday. There were no caterpillars out feeding but it was really too early in the day. I have only ever seen them in the evening. The strappy leafed plants have some buds on them. These are a bit hard to see as they are hidden away in the leaves. Soon I'll be able to take a photograph.



Karla's Banksia
Woodland

Resource Sheet 38

- Activity 3.6 MIME page 107 ■ Activity 3.12 SIX QUESTIONS page 108
 ■ Activity 3.13 QUESTION TIME page 108
 ■ Activity 3.19 TIME LINE page 109 ■ Activity 3.20 POSTER page 109



Phlebocarya
flowers

6pm 25th September 1991

I saw the caterpillars today. They are only a tiny bit bigger than they were in April. Winter can't be the best time for growing. The caterpillars have done well to survive all this time. There are always lots of birds around, but not so many by the time they are out and about. The flowers of the plants are nearly out. I must make sure I have my camera next time. I'll draw them as well, just as I have drawn the caterpillars and the butterfly.

2pm 2nd October 1991

I came earlier today to take the photographs. I had to hold the leaves of the plant back with sticks to see the flowers. I was being very careful not to disturb the caterpillar tunnel and noticed that the tunnel was closed over at both ends. It looked like the caterpillar has formed a pupa.



I checked a few others and they were the same. It looks like I will have to come more often now, so I can see the butterflies when they emerge from the pupae.

4pm 20th October 1991

The pupae are starting to mature. I saw my first butterfly today. The butterfly was feeding on the tiny cream flowers of another plant. It's the same one I found my butterfly on last October, a Pineapple Bush.

3pm 10th November 1991

All my pupae have matured. I've seen about six butterflies altogether. The females laid eggs on the strappy leafed plants and another plant with strappy leaves.

12th November 1991

I took my photos of the strappy leafed plant to the Herbarium and found out it was called a *Phlebocarya ciliata* (flea-bow-karr-ee-a sill-ee-ah-ta).



a *Phlebocarya*
ciliata plant

Resource Sheet 39

■ Activity 3.13 QUESTION TIME

page 108

1. Q. What was Karla listening to whilst walking in the bushland?
A. *Birds.*
2. Q. The flower heads of the Pineapple Lily were shaped like a what?
A. *Drumstick.*
3. Q. The Three Spotted Skipper Butterfly sipped the nectar with its long?
A. *Proboscis(tongue).*
4. Q. On how many of the plants did the butterfly lay eggs?
A. *About 10.*
5. Q. Karla went to the library and found a few books on Australian?
A. *Butterflies.*
6. Q. In the book, Karla found out that some butterflies only feed at night. Is this true or false?
A. *True.*
7. Q. The caterpillars homes are made of thread. What do they look like?
A. *Silk.*
8. Q. The caterpillar is always on an old leaf. True or false?
A. *False.*
9. Q. Karla noticed the caterpillar behaving very strangely. Why was this?
A. *It flicks its body to dispose its droppings some distance away.*
10. Q. The strappy leafed plant had buds on it in August. Why were they difficult to see?
A. *They were hidden away in the leaves.*
11. Q. Why had the caterpillars done well to survive? What could have harmed them?
A. *Birds.*
12. Q. Before the caterpillar becomes a butterfly, it becomes a?
A. *Pupa.*
13. Q. How many butterflies did Karla end up seeing?
A. *About 6.*
14. Q. Can you remember the name of the strappy leafed plant?
A. *Phlebocarya ciliata.*
15. Q. What does the name *ciliata* in *Phlebocarya ciliata* mean?
A. *Thick with hair.*

Resource Sheet 40

■ Activity 3.13 QUESTION TIME

page 108



x1 ▲
p. Three Spotted
Skipper sipping
nectar from
Pineapple Lily
flowers

1. Q. What was Karla listening to whilst walking in the bush?

A. _____

2. Q. The flower heads of the Pineapple Lily were shaped like a what?

A. _____

3. Q. The Three Spotted Skipper Butterfly sipped the nectar with its long?

A. _____

4. Q. On how many of the plants did the butterfly lay eggs?

A. _____

5. Q. Karla went to the library and found a few books on Australian?

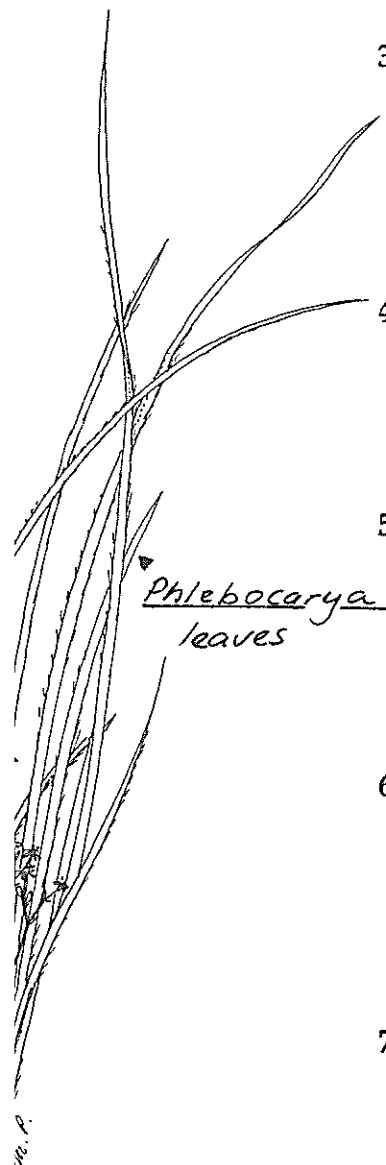
A. _____

6. Q. In the book, Karla found out that some butterflies only feed at night. Is this true or false?

A. _____

7. Q. The caterpillars homes are made of thread. What do they look like?

A. _____



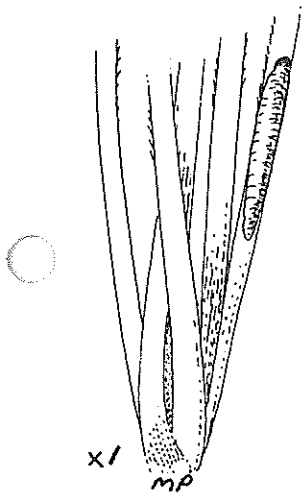
▲
Phlebocarya
leaves

Resource Sheet 40 continued

■ Activity 3.13 QUESTION TIME

page 108

a caterpillar on
▼ a leaf



8. Q. The caterpillar is always on an old leaf. True or false?

A. _____

9. Q. Karla noticed the caterpillar behaving very strangely. Why was this?

A. _____

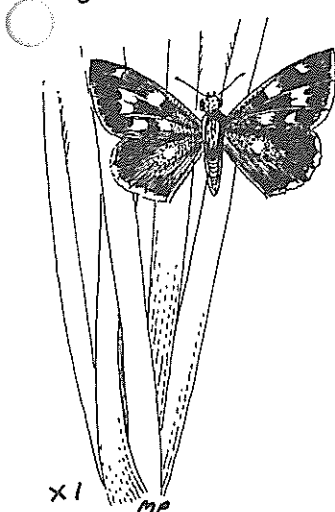
10. Q. The strappy leafed plant had buds on it in August. Why were they difficult to see?

A. _____

11. Q. Why had the caterpillars done well to survive? What could have harmed them?

A. _____

▼ a Three Spotted
Skipper laying
eggs on a leaf



12. Q. Before the caterpillar becomes a butterfly, it becomes a?

A. _____

13. Q. How many butterflies did Karla end up seeing?

A. _____

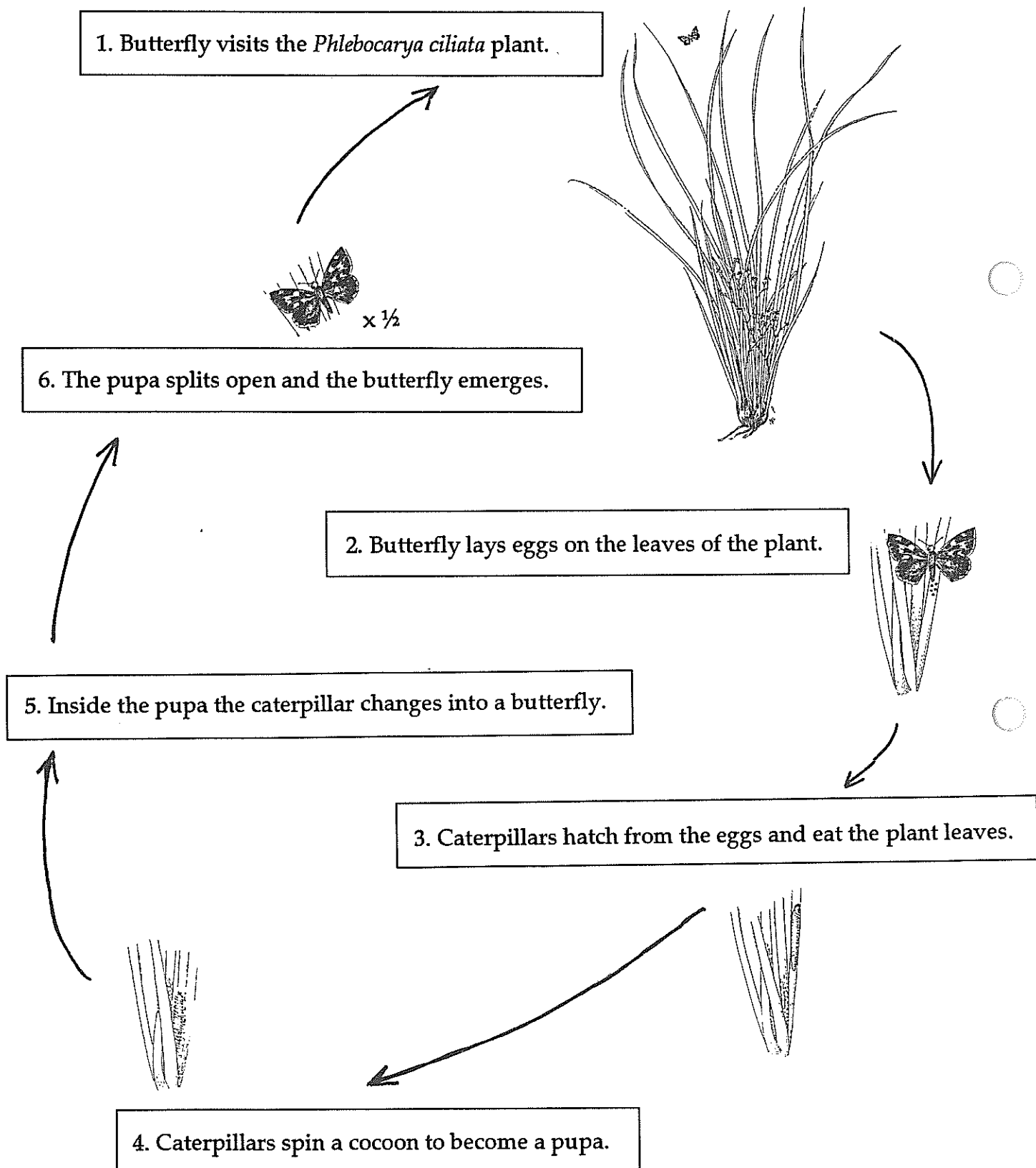
14. Q. Can you remember the name of the strappy leafed plant?

A. _____

Resource Sheet 41

■ Activity 3.14 LIFE CYCLE

page 108



Resource Sheet 42

■ Activity 3.17 INTERESTING WORDS CHART
 ■ Activity 3.24 STRAPPY LEAF PLANT

page 109
 page 111

Word	Paragraph	Any clues from the text?	Your explanation
nectar	25th Oct	from tiny cream flowers	sweet liquid found in flowers
strappy	25th Oct		
mud-map	25th Oct		
bind	5th Dec		
munching	20th Jan		
magnified	20th Jan		
behaving	3rd Feb		
droppings	3rd Feb		
cope	5th April		
hidden	10th Aug		
pupa/pupae	2nd Oct		
emerge	2nd Oct		
mature	20th Oct		
herbarium	12th Nov		

Resource Sheet 43

■ Activity 3.19 TIME LINE

page 109

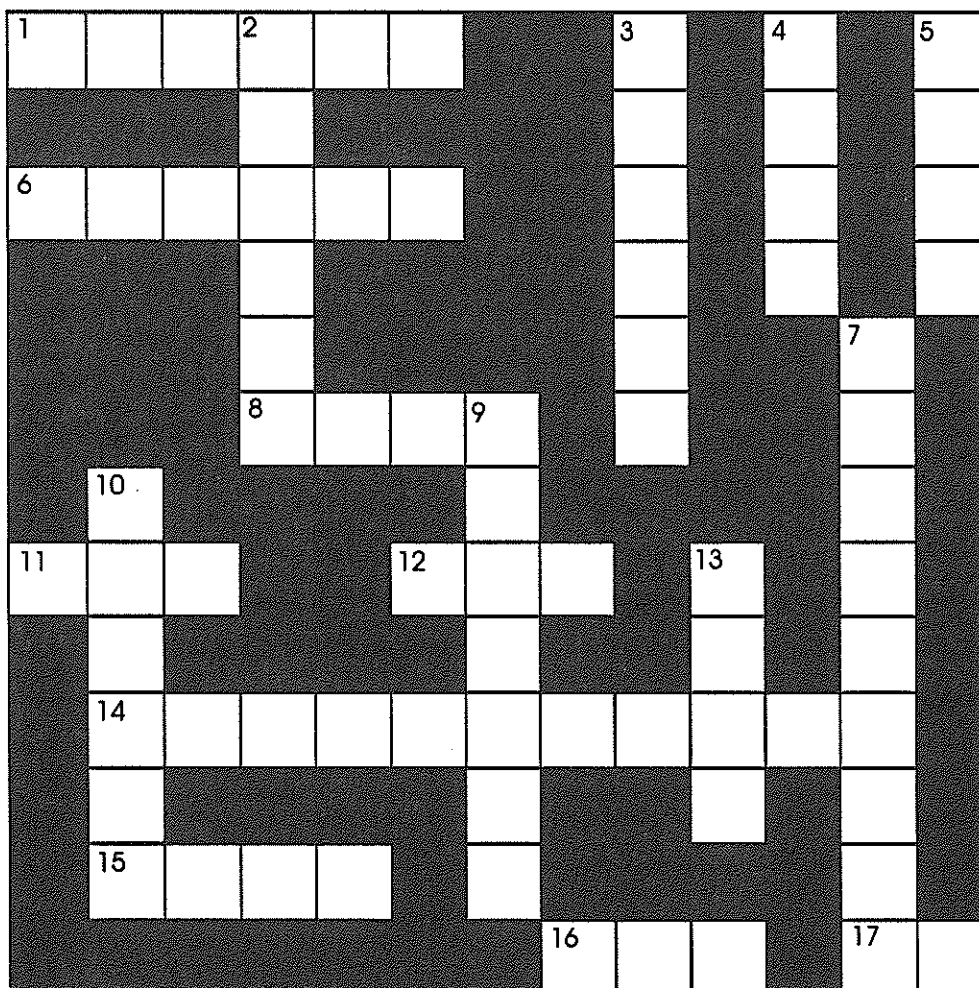


Resource Sheet 44

■ Activity 3.21 CROSSWORD

page 110

This crossword is based on the information from Karla's diary Resource Sheet 38.



ACROSS

1. Butterflies sip this out of flowers
6. Two leaves are joined together by the butterfly to make a _____
8. The female butterfly lays these.
11. The movement of a butterfly
12. The weather is _____ when the rain has not yet come.
14. A young butterfly.
15. "There are no caterpillars to be _____"
16. Part of a plant.
17. Another word for 'I'.

DOWN

2. Butterflies use this to get the nectar out of a flower.
3. Favourite food of butterflies.
4. Predator of the butterfly.
5. Another word for cocoon.
7. A place where information about plants is collected and recorded.
9. The name given to the plant with particular leaves.
10. This is what a caterpillar does with its body to get rid of its droppings.
13. The thread of the pupa feels like _____

Resource Sheet 45

■ Activity 3.23 CHOICES

page 110

KARLA'S DIARY

5pm 25th October 1990

While walking in the bush listening to the birds, I saw a small three spotted skipper butterfly. It was sipping nectar from the tiny cream flowers in the drumstick-like flower heads on a Pineapple Lily (*Dasypogon bromeliifolius*). After drinking the nectar with its long tongue, the skipper flew to a small, strappy leafed plant and laid some eggs on the leaves. The butterfly laid eggs on about ten of these plants in the patch and then flew away. I've drawn a mud-map of the location of the plants and placed some pieces of wood around the plants. Now I will be able to find the plants when I return to see the eggs hatch. The eggs are so small that it won't be easy to find them again.

I don't know what the strappy leafed plant is. When it flowers next year, I'll take a photograph of it and see if I can find out what it is.

3pm 10th November 1990

This is the third time I've been back to look for the butterfly eggs. The first time I looked, I could not find any eggs. The second time I found them but they did not seem to have changed. Now they are just shells. There are no caterpillars to be seen. I'll look again in a few weeks, the caterpillars may have grown big enough to be seen by then.

3pm 25th November 1990

There are still no caterpillars to be found. Maybe they have been eaten, or they have left the strappy leafed plant for another plant.

7pm 20th January 1991

I went to the bush again tonight just at the right time to see the caterpillar come out of his home. It was fun to see it munching away at a leaf. The caterpillar is always on a young leaf. I think it must like its food fresh and juicy, not old and tough. It would be great to have eyes like the video cameras have, and see the caterpillar magnified.

9pm 10th August 1991

The weather was great today; rain in the early morning, sunny by midday. There were no caterpillars out feeding but it was really too early in the day. I have only ever seen them in the evening. The strappy leafed plants have some buds on them. These are a bit hard to see as they are hidden away in the leaves. Soon I'll be able to take a photograph.

Resource Sheet 45 continued

■ Activity 3.23 CHOICES

page 110

2pm 2nd October 1991

I came earlier today to take the photographs. I had to hold the leaves of the plant back with sticks to see the flowers. I was being very careful not to disturb the caterpillar tunnel and noticed that the tunnel was closed over at both ends. It looked like the caterpillar has formed a pupa. I checked a few others and they were the same. It looks like I will have to come more often now, so I can see the butterflies when they emerge from the pupae.

6pm 5th December 1990

I've found some!! I was having no luck finding the caterpillars so I went to the library and found a few books on Australian butterflies. It seems that some only feed at night, so I came as late as I could to check this out. The book gave me the right idea because when I went to look at my plants, three caterpillars were sitting on the young leaves of the strappy leafed plants. I searched the plants for more but was unable to find any more caterpillars. What I did find were some caterpillar homes. The caterpillar uses silk-like threads to bind the strappy leaves together to make a little tunnel in the leaves. I will have to come back in the day time and see if this is where the caterpillars hide. Perhaps this will explain why I could not find the caterpillars when I looked before.

6pm 5th April 1991

I haven't been able to come to the bush for a while but I finally got there today. The caterpillar is nearly 4 centimetres long now. The weather is getting much cooler. It is still very dry in the bushland as the rains are yet to arrive. The strappy leafed plant seems to cope all right in summer, it doesn't grow but it stays green and doesn't look half dead like some of the bushland plants.

7pm 3rd February 1991

Tonight I noticed the caterpillar behaving very strangely. As it eats, the caterpillar flicks its body. I sat and watched for a while and noticed it was flicking its droppings. The droppings drop quite a distance away from where it is eating. This seems to stop them falling into its tunnel and making its home grubby. Maybe it also stops any animal from finding it by seeing its droppings. The plant might lose some leaves as the caterpillar eats them, but it gets some fertiliser from the droppings.

Resource Sheet 45 continued

■ Activity 3.23 CHOICES

page 110

6pm 25th September 1991

I saw the caterpillars today. They are only a tiny bit bigger than they were in April. Winter can't be the best time for growing. The caterpillars have done well to survive all this time. There are always lots of birds around, but not so many by the time they are out and about. The flowers of the plants are nearly out. I must make sure I have my camera next time. I'll draw them as well, just as I have drawn the caterpillars and the butterfly.

3pm 5th January 1991

At last I was able to go back to look for my caterpillars today. I looked carefully through the plant and found a little tunnel and inside was the caterpillar. It had grown since I last saw it and it is about 2 centimetres long now. During the day when it is hot, the caterpillar must stay in its shelter. At night, when it is cool and there are not so many birds about, it comes out to feed.

May, June and July 1991

We are having a great wet season. It is raining every few days. I've only been to the bush a few times over the last few months. I've only seen my caterpillars out of their homes once. They don't seem to like coming out when it is cold and wet. They are not getting any bigger but they are not getting smaller, so I guess they are OK.

4pm 20th October 1991

The pupae are starting to mature. I saw my first butterfly today. The butterfly was feeding on the tiny cream flowers of another plant. It's the same one I found my butterfly on last October, a Pineapple Bush.

3pm 10th November 1991

All my pupae have matured. I've seen about six butterflies altogether. The females laid eggs on the strappy leafed plants and another plant with strappy leaves.

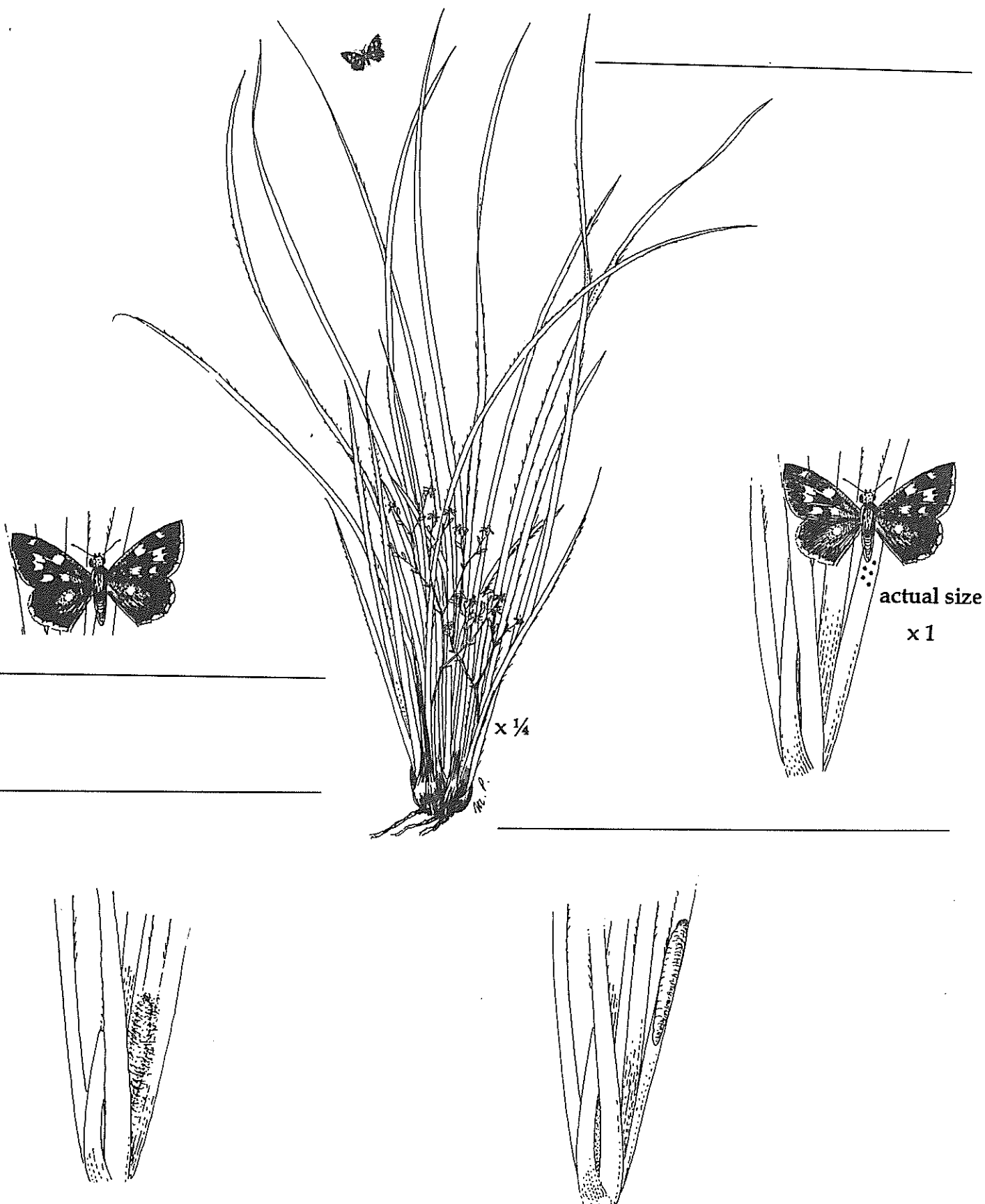
12th November 1991

I took my photos of the strappy leafed plant to the Herbarium and found out it was called a *Phlebocarya ciliata* (flea-bow-karr-ee-a sill-ee-ah-ta).

Resource Sheet 46

■ Activity 3.27 BUTTERFLY LIFE CYCLE

page 111



Resource Sheet 47

Activity 3.29 COMPARING TWO BUTTERFLIES

page 112

Provide the students with a picture of two different butterflies, their caterpillars and some information about them, then complete.

<p>Write down how these two butterflies and their caterpillars are the same, and how they are different.</p>	
<p>Things that are the same:</p>	<p>Things that are different:</p>
<p>eg: Both have 2 pairs of wings</p>	<p>One is spotted and the other is?</p>

Background



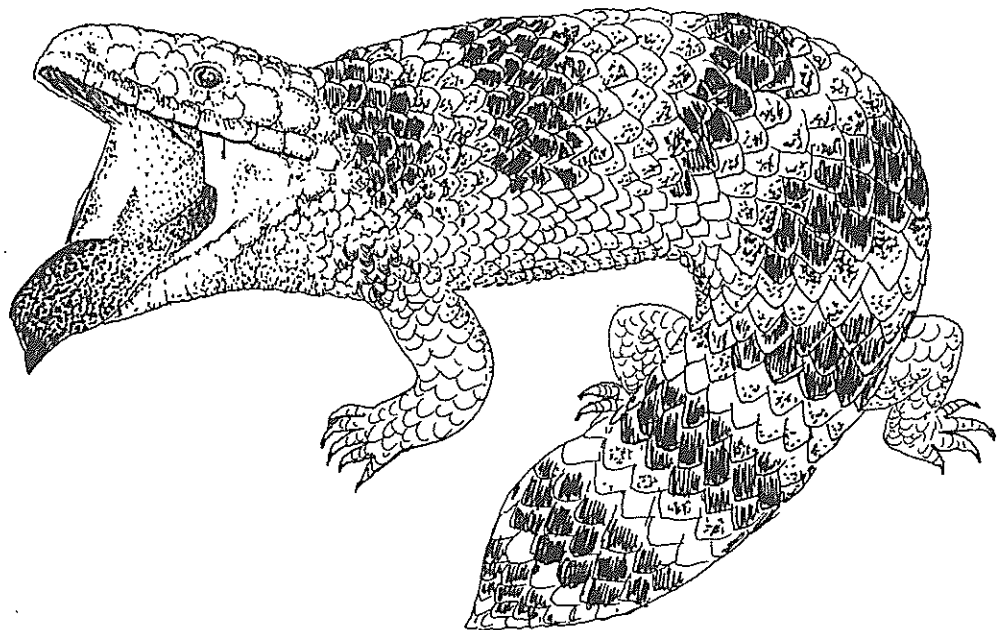
LIFE IN THE LOW SHRUBS

A BOBTAIL'S EYE VIEW

One of the most commonly seen reptiles in Banksia Woodland is the Bobtail or Sleepy Lizard (*Trachydosaurus rugosus*). The bobtail actually belongs to the skink group and is not a goanna. Bobtails are omnivorous, that is, they eat both plants and animals.

Bobtails often visit home gardens. They love fresh strawberries and occasionally the odd chicken egg.

In the wild, one of the bobtail's foods is the fruit from the Swan Berry Plant (*Astroloma macrocalyx*). This plant has long tubular flowers which are adapted for bird pollination. They are whitish green and contain a lot of nectar. The bobtail eats the fruit of this plant, not the flower, and excretes the seeds. This method of seed distribution highlights the essential interaction of plants and animals.



A Bobtail Skink (*Trachydosaurus rugosus*) warning off an intruder as it searches for a meal of Swan Berry fruit

Background



When threatened, a bobtail will hiss and stick its tongue out in the hope of scaring its enemy away. This is called a scare defence mechanism. They have a small row of fine teeth and, when they bite, they are not keen to let go.

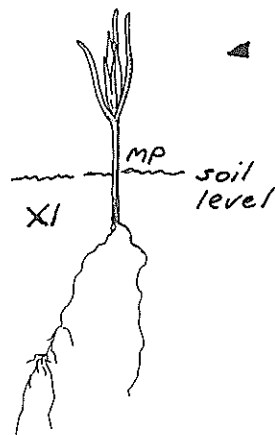


▲ a Swan Berry plant with many fruit hidden amongst the leaves

a branchlet of Swan Berry flowers



a branchlet of Swan Berry fruit



▲ a Swan Berry seedling

ACTIVITIES

■ Activity 3.30

A BOBTAIL'S EYE VIEW - IN PICTURES*Resource Sheets 48, 49 page 137, 138*

JUNIOR

LANGUAGE

Teacher reads "A Bobtail's Eye View" (Resource Sheet 48). Students write a caption below each picture.

■ Activity 3.31

DRAMA*Resource Sheet 48 page 137*

JUNIOR

MUSIC &
MOVEMENT

Students act as bobtails. Aspects to mimic are:

- ◆ moving close to the ground
 - ◆ moving on four legs
 - ◆ basking in the sun
 - ◆ defending themselves
 - ◆ sheltering under bushes.
-

■ Activity 3.32

SENSORY POEM

JUNIOR

Take students out into the sunshine to bask in the sun. Students describe their experiences.

LANGUAGE

Make a class sensory poem.

■ Activity 3.33

MODEL MAKINGJUNIOR
MIDDLE
UPPER

Using junk material or plasticine, students make a model of a bobtail.

ART & CRAFT

■ Activity 3.34

A BOBTAIL'S EYE VIEW - IN WORDS

MIDDLE

Resource Sheets 48, 50 page 137, 139

LANGUAGE

Brainstorm prior knowledge of bobtails. Read "A Bobtail's Eye View" from Resource Sheet 48. Students complete "What I Know" and "What I've Learned" (Resource Sheet 50).

■ Activity 3.35

SYLLABLE POEMS

MIDDLE

Students write a syllable poem based on their knowledge about bobtails, using the following format.

LANGUAGE

Line 1 one syllable
 Line 2 two syllables
 Line 3 three syllables
 Line 4 two syllables
 Line 5 one syllable

■ Activity 3.36

RESEARCH

MIDDLE
UPPER

Students research the differences and similarities between lizards.

Choose one and write about it.

Prepare a one minute speech based on their research.

LANGUAGE

■ Activity 3.37

QUESTION TIME

*Resource Sheets 48, 51 page 137, 140*MIDDLE
UPPER

Read the Bobtail's Story (Resource Sheet 48) to the class. Present questions about the diary as a worksheet (Resource Sheet 51).

LANGUAGE

■ Activity 3.38 **STRUCTURED OVERVIEW***Resource Sheets 48, 52 page 137, 142***UPPER***LANGUAGE*

Complete the structured overview sheet (Resource Sheet 52) by reading A Bobtail's Eye View (Resource Sheet 48) and filling in the headings and key words.

■ Activity 3.39 **COMIC STRIP****UPPER**

Students make a comic strip style story to illustrate a day in the life of a bobtail.

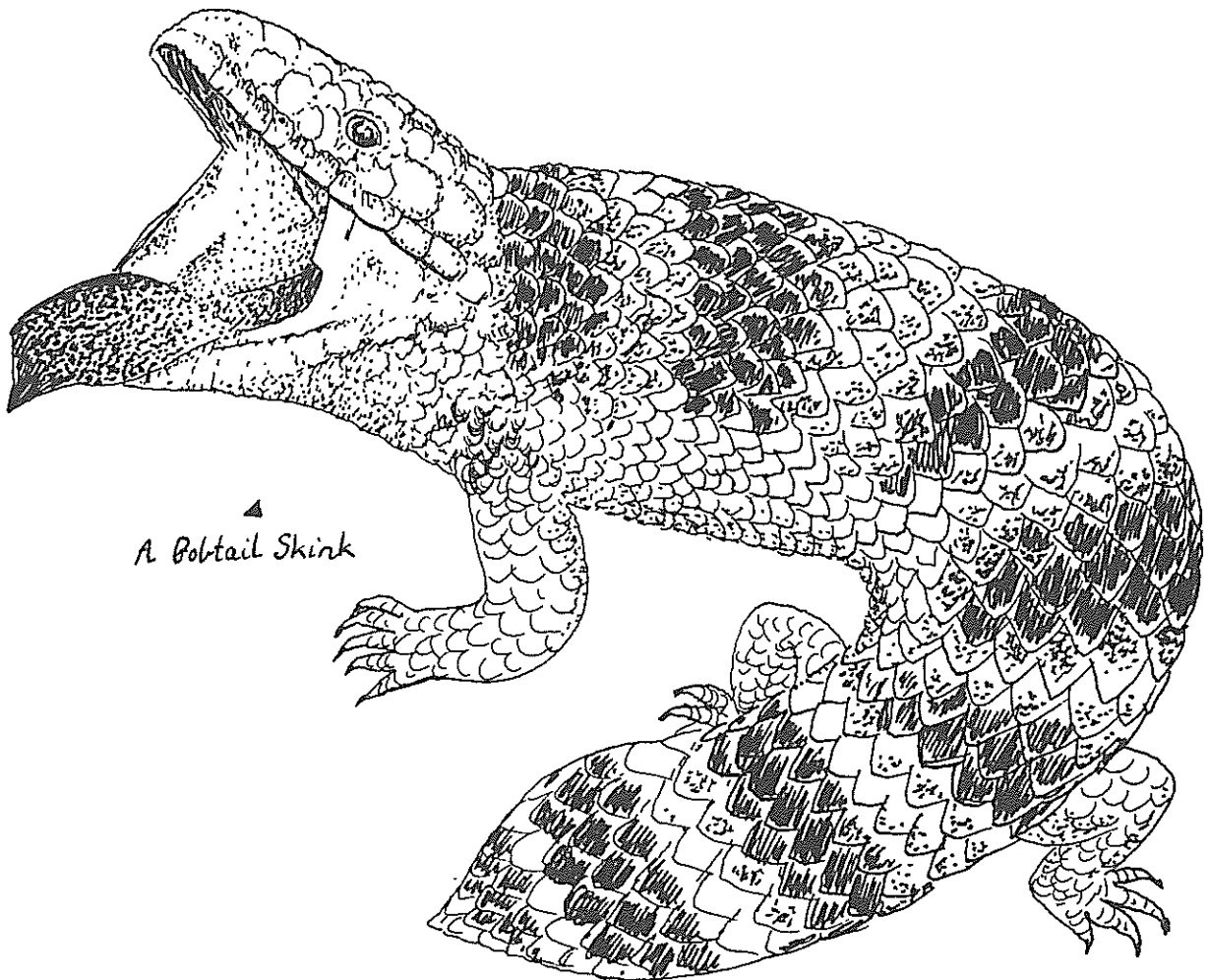
*LANGUAGE***■ Activity 3.40** **LETTER****UPPER**

Write a letter to the Western Australian Museum or Western Australian Gould League to ask for information about bobtails.

LANGUAGE



◀ Swan Berry plant



▲
A Bobtail Skink

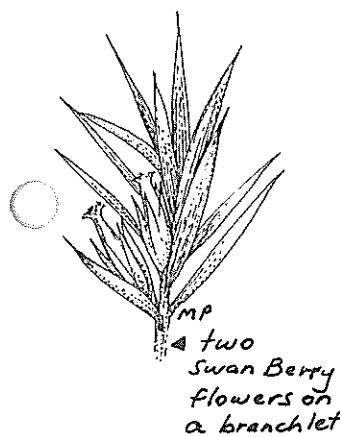
Resource Sheet 48

■ Activity 3.30	A BOBTAIL'S EYE VIEW - IN PICTURES	page 133
■ Activity 3.31	DRAMA	page 133
■ Activity 3.34	A BOBTAIL'S EYE VIEW - IN WORDS	page 134
■ Activity 3.37	QUESTION TIME	page 134
■ Activity 3.38	STRUCTURED OVERVIEW	page 135

A BOBTAIL'S EYE VIEW



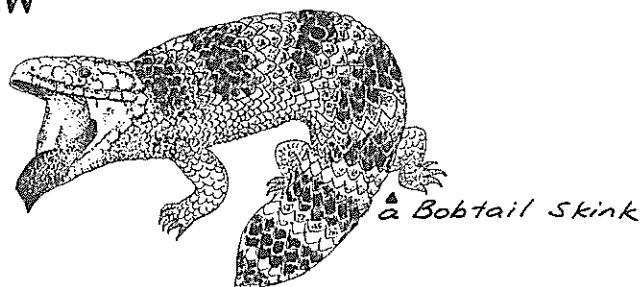
a Swan Berry plant



two Swan Berry flowers on a branchlet



four Swan Berry fruit on a branchlet



a Bobtail Skink

Introduction

I'm a bobtail. Many people think I'm a goanna but they're wrong! I'm a skink.

The name bobtail describes my stumpy tail. I have such short legs that my belly rubs along the ground. My body is strong and covered in shiny-interlocking scales. I am a mottled blue-grey colour. I am very proud of my bright blue tongue which I poke out when I get angry.

I live in the Banksia Woodland. My territory is about 2 kilometres square. I wake up slowly in the morning because I'm so cold. As the sun rises, it warms me up and I can often be seen basking on the sand. In my head I have a map of my territory. I spend most of my days moving around eating plants. One of my favourite foods is the fruit of the Swan Berry. You may have seen one of these bushes. It has tubular cream flowers in Spring and is about 50 centimetres tall. Birds collect nectar from these flowers and pollinate them. I have to climb over the spiky leaves to get to the delicious juicy green fruit. There is a big seed inside the fruit that I can't digest and I scatter them all over my territory in my droppings.

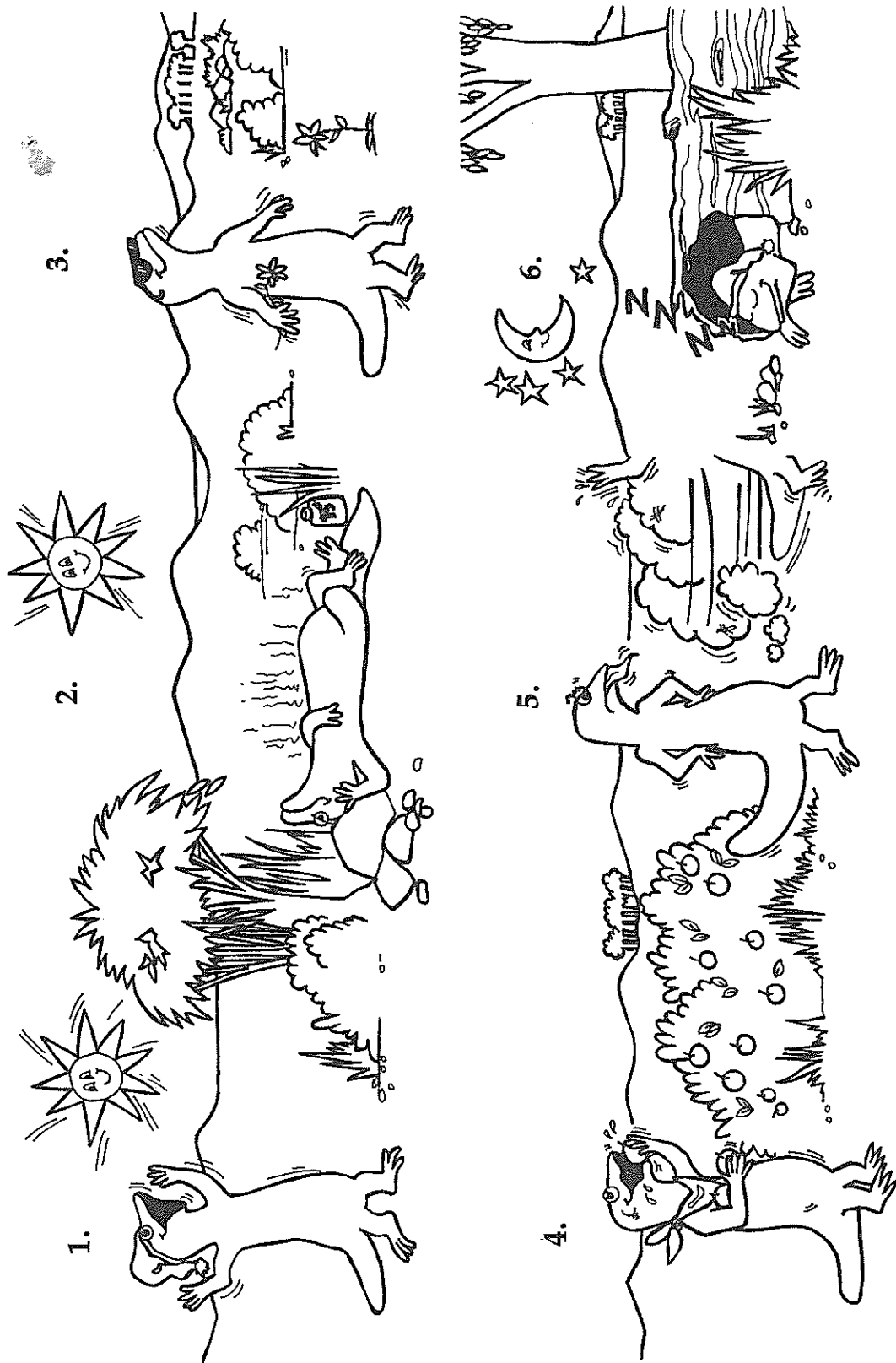
I also eat snails, slaters and any insect that crawls by. I am omnivorous. I will live for about 20 years. I am 11 years old and have had 15 babies in the last ten years. My babies are born live and not in eggs. My mate lives in the territory next to mine and we meet once a year.

I fiercely defend my territory from other bobtails. I try to scare off people, dogs and feral cats if they threaten me. I do this by hissing, sticking out my tongue and opening my jaws wide ready to bite.

At night I curl up under a shrub or log to sleep. The next morning when the sun warms me, my day begins again.

Resource Sheet 49

■ Activity 3.30 A BOBTAIL'S EYE VIEW - IN PICTURES page 133

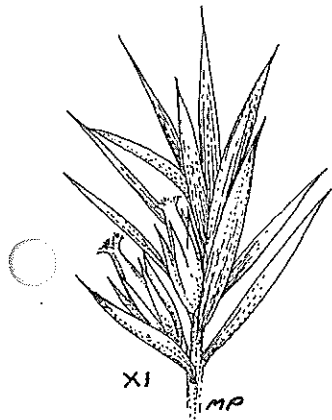


Resource Sheet 50

■ Activity 3.34 A BOBTAIL'S EYE VIEW - IN WORDS

page 134

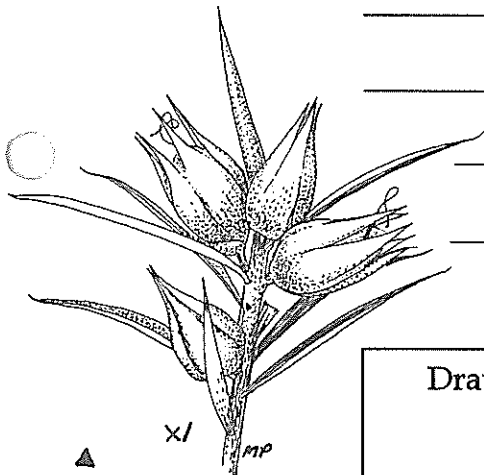
What I know:



▲
two Swan Berry
flowers on a
branchlet

Now read the story "A Bobtail's Eye View"

What I've learned:



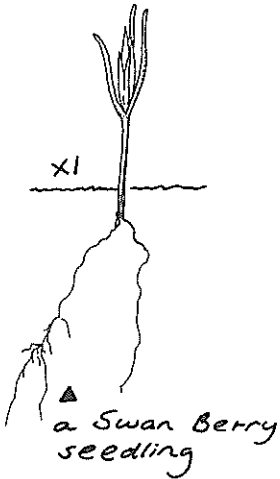
▲
four Swan Berry
fruit on a
branchlet

Draw a Bobtail Skink from the description in the story.

Resource Sheet 51

■ Activity 3.37 QUESTION TIME

page 134



1. What is the most commonly seen reptile in the Banksia Woodland?

2. How do you think people feel when bobtails eat their home-grown strawberries or chicken eggs?

3. Name the bobtail's favourite plant food in the wild.

4. a. How does the bobtail react when threatened?

- b. How do you think animals would feel when threatened like this?

5. Do bobtails bite? Describe their teeth.

6. Do you know of other names commonly used for bobtails? (eg: shingle-back lizard, blue-tongue lizard)

7. The bobtail is not a goanna. What is it?

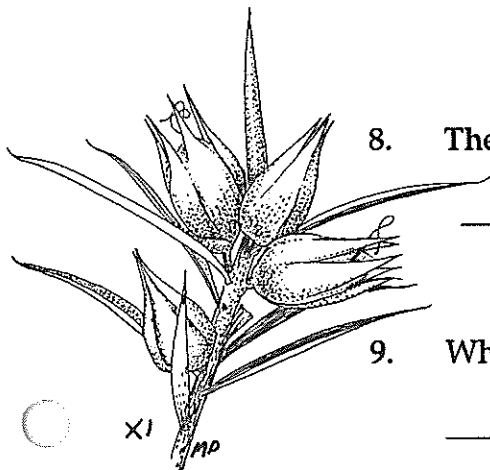


Please turn over

Resource Sheet 51 continued

■ Activity 3.37 QUESTION TIME

page 134



▲ four Swan Berry
fruit on a
branchlet

8. The territory covered by a bobtail is 2 kilometres. True or false?

9. What does omnivorous mean?

10. "My babies are born live, not in eggs." Discuss other creatures whose young are born this way.

Draw a picture of a bobtail.



▲ two Swan Berry
flowers on a
branchlet

Resource Sheet 52

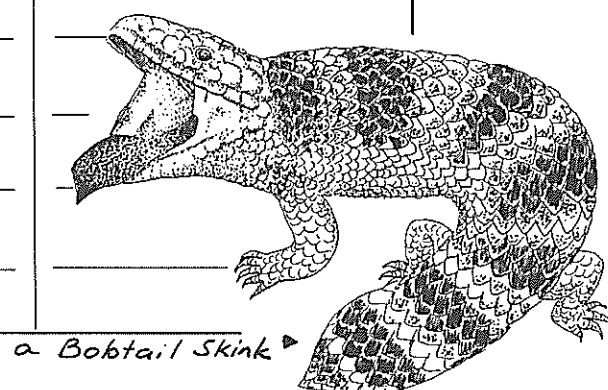
■ Activity 3.38 STRUCTURED OVERVIEW

page 135

A Bobtail Skink is Missing - Create an Overview Identity File

Read "A Bobtail's Eye View" and write the information under the six headings.

Description	Distribution	Habitat
Feeding Habits	Reproduction	Other Interesting Points



a Bobtail Skink ▶

Background



LIFE IN THE TALL SHRUBS

HOW THE WOOLLY BUSH LIVES

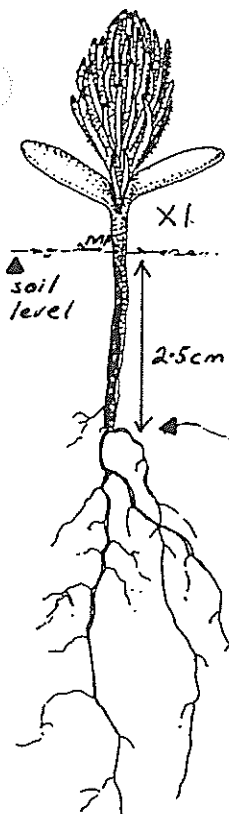
The Woolly Bush is a grey-green/grey-blue tall shrub between 1.5 metres to 4 metres tall. It is round and has a woolly appearance. From a distance, the closely packed and overlapping leaves look like woolly clothing on the stems, and, looking closer, the hairs covering the stem have a wool-like effect.

a Woolly Bush
flower bud



▲ a branchlet from
a Woolly Bush

The Woolly Bush is a member of the Banksia Family. Unlike the Banksias, on which thousands of flowers are grouped together in brightly coloured spikes, the Woolly Bush carries very small single flowers which are often hidden amongst the dense foliage. These cup-like flowers produce a lot of nectar and when they're pollinated, they grow into fruits. The fruit is held on the Woolly Bush in a cup formed by the special flower leaves. Adult plants produce special leaves with glands that produce a sugary substance (nectar) that is food for wasps and other insects.



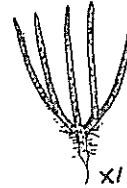
an ant buried the seed 2.5cm
below the surface of the soil

Background



The action of the ants in transporting seeds below the ground is important to the way the Woolly Bush lives. The Woolly Bush is a colonising species which means its seeds are often the first to come up in disturbed soil. Soil is disturbed by drought, fire and clearing.

a Woolly Bush.
leaf without
glands



◀ an ant collecting
a Woolly Bush
fruit from a cup
of leaves



▲ a Woolly Bush
leaf with
glands (nectaries)

Ants remove fruits from the special leaves and store the fruits in their nests. The seeds from these fruits will germinate if they are brought to the surface by soil disturbance or fire. Seeds which fall straight to the ground are likely to be eaten by birds or rodents.



Woolly Bush (*Adenanthos cygnorum*)

ACTIVITIES

■ Activity 3.41

DRAMA

JUNIOR

The students imagine what it would be like to be an ant. Important aspects of behaviour and appearance to mimic are:

MUSIC &
MOVEMENT

- ◆ moving on six very thin legs
- ◆ scampering up vertical surfaces
- ◆ collecting fruit from the Woolly Bush in their mouths
- ◆ eating the fleshy attachment on the seeds
- ◆ burying the seed, in the soil of the nest
- ◆ collecting nectar from the leaves and flowers.

■ Activity 3.42

ANT ART

JUNIOR

Using dead branches, cover in cotton wool or balls of newspaper. Paint it the appropriate colour or gently sponge with diluted food colouring.

ART &
CRAFT

Make seeds out of cardboard and place amongst the branches.

Make ants using 2 pockets of an egg carton and pipe cleaners (see diagram below).

Paint the ants and attach them to the branches.

Resource: *Dead Woolly Bush branches*

Cotton wool

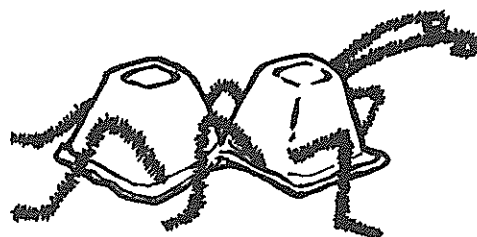
Paint

Cardboard

Egg cartons

Pipe cleaners

Paint brushes



■ Activity 3.43 THE ANT EXPLORER

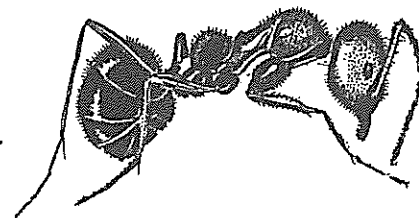
JUNIOR
MIDDLE

LANGUAGE

Class reads the poem "The Ant Explorer" and acts it out.

The Ant Explorer

Once a little sugar ant made up his mind to roam -
Too far away, far away, far away from home.
He had eaten all his breakfast, and he had his Ma's consent
To see what he should chance to see and here's the way he went -
Up and down a fern frond, round and round a stone,
Down a gloomy gully where he loathed to be alone,
Up a mighty mountain range, seven inches high,
Through the fearful forest grass that nearly hid the sky,
Out along a bracken bridge, bending in the moss,
Till he reached a dreadful desert that was feet and feet across.
T'was a dry, deserted desert, and a trackless land to tread;
He wished that he was home again and tucked-up tight in bed.
His little legs were wobbly, his strength was nearly spent,
And so he turned around again and here's the way he went -
Back away from desert lands feet and feet across,
Back along the bracken bridge bending in the moss,
Through the fearful forest grass, shutting out the sky,
Up a mighty mountain range seven inches high,
Down a gloomy gully, where he loathed to be alone,
Up and down a fern frond and round and round a stone.
A dreary ant, a weary ant, resolved no more to roam,
He staggered up the garden path and popped back home.



by C.J Dennis

■ Activity 3.44 DOT-TO-DOT

Resource Sheet 53 page 149

JUNIOR

ART &
CRAFT

Students complete the dot-to-dot activity (Resource Sheet 53) to discover an ant collecting the seed from the Woolly Bush. Students colour it in, matching the colours as close as possible to the Woolly Bush on the Banksia Woodland Poster.

■ Activity 3.45 BUSHLAND VISIT *Resource Sheet 54 page 150*

JUNIOR

Visit your bushland and see if you can find some Woolly Bushes. If this is not possible, use another tall shrub in your area, (eg: wattle).

BUSHLAND

Observe the life on the Woolly Bush. Write down your observations. Consult Activity Sheet 54 on the life cycle and see what you would expect to be happening at this time of the year.

SCIENCE

Remind the children of the need to be patient, quiet and still. They may not see animals but look for evidence of birds, insects and animals.

Children to note the interactions between animals and plants that they observe.

■ Activity 3.46 DICTIONARIES

MIDDLE

Read the background information to the class. Choose ten or so interesting words from the passage and place on a piece of paper.

LANGUAGE

Write one word at a time on the board. Say go and the students look up the word. The first one to have their finger on the word in their dictionary wins. Get them to read out the definition and write it on the board.

■ Activity 3.47 WOOLLY BUSH DESCRIPTION *Resource Sheet 54 page 150*

MIDDLE
UPPER

Students give a name label and brief description of each picture on Resource Sheet 54.

SCIENCE
LANGUAGE

You may need to discuss the pictures first.

- | | | |
|---------------|-------------|-------------------------|
| 1. adult bush | 3. seedling | 5. flower bud |
| 2. leaf | 4. branch | 6. ant collecting fruit |

■ Activity 3.48 ANT COUNT

MIDDLE
UPPER

SCIENCE

Students locate an ant nest in the locality the class is studying.

Students observe the nest entrance for two minutes and make a tally of the number of ants going into the nest, and another of the ants coming out.

Repeat the process at different times of the day.

Discuss with the class:

- a. Whether more ants are coming in or going out at each observation.
- b. Are there any significant changes in the numbers going in and out?
- c. What conclusions can the students draw based upon their observations?

Watch ants climbing up and down a plant as they come and go to their nest. Do they travel faster on their way up or down?

■ Activity 3.49 QUESTION TIME *Resource Sheets 55, 56 page 151, 152*

UPPER

LANGUAGE

Students read the information about how the Woolly Bush lives (Resource Sheet 55) and answer the questions (Resource Sheet 56).

Resource Sheet 53

■ Activity 3.44 DOT-TO-DOT

page 146



Resource Sheet 54

■ Activity 3.45 BUSHLAND VISIT

page 147

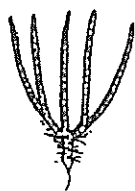
■ Activity 3.47 WOOLLY BUSH DESCRIPTION

page 147

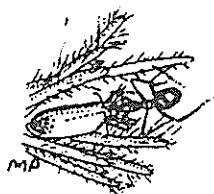
LIFE CYCLE OF WOOLLY BUSH



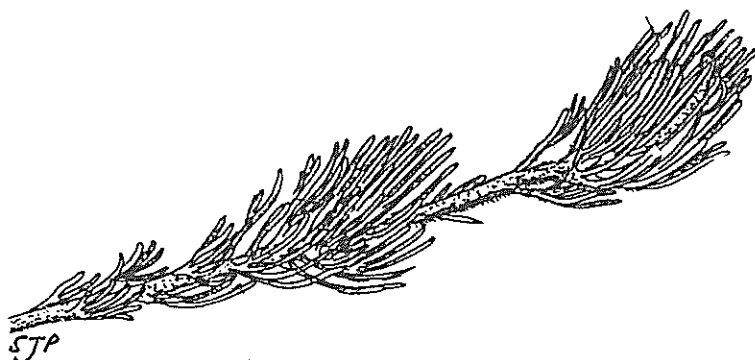
1. _____



2. _____



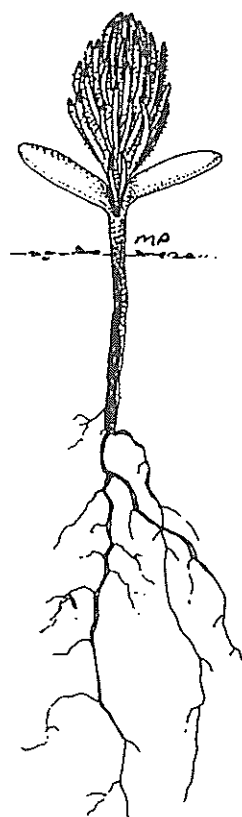
6. _____



4. _____



5. _____



3. _____

Resource Sheet 55

■ Activity 3.49 QUESTION TIME

page 148

HOW THE WOOLLY BUSH LIVES.

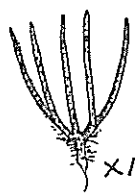
Background

The Woolly Bush is a grey-green/grey-blue tall shrub between 1.5 metres to 4 metres tall. It is round and has a woolly appearance. From a distance, the closely packed and overlapping leaves look like woolly clothing on the stems, and looking closer, the hairs covering the stem have a wool-like effect.

The Woolly Bush is a member of the Banksia Family. Unlike the Banksias, on which thousands of pale pink flowers are grouped together in brightly coloured spikes, the Woolly Bush carries very small single flowers which are often hidden amongst the dense foliage. These cup-like flowers produce a lot of nectar and when they're pollinated, they grow into fruits. The fruit is held on the Woolly Bush in a cup formed by the special flower leaves. Adult plants produce special leaves with glands that produce a sugary substance (nectar) that is food for wasps and insects.

Ants remove fruits from the special leaves and store the fruits in their nests. The seeds from these fruits will germinate if they are brought to the surface by soil disturbance or fire. Seeds which fall straight to the ground are likely to be eaten by birds or rodents.

The action of the ants in transporting seeds below the ground is important to the way the Woolly Bush lives. The Woolly Bush is a colonising species which means its seeds are often the first to come up in disturbed soil.



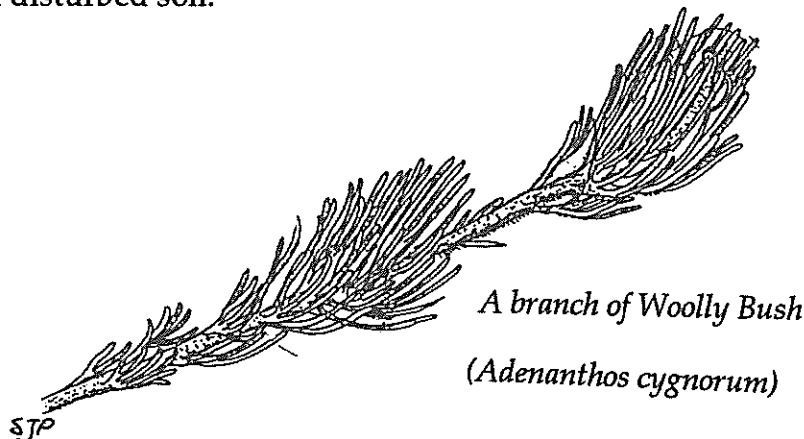
▲ a leaf without glands



▲ a leaf with glands



▲ an ant collecting a fruit from a cup of leaves



A branch of Woolly Bush
(*Adenanthos cygnorum*)

Resource Sheet 56

■ Activity 3.49 QUESTION TIME

page 148

1. The Woolly Bush is a member of the Banksia Family. What makes it different to Banksias that you know?

2. Why do you think Honeyeaters like nesting in the Woolly Bush?

3. a. Why is what ants do with the seeds so important to how the Woolly Bush lives?

- b. What other things do the ants do?

- c. Do the ants help the Woolly Bush to regenerate after a fire or clearing?

4. What other creatures live on or off the Woolly Bush? Can you list what one of them does?

5. Ants discourage moths from landing on the Woolly Bush. Do you think this is a good thing?

6. The introduced Laughing Turtle-Dove is the main seed eating bird from the Woolly Bush. Could this cause problems with the local animal community?

7. The flowers have to be pollinated. Which creature in the community does the pollination?



Background

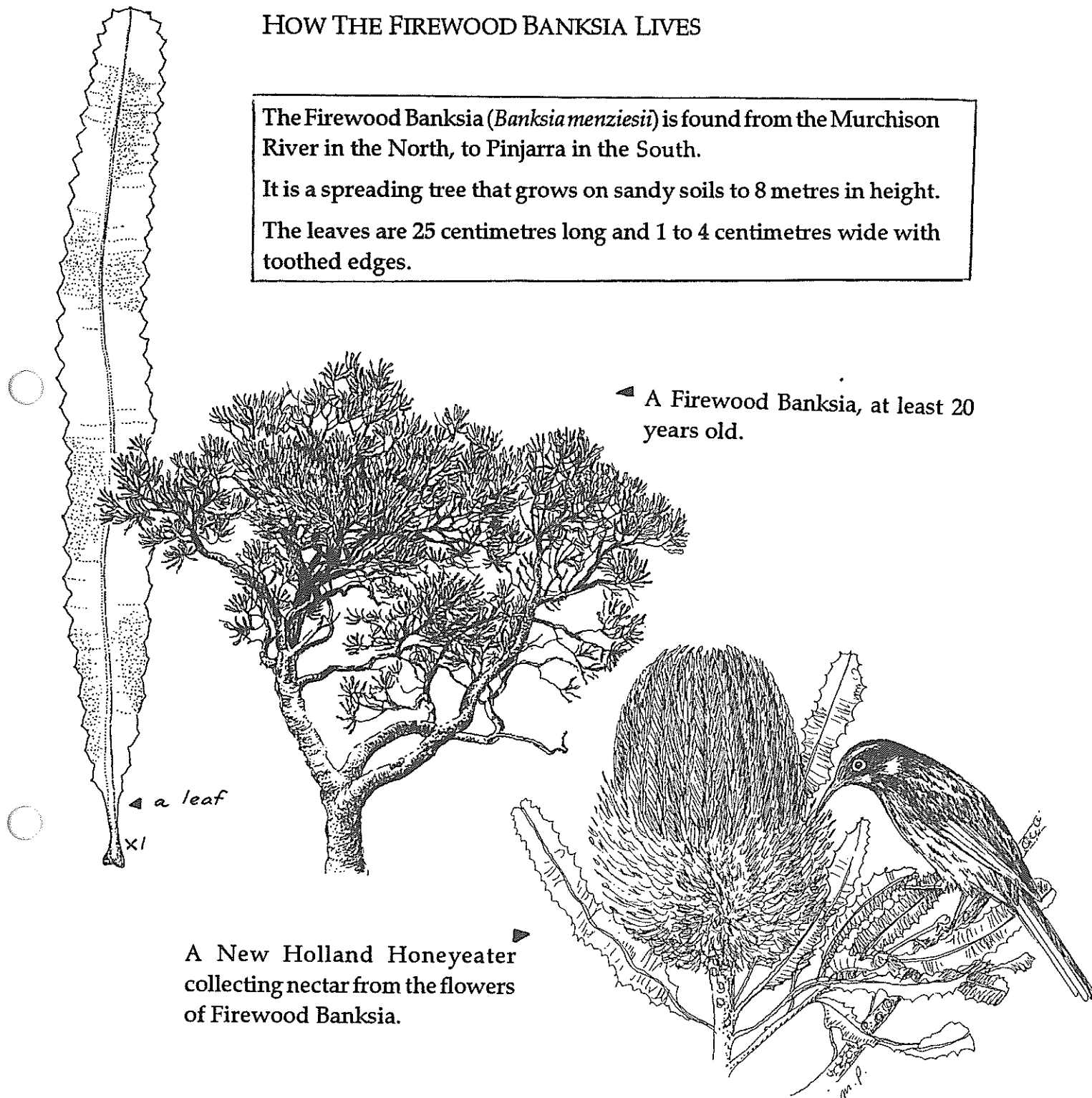
LIFE IN THE LOW TREES

HOW THE FIREWOOD BANKSIA LIVES

The Firewood Banksia (*Banksia menziesii*) is found from the Murchison River in the North, to Pinjarra in the South.

It is a spreading tree that grows on sandy soils to 8 metres in height.

The leaves are 25 centimetres long and 1 to 4 centimetres wide with toothed edges.



◀ A Firewood Banksia, at least 20 years old.

▶ A New Holland Honeyeater collecting nectar from the flowers of Firewood Banksia.

In Winter the 6-10 year old Firewood Banksias produce thousands of deep pink to red flowers covered in silky hairs. These flowers are grouped together in a cone.

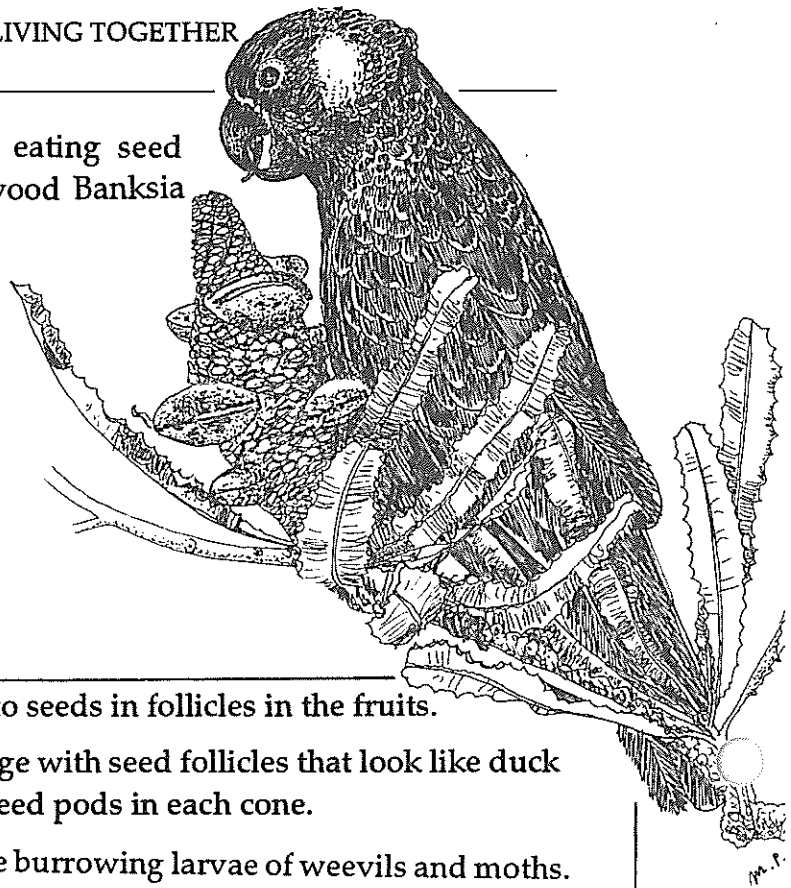
The nectar of the flower is much loved by Honeyeaters.

The Honeyeaters carry pollen from one flower to another and effect pollination.

Background



A Black Cockatoo eating seed taken from a Firewood Banksia cone.



Pollinated flowers grow into seeds in follicles in the fruits.

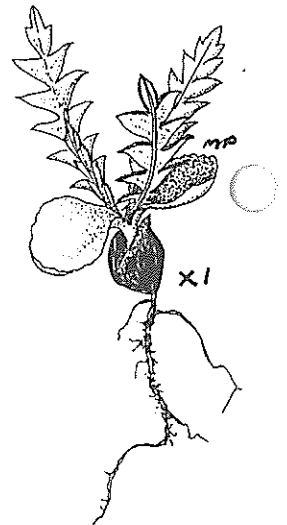
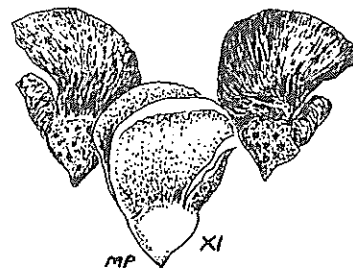
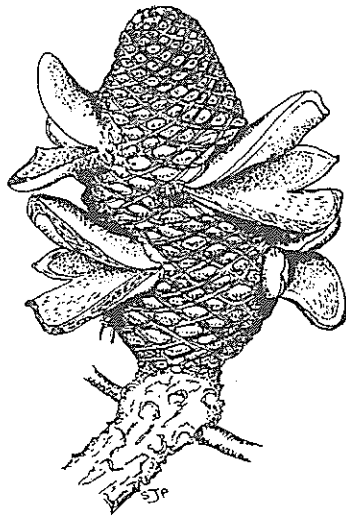
The cones prominently bulge with seed follicles that look like duck beaks. There are up to 25 seed pods in each cone.

These cones are used by the burrowing larvae of weevils and moths. Black Cockatoos like to eat the seeds and the larvae burrowing in the Banksia cones.

The seeds of the Firewood Banksia drop from ripe fruit in the Autumn of the year following flowering.

Seed grows in the ash beds in Winter.

Firewood Banksia seed



A Firewood Banksia cone that has dropped its seed.

A Firewood Banksia seedling

The Firewood Banksia grows in association with the Candlestick Banksia. One of the two is generally in flower, and thus can provide an almost constant source of food for Honey Possums and Honeyeaters all year round.

ACTIVITIES

■ Activity 3.50

DRAMA

JUNIOR

Introduce the students to life in the Firewood Banksia.

The students act out the behaviour and appearance of a:

MUSIC &
MOVEMENT

A. Black Cockatoo

- ◆ flying in flocks over very large areas in search of food
- ◆ the long, drawn-out whistle they make as they fly and the warning screech when disturbed
- ◆ eating insect larvae, flowers, nectar and seeds
- ◆ using their beaks like a nutcracker to crack open stems to eat caterpillars and to get seed from the woody fruit of Banksias, Dryandras and Eucalypts.

B. Singing Honeyeater

- ◆ flying singly or in family groups over moderately large areas searching for food
- ◆ singing melodious songs when sitting in a tree or shrub, especially in chorus at dawn
- ◆ eating insects and drinking nectar
- ◆ using the brush-like tongues to mop up the nectar and their beaks to catch the insects.

C. Honey Possum

- ◆ with a long pointy snout
- ◆ using a long, brush-like tongue to lick out the nectar and pollen of a Banksia flower
- ◆ most of the day is spent asleep
- ◆ gripping branches with fingers and toes rather than claws in much the same way as a monkey does
- ◆ moving in excited darts from flower to flower when foraging.

■ Activity 3.51

MATCHING

Resource Sheets 57, 58 page 159, 160

JUNIOR

Read the information on Resource Sheet 57 to the students.

Cut out the words at the bottom of Resource Sheet 58.

Students glue them onto the picture above, next to the correct sentence.

LANGUAGE

Solutions

- | | | |
|-------------------|----------------|--------------------------|
| 1. Black Cockatoo | 3. Honey Eater | 5. Firewood Banksia cone |
| 2. Insect Larva | 4. Seedling | 6. Seeds |

■ Activity 3.52 **3D ART** *Resource Sheets 59, 60 pages 161, 162*
JUNIOR

Draw a large outline of a Banksia tree (use an overhead projector and Resource Sheet 59 as a stencil) and hang it on the classroom wall.

ART & CRAFT

Students paint the picture and cut out the cockatoos from Resource Sheet 60.

Students place the stationary birds in the tree and hang the birds in flight from the classroom roof around the tree.

■ Activity 3.53 **SENTENCE FINISH** *Resource Sheets 57, 61 pages 159, 163*
**MIDDLE
UPPER**

Students read the information on Life in the Low Trees - Firewood Banksia (Resource Sheet 57) and complete the sentences on Resource Sheet 61.

LANGUAGE

Answers: 1c	2f	3d	4g	5j
6e	7h	8a	9b	10i

■ Activity 3.54 **COCKATOO CAPERS** *Resource Sheets 62, 63 pages 164, 165*
**MIDDLE
UPPER**

Read the information on Resource Sheet 62 together as a class and discuss the questions and activities on Resource Sheet 63.

LANGUAGE

■ Activity 3.55 **WORD SLEUTH**
*Resource Sheets 64 - 66 pages 166 - 168***MIDDLE
UPPER**

Students complete the word sleuth (Resource Sheet 64).

LANGUAGE

■ Activity 3.56 MAKING A BANKSIA CONE *Resource Sheet 67 page 169*

MIDDLE
UPPER

ART &
CRAFT

Follow instructions on Resource Sheet 67. When cone is complete, hang the coloured-in, cut-out pictures of the Singing Honeyeater and hang from the hoop. Attach the coloured-in and cut-out pictures of the Honey Possum to the branch and flower of the Firewood Banksia.

Resource: *red or orange crepe paper*

pipe cleaners

thin wire

packaging foam (the solid type used for electrical appliances)

hoop

■ Activity 3.57 QUESTION TIME - THE FIREWOOD BANKSIA

Resource Sheets 68, 69 pages 170, 171

MIDDLE
UPPER

Students read about the Firewood Banksia (Resource Sheet 68) and answer the questions (Resource Sheet 69).

LANGUAGE

■ Activity 3.58 QUESTION TIME - BLACK COCKATOOS

Resource Sheets 62, 70 pages 164, 172

MIDDLE
UPPER

Students read about the Black Cockatoos (Resource Sheet 62) and answer the questions (Resource Sheet 70).

LANGUAGE

■ Activity 3.59 QUESTION TIME - THE HONEY POSSUM

Resource Sheets 65, 71 pages 167, 173

MIDDLE
UPPER

Students read about the Honey Possum (Resource Sheet 65) and answer the questions (Resource Sheet 71).

LANGUAGE

-
- **Activity 3.60** | **QUESTION TIME - THE SINGING HONEYEATER**
Resource Sheets 66, 72 pages 168, 174
- MIDDLE
UPPER
LANGUAGE** | Students read about the Singing Honeyeater (Resource Sheet 66) and answer the questions (Resource Sheet 72).
-
- **Activity 3.61** | **FRUIT STAGES** *Resource Sheet 73 page 175*
- UPPER
SCIENCE
ART & CRAFT** | Using the information in Resource Sheet 73, discuss the life cycle of the Firewood Banksia.
 How are animals linked with each stage?
 Students to sketch their own Firewood Banksia fruit stages and record the insect and bird species that interact with each stage.
-
- **Activity 3.62** | **THE GREAT DEBATE**
- UPPER
LANGUAGE** | Find out about Honey Possums and the effect that cats and foxes have upon them.
 Have a class debate for pet cats or against. Your topic could be "Introduced species are killing native wildlife!"
-

Resource Sheet 57

■ Activity 3.51 MATCHING

page 155

■ Activity 3.53 SENTENCE FINISH

page 156

DESCRIPTION OF THE LIFE STAGES OF FIREWOOD BANKSIA

See Background for illustrations p153, p154

The seeds of the Firewood Banksia drop from ripe fruit in the autumn of the year following flowering.

Fallen seed is eaten by seed-eating birds and by native rodents, rats and mice.

Beetle larvae feed on the seed while it is in the fruit.

Seedling grows in the ash beds in winter.

Many Honeyeaters, (Western Spinebill, Singing, Brown, Tawny-crowned, and New Holland) and the Red and Little Wattlebirds visit the flowers to mop up the nectar. The Honeyeaters carry pollen from one flower to another and affect pollination.

Insects collect nectar from the flowers and do not affect pollination.

The larvae of moths and weevils eat the flowers.

Twenty Eight Parrots and Black Cockatoos eat these larvae and destroy the flowers.

Pollinated flowers grow into fruits which contain seeds.

In winter, the 6 - 10 year old adult plants produce thousands of deep pink to red flowers covered in silky hairs. These flowers are grouped together in a cone.

Firewood Banksias can survive bushfire because they have an underground swollen root (called a lignotuber). Even if the tree is completely burnt, a new tree can grow out of the lignotuber.

The thousands of cup shaped flowers in the cone produce a lot of nectar.

Resource Sheet 58

■ Activity 3.51 MATCHING

page 155

1. _____ eats insect larvae and seeds.
2. _____ is food for Cockatoos.
3. _____ eats nectar and pollen from the flower.
4. _____ grows in the winter.
5. _____ has thousands of pink and red cup shaped flowers.
6. _____ drop from ripe fruit in autumn.

Banksia cone

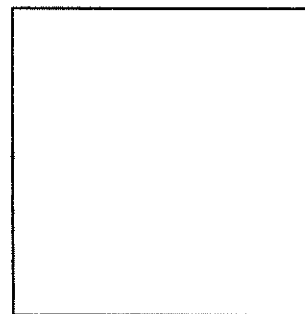
Black Cockatoo

Honeyeater

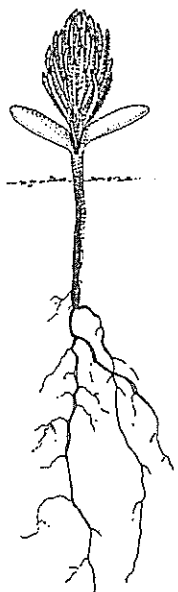
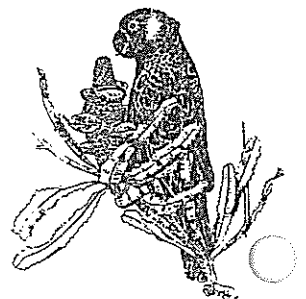
Seedling

Seeds

Insect larva



*draw your own
insect larva*



Resource Sheet 59

■ Activity 3.52 3D ART

page 156

BANKSIA TREE OUTLINE



Resource Sheet 60

■ Activity 3.52 3D ART

page 156



Resource Sheet 61

■ Activity 3.53 SENTENCE FINISH

page 156



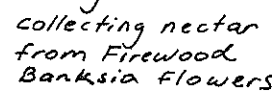
LIFE IN THE LOW TREES - FIREWOOD BANKSIA

The Firewood Banksia is a dominant low tree in the Banksia Woodland. It is commonly found in the metropolitan area.

Complete the following sentences using the sentence endings below.

1. In winter, the 6 - 10 year old adult plants _____
2. The thousands of cup-shaped flowers _____
3. Many Honeyeaters _____
4. The insects collect nectar _____
5. Parrots _____
6. Pollinated flowers grow into fruits _____
7. Beetle larvae _____
8. The seeds of the Firewood Banksia _____
9. Fallen seed is eaten by _____
10. Seeds grow in the ash beds _____

Continue the above sentences with the following lines:

- a. drop from ripe fruit in the autumn of the year following a New Holland Honeyeater flowering. 
- b. seed-eating birds and native rats, rodents and mice. 
- c. produce thousands of deep pink to red flowers covered in silky hairs. 
- d. visit the flowers to mop up the nectar.
- e. which contain seeds.
- f. in the cone produce lots of nectar.
- g. from the flowers and do not affect pollination.
- h. feed on the seed while it is in the fruit.
- i. in winter.
- j. and Black Cockatoos eat this larvae and destroy the flowers.

Resource Sheet 62

■ Activity 3.54 COCKATOO CAPERS

page 156

■ Activity 3.58 QUESTION TIME - BLACK COCKATOOS

page 157

- A. In Western Australia we have two native Black Cockatoos. The White Tailed Cockatoo has a short beak and the Red Tailed Cockatoo has a long beak.
- B. The White Tailed Black Cockatoo lives between Kalbarri and Esperance.
- C. From the tip of their tail to the tip of their beak, they are 60 centimetres in length. (The length of two ordinary school rulers end to end). When their wings are outstretched they are close to 1 metre wide. (The length of a blackboard ruler).
- D. Both males and females have a white ear patch and a very prominent white patch in the mid-tail.
- E. The call of this Black Cockatoo is loud and harsh and because it occurs in the early winter period around June, people often associate this call with the coming of rain. With the amount of noise these birds make, one would think a flood was on its way!
- F. They nest in tree hollows, preferring deep hollows. This is why it is important to leave dead trees in any bushland.
- G. After the age of four years, the birds are ready to breed. Only one white egg (rarely two) is laid, measuring 3.5 centimetres by 5 centimetres. The eggs are kept warm for 29 days and the young are fed at the nest for 90 days. Parents feed their young regurgitated seed. The young insert their beaks inside the parent's beak and eat the coughed-up seed.
- H. Even after leaving the nest as a flying youngster, the young will still feed from their parents for about 4 months.
- I. Many Aboriginal names of Western Australian birds sound like the noise they make. The White Tailed Black Cockatoo is called "oo-lak" near Perth, "ngo-lak" in the Avon Valley, and "woo-lak" in Albany.
- J. Each of these names, so similar in sound, describes one of the calls of this bird. The birds move in flocks, varying in size from six to several hundred. By listening carefully, you can detect the young fliers still calling out their "begging-for-food" sounds amidst the adult calls.
- K. This cockatoo feeds on a variety of foods from wood-boring caterpillars to seeds and nectar. They love the nectar from the Banksia tree.

Resource Sheet 63

- Activity 3.53 SENTENCE FINISH
■ Activity 3.54 COCKATOO CAPERS

page 156

page 156

1. See if you can find Kalbarri and Esperance on a map. Measure the distance between the two towns as the crow flies (or should we say cockatoo?)

2. Try and make the sound of a Black Cockatoo. See whose call is the closest to the real thing.

3. What other natural sign do people believe is associated with coming events? eg: ants coming out and working in a frenzy are often associated with rain.

4. Snakes, lizards, cars and man all cause death to cockatoos. Can you explain how? What other predators of cockatoos are there that you can think of?

5. How does the raising of cockatoo young compare with that of humans?

6. Record Black Cockatoo visits in your area. Take special note of what they are eating, what trees they frequent and how many are in their flock. You may recognise them from a previous visit. They may be regular visitors.

7. What other creatures enjoy the nectar from the Banksia tree?

Resource Sheet 64

■ Activity 3.53 WORD SLEUTH

page 156

Find 18 words in the word sleuth and circle them.
Cross them out below when you find them.

fly	flower	honey	insect	night
lick	tongue	singing	nectar	eyes
blossom	banksia	possum	beak	claws
climb	song	melody		

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

Resource Sheet 65

■ Activity 3.55

WORD SLEUTH page 156

■ Activity 3.59

QUESTION TIME - THE HONEY POSSUM page 157

THE HONEY POSSUM

Introduction

The Honey Possum is a native mammal that lives in the Banksia Woodland. It is rarely seen as it is a shy, nocturnal animal. Honey Possums have no close relatives and are classified as a family on their own.

Description

The body of the Honey Possum is only 7 centimetres long when fully grown. The tail however, measures 8 centimetres long. It has a dark stripe running down its back, wedged between two paler stripes. The soft fur is light brown to grey in colour. Honey Possums have long pointed snouts, brush tipped tongues, and nails on the ends of their toes. As a result of being nocturnal, Honey Possums have extremely large pupils in their eyes. This enables them to see well at night.

Habitat

The Honey Possum usually sleeps in abandoned bird nests and in the hollow stems of Grass Trees. They spend most nights in the tops of Banksia Trees. They grip the branches in much the same way as a monkey does. They dart quickly from flower to flower as they feed.

Food and Hunting

The Honey Possum usually feeds on the nectar from Banksia flowers. It pushes its long snout into the flowers and uses its brush tipped tongue to lick the nectar and pollen out.

Reproduction

The Honey Possum is a marsupial and therefore the female has a pouch in which she carries her young. The babies are born live and crowd up into the pouch where they are suckled on milk. There is usually more than one baby per litter, and they are fully grown within one year.

Ending/Interesting Points

The Honey Possum is very light and darts around the tops of Banksia trees with amazing speed and agility. It is no wonder they are so rarely seen, being so small, shy, quick moving and nocturnal.

Resource Sheet 66

- Activity 3.55 WORD SLEUTH page 156
■ Activity 3.60 QUESTION TIME - THE SINGING HONEYEATER page 158

THE SINGING HONEYEATER

Description

The Singing Honeyeater is a beautiful bird with a streak of yellow under the eye. It has yellow and grey-brown feathers, and is a prolific singer. It has a broad black band from beak to eye. Its body grows to a length of 20 centimetres.

Distribution and Habitat

These birds are widespread across Australia, except along the East Coast and Tasmania. They are found in Banksia Woodlands and the dry interior.

Reproduction

Their reproduction pattern is much like other birds. Two to three pinkish/white eggs with red-brown specks on the wide end are laid in a cup-shaped nest. The nest is built in dense small trees or tall trees and is constructed of small twigs and strips of bark bound together by spiders' webs, and often lined with Banksia and Zamia down, mammal hair, soft plant materials and occasionally a feather.

Feeding Habits

Singing Honeyeaters use their brush-like tongues to mop up nectar and sugary-secretions from plants. Insects form the rest of their diet.

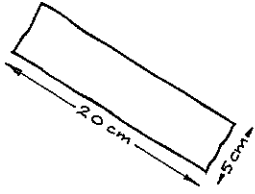
Other

The Singing Honeyeater is an important component of the Banksia Woodland as it is an important pollinator.

Resource Sheet 67

■ Activity 3.56 MAKING A BANKSIA CONE

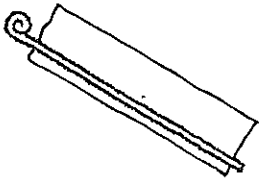
page 157



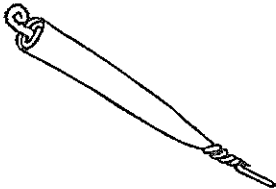
1. Cut pieces of red or orange crepe paper 20 cm x 5 cm.



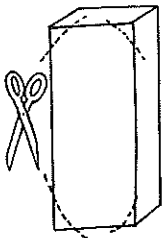
2. Curl the ends of pipe cleaners.



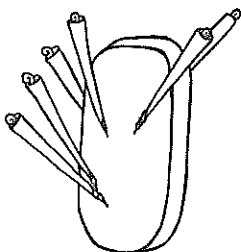
3. Wrap the crepe paper around the pipe cleaners leaving the curled end of the pipe cleaner uncovered.



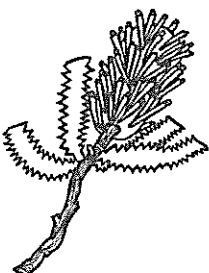
4. Twist base of crepe paper to secure.



5. Shape a piece of packaging foam to form the basis of the banksia "cone".



6. Stick pipe cleaner "flowers" into the packaging foam.



7. Add twig and leaves.

Resource Sheet 68

■ Activity 3.57 QUESTION TIME - HOW THE FIREWOOD BANKSIA LIVES
page 157

THE FIREWOOD BANKSIA

Illustrations p153, p154.

The Firewood Banksia (*Banksia menziesii*) is found from the Murchison River in the North, to Pinjarra in the South.

It is a spreading tree that grows on sandy soils to 8 metres in height.

The Firewood Banksia flowers from late summer to late winter. The flowers are pink and silver before opening, changing to pink to red when opened. Some plants have yellow flowers.

The leaves are 25 centimetres long and 1 - 4 centimetres wide with toothed edges.

The cones prominently bulge with seed follicles that look like duck beaks. There are up to 25 seed pods in each cone.

These cones are used by the burrowing larvae of weevils and moths for food.

Black Cockatoos like to eat the seeds in the Banksia cones and these burrowing larvae.

The nectar of the flower is much loved by Honeyeaters.

The Firewood Banksia grows in association with the Candlestick Banksia. One of the two is generally in flower, and so provides an almost constant source of food for Honey Possums and Honeyeaters all year round.

Resource Sheet 69

■ Activity 3.57 QUESTION TIME - THE FIREWOOD BANKSIA page 157

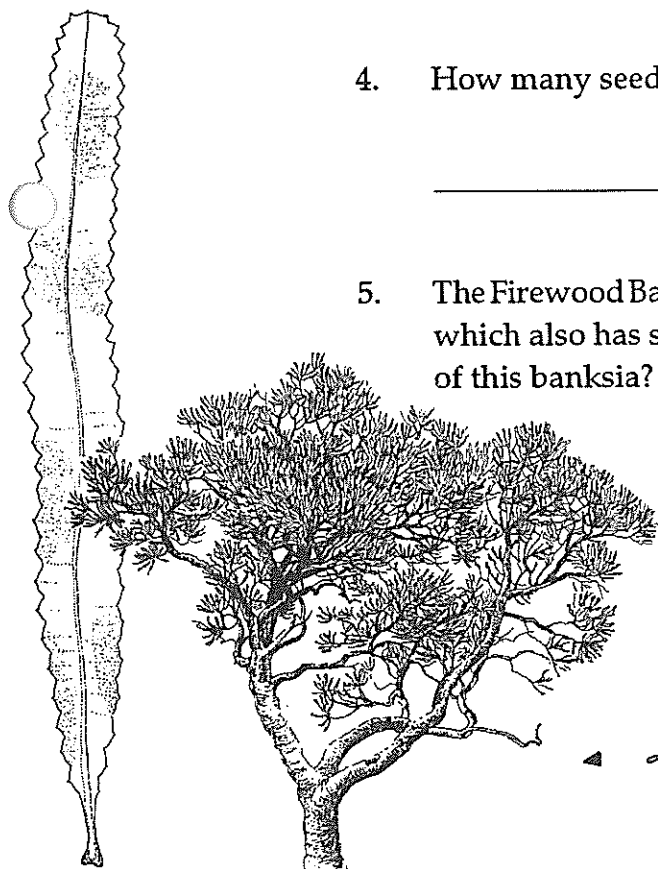
1. Where are Firewood Banksias found in Western Australia?

2. Describe the growth of the Firewood Banksia trees in terms of height and spread.

3. What colours are the flowers before opening and after opening?

4. How many seeds can be found in one Banksia cone?

5. The Firewood Banksia grows in association with another Banksia which also has something to do with fire. What is the name of this banksia?



▲ a Firewood
Banksia leaf

▲ a Firewood Banksia tree

Resource Sheet 70

■ Activity 3.58 QUESTION TIME - BLACK COCKATOOS

page 157

BLACK COCKATOOS

1. White-tailed Black Cockatoos are _____ centimetres long and _____ centimetres across the wing span.

2. Where are the two white markings found?

3. Which three types of food do these black cockatoos eat?

4. Where do they nest?

5. How many eggs are laid?

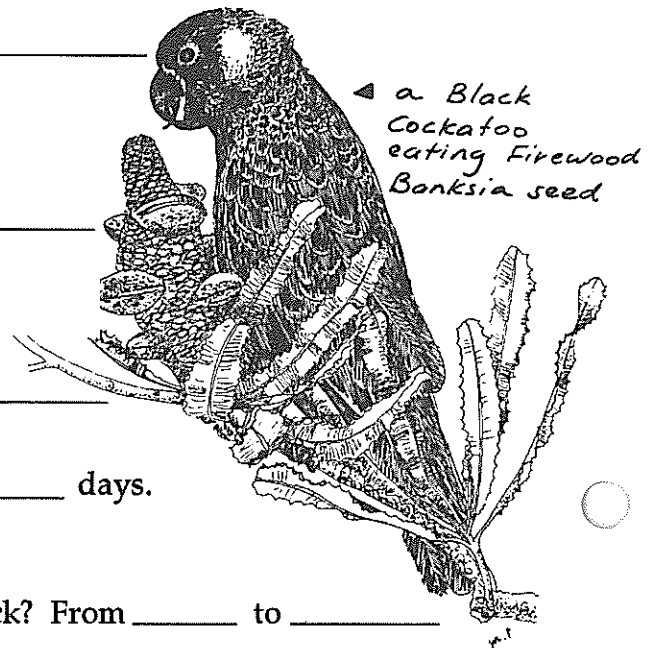
6. The eggs are kept warm for _____ days.

7. How many birds can be in a flock? From _____ to _____

8. Name a plant from which the nectar is taken .

9. Name one of the Aboriginal names for the Black Cockatoo .

10. What are the names of the two types of White-tailed Black Cockatoos in Australia?



Resource Sheet 71

Activity 3.59

QUESTION TIME - THE HONEY POSSUM

page 157

THE HONEY POSSUM

1. a) True or false. The Honey Possum is nocturnal?
b) What does nocturnal mean?

2. Can the possum fit in the palm of your hand?

3. Where does the Honey Possum sleep?

4. What does the Honey Possum love eating that is found on Banksia flowers?

5. The Honey Possum is a marsupial. What does this mean?



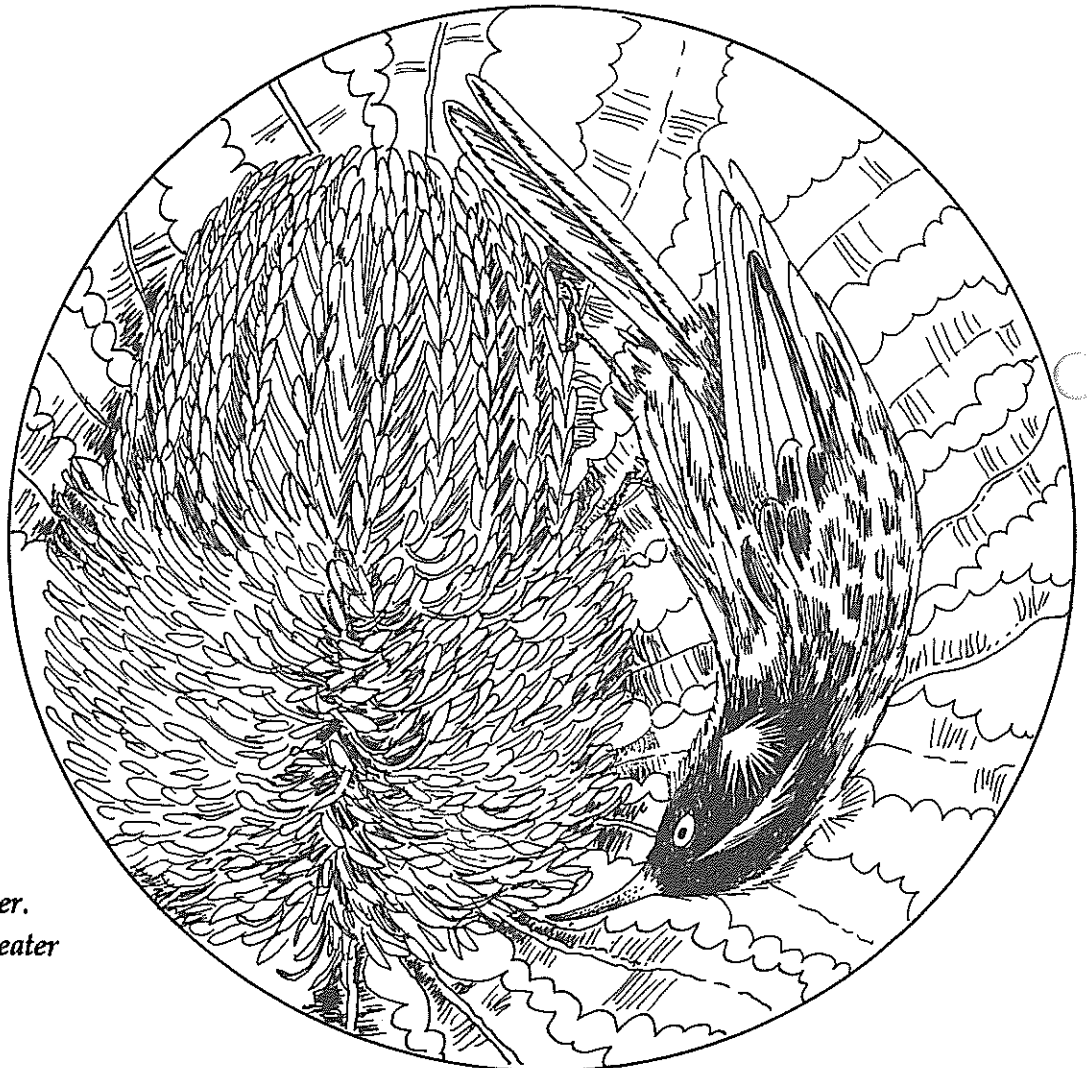
◀ Honey Possum climbing on a Couch Honey-pot flower head in search of nectar

Resource Sheet 72

■ Activity 3.60 QUESTION-TIME THE SINGING HONEYEATER page 158

THE SINGING HONEYEATER

1. a) What colour is the streak below the Honeyeater's eye? _____
b) What colour is below this? _____
2. This bird is two-thirds the length of an ordinary school ruler.
How long is this? _____
3. Where do you not find these birds' in Australia? _____
4. What is the nest made out of? _____
5. Why should you not collect birds nests or eggs from trees?



*Another type of honeyeater.
The New Holland Honeyeater
collecting nectar.*

Resource Sheet 73

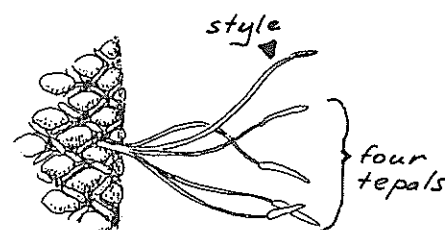
■ Activity 3.61 FRUIT STAGES

page 158

LIFE CYCLE OF THE FIREWOOD BANKSIA

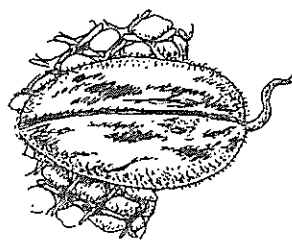


▲
A New Holland Honeyeater
collecting nectar from the
open flowers.

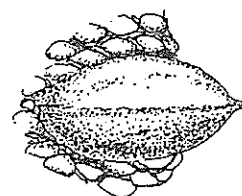


▲
A single flower

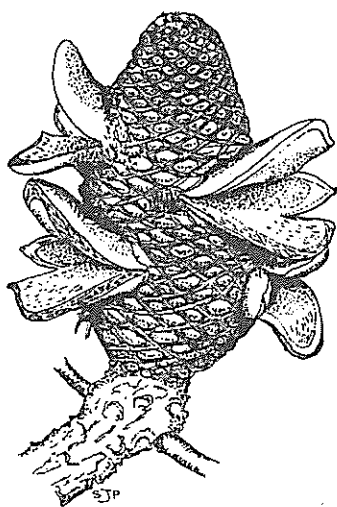
▼
Pollinated flowers grow into seeds
in the follicles in the cones



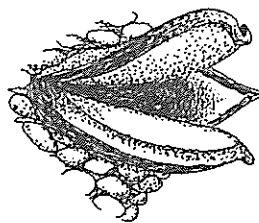
▲
Green follicle



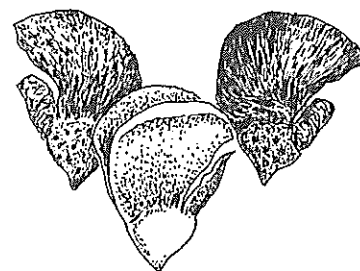
▲
Dry follicle



▲
A whole cone after it
has dropped its seed



▲
Open follicle

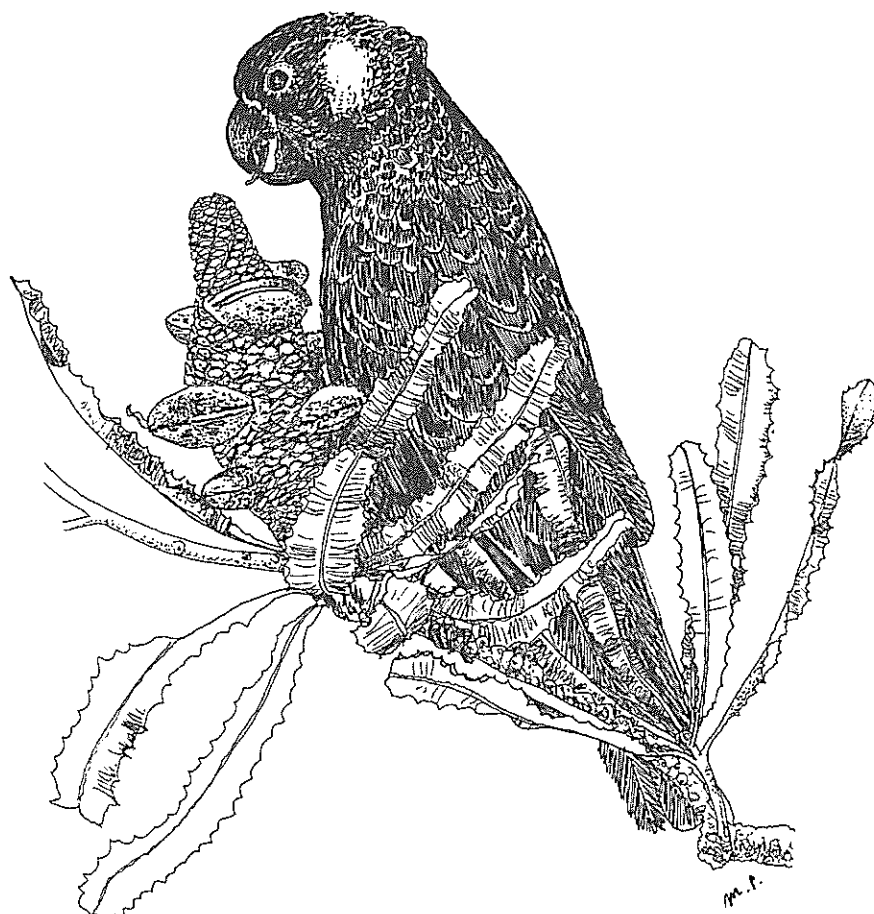


▲
Seeds

*New Holland
Honeyeater*



*Carnaby's
Cockatoo*



Background



LIFE IN THE BANKSIA WOODLAND

Together the plants and animals described in the previous activities form part of the Banksia Woodland community.

Many birds only visit Banksia Woodland when food is available. Twenty-Eight Parrots normally live and breed in nearby gum tree hollows of Tuart or Jarrah trees while the Black Cockatoos fly hundreds of kilometres to Salmon Gum Woodland to nest. Honeyeaters can breed in the Banksia Woodland but migrate around several plant communities to obtain their food requirements throughout the year.

Some birds need several communities, in some cases very far from the Banksia Woodland, in contrast with the animals which can live their whole lives within the one plant community.

To help the children to develop the idea of the Banksia Woodland community, a poster of Life in a Banksia Woodland has been prepared. The artist, Margaret Pieroni, has also drawn most of the drawings in this package. The Banksia Woodland painting is of the Harry Sandon Reserve in Melville near Perth. The animal inserts are of those known to live in a Banksia Woodland. (Posters are available from Greening Western Australia)

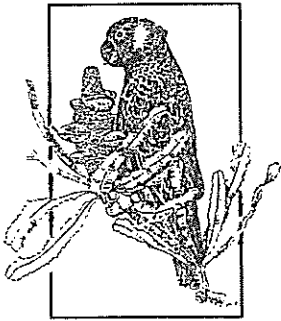
The poster illustrates plants and animals from various sections of the package including:

Bobtail
Termite
Three Spotted Skipper Butterfly
Western Spiny-tailed Gecko
Echidna
Honey Possum
Singing Honeyeater
White-tailed Black Cockatoo
New Holland Honeyeater

All these creatures can be found in Banksia Woodland. Echidnas and Honey Possums are unlikely to be seen as they are nocturnal and are becoming uncommon. Termites and Western Spiny-tailed Geckos can be observed during the day.

The New Holland Honeyeater (from the Tuart Woodland) and White-tailed Black Cockatoo (from the Salmon Gum Woodland) are seasonal visitors.

Background



The decline in the numbers of these animals is related to the loss of habitat, the fragmentation of habitat and habitat decline. These are related to weed invasion, disease, salinity and predation by feral animals.

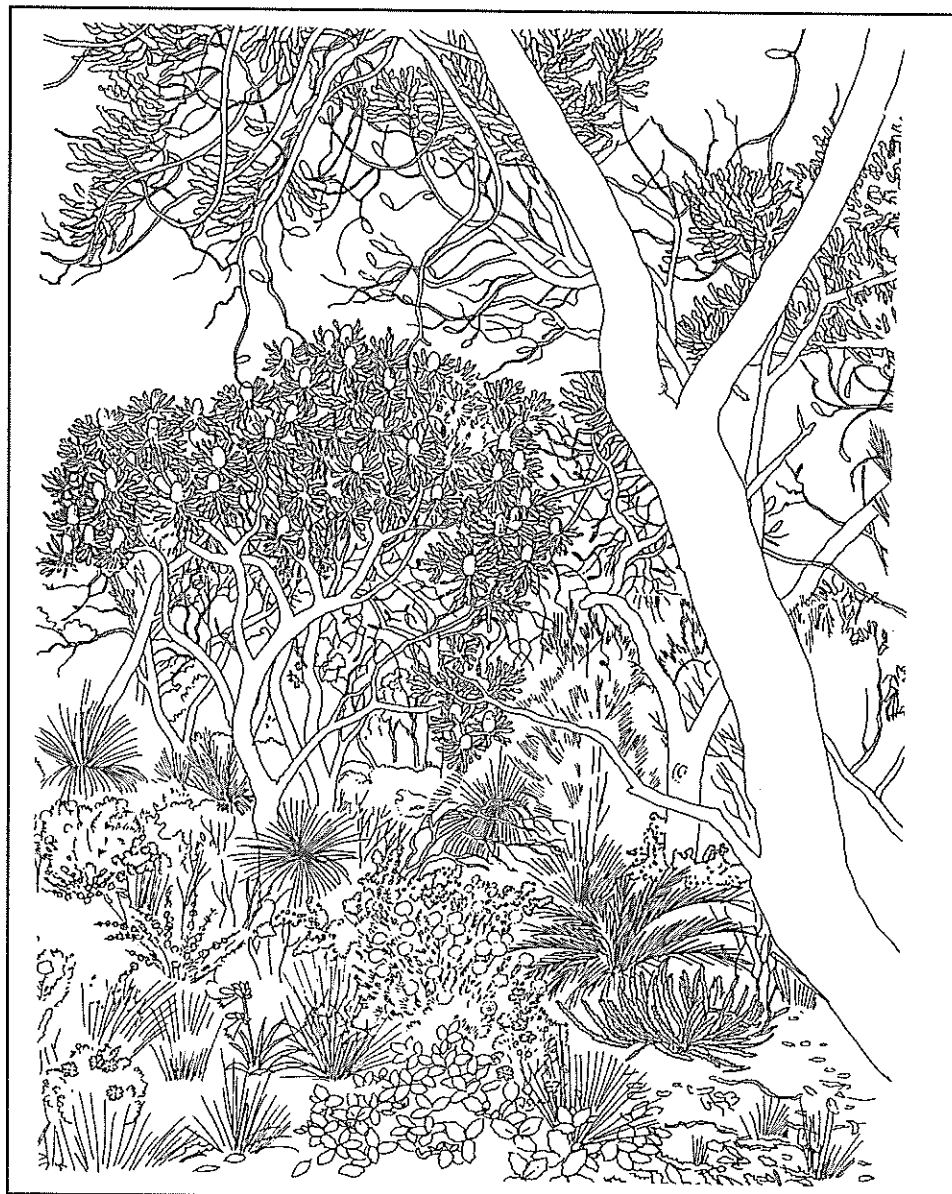
For example, Banksia Woodland is susceptible to the dieback disease caused by the fungus *Phytophthora* (pthy-top-thor-a).

The *Phytophthora* fungus kills Banksia trees by attacking the roots of the plant, interfering with their ability to absorb nutrients from the soil.

Once infected with the fungus, the Banksia tree dies very quickly, decreasing the amount of habitat available to its associated animal life.

Further information and activities relating to the dieback disease caused by the fungus *Phytophthora* are provided in Appendix 3, page 283.

Banksia
Woodland
at Harry
Sandon Reserve



ACTIVITIES

■ Activity 3.63

MATCH THE ANIMALS

Resource Sheets 74, 75 pages 187, 188

JUNIOR

Students cut out the animals from Resource Sheet 74 and glue them onto Resource Sheet 75 to match the statements.

LANGUAGE

■ Activity 3.64

SPOT THE DIFFERENCE

Resource Sheet 76 page 189

JUNIOR

Look carefully for the differences in Spot the Difference (Resource Sheet 76). There are 10 differences to find.

MATHEMATICS

■ Activity 3.65

HOME SWEET HOME

Resource Sheet 77 page 190

JUNIOR

MIDDLE

Match the creatures with their nests or homes.

SCIENCE

■ Activity 3.66

CAMOUFLAGE

JUNIOR

MIDDLE

Discuss what camouflage means. Where would the Banksia Woodland creatures go to camouflage themselves from their enemies? What would be their enemy?

SCIENCE

ART & CRAFT

Students draw a picture of some bush and camouflage the creature in there. Try to copy the colours as accurately as possible. Students ask their neighbour to see if they can find and identify the creature.

■ Activity 3.67 CREATURE FEATURE

JUNIOR
MIDDLE
UPPER

SCIENCE

Display the coloured poster of the Banksia Woodland to the class. Discuss and find the plants, insects and animals studied in this section of the package. You should be able to find:

- a. in the bushland
 - ◆ Firewood Banksia
- b. in the inserts
 - ◆ Pineapple Bush
 - ◆ Three Spotted Skipper Butterfly
 - ◆ Woolly Bush
 - ◆ Firewood Banksia - fruit in cone
 - ◆ Firewood Banksia - White-tailed Black Cockatoos
 - ◆ Firewood Banksia - flower and New Holland Honeyeater
 - ◆ Bobtail
 - ◆ Termites in the leaf litter of the Woodland floor
 - ◆ Western Spiny-tailed Gecko sun basking on a branch
 - ◆ Echidna on the Woodland floor searching for termites
 - ◆ Honey Possum looking for nectar in a Couch Honey-pot flower

Resource: *Banksia Woodland poster*

■ Activity 3.68 FEEDING HABITS

JUNIOR
MIDDLE
UPPER

SCIENCE

Discuss the feeding habits of the animals in the Banksia Woodland poster with the students and make a table showing your findings:

- ◆ Insects eat vegetation (herbivores)
- ◆ Echidnas are meat eaters (carnivores)
- ◆ Bobtails, Parrots and Honeyeaters eat both vegetation and meat (omnivores).

Resource: *Banksia Woodland poster*

■ Activity 3.69 NIGHT AND DAY

JUNIOR
MIDDLE
UPPER

SCIENCE
MATHEMATICS

Divide the animals in the Banksia Woodland poster into two groups and record your results on a table showing the two categories:

- i. the day active (diurnal) animals, (termites, ants, butterflies and reptiles), and
- ii. the night active (nocturnal) animals, (birds, echidnas and possums).

Use the terminology that is suitable for the age level.

Resource: *Banksia Woodland poster*

■ Activity 3.70 WHAT AM I?

JUNIOR
MIDDLE
UPPER

LANGUAGE

Students make up their own questions "What am I?" Here are a few ideas to get the class started.

What am I?

I am noisy. I live in hollow tree branches. I eat seeds. I hang out with a group of my own kind.

A Black Cockatoo.

What am I?

I have a long tongue. I love nectar. I'm good at climbing trees. I sleep most of the day. I have big eyes so that I can see better at night.

A Honey Possum.

What am I?

I live no longer than a few months. I have spots on me. My babies become caterpillars before they turn out like me. I flutter from bush to bush.

Three Spotted Skipper Butterfly.

What am I?

Possums and Honeyeaters like me. I am often seen around Perth looking magnificent. My skin is very rough. I usually grow crooked.

Firewood Banksia.

■ Activity 3.70

continued

JUNIOR
MIDDLE
UPPER

LANGUAGE

What am I?

I love the warmth. I have suction-type pads on my feet. I have big eyes. I will drop my tail to avoid being eaten. I like climbing over wood.

Western Spiny-tailed Gecko.

- Extension: 1.** One student sits at the front of the classroom with the name of a Banksia Bushland creature on a piece of paper on their forehead. The student asks the class five questions in regards to "What am I?" Their answers must be answered as either "yes" or "no". The student guesses the creature.
- 2.** Similar to that above but with a role reversal, in that the person at the front chooses a creature and the class must ask five questions before they can guess the creature. The front person may only answer "yes" or "no".

■ Activity 3.71

JUNIOR
MIDDLE
UPPER

SCIENCE
LANGUAGE
ART & CRAFT

RESEARCH

Allow your students to choose a new animal, not previously studied from the list below:

Western Spiny-tailed Gecko
New Holland Honeyeater
Echidna
Termites

Students research the animal and write a report including pictures and diagrams, using the First Steps scaffold headings:

- ◆ Introduction
- ◆ Description
- ◆ Distribution
- ◆ Habitat
- ◆ Feeding Habits
- ◆ Reproduction
- ◆ Other Interesting Points
- ◆ Ending

They should consider:

- ◆ what plants are important in their lives for food, shelter and breeding
- ◆ their feeding habits
- ◆ their preferred natural habitat
- ◆ their reproductive cycles
- ◆ their enemies and ways of coping with them
- ◆ description of their physical features.

Combine the results of the student investigations and create a display.

■ Activity 3.72 PAINT A POSTER

JUNIOR
MIDDLE
UPPER

Visit another plant community other than the Banksia Woodland (eg: Tuart) and have the students paint their own posters showing life in this community.

ART & CRAFT

■ Activity 3.73 WORD POWER

JUNIOR
MIDDLE
UPPER

How many small words can the students make out of the following words?

LANGUAGE

pineapple	firewood	banksia	buttercups
skipper	butterfly	spotted	carnaby
cockatoo	honeyeater	honeypot	holland
bobtail	termite	echidna	possum

■ Activity 3.74 PREDICTIONS

JUNIOR
MIDDLE
UPPER

In relation to the Banksia Woodland poster have the students suggest what would happen if:

LANGUAGE

- a. fire burns the understorey?
- b. all dead wood is collected for firewood?
- c. people chop down trees?
- d. there is a storm?
- e. plant disease attacks the Banksia tree?

■ Activity 3.75 SOCIOGRAM

Resource Sheet 78 page 191

MIDDLE
UPPER

Copy Resource Sheet 78 onto a board or overhead. Discuss the inter-relationships between all the plants and creatures on the poster. Link these relationships together on the sociogram. An example is given on Resource Sheet 78 to get the class started.

SCIENCE
SOCIAL
STUDIES

■ Activity 3.76

DISCUSS

MIDDLE
UPPER

Discuss the hazards that the animals face in the Banksia Woodland. How have people helped these animals to continue to live in the Banksia Woodland?

SCIENCE
SOCIAL
STUDIES

■ Activity 3.77

DEBATE

MIDDLE
UPPER

Organise a class debate for and against feral animals. Specially look at foxes and/or cats which are the main problems in the Banksia Woodland.

LANGUAGE

■ Activity 3.78

COURT ROOM CRIME

MIDDLE
UPPER

Organise a court room session.

The Crime: Charges are being laid against a person who dumped a litter of kittens into the bushland when they were unable to sell or give them away.

LANGUAGE

Include the judge, jury, defense counsel, etc.

■ Activity 3.79

RECORDING INFORMATION *Resource Sheet 79 page 192*MIDDLE
UPPER

In groups, students record what they have discovered about one of the animals discussed in this section on Resource Sheet 79 for display on the wall or in a booklet.

LANGUAGE

Resource: *Landscape magazine, CALM Education Centre
Nature Walkabout, Gould League Association*

■ Activity 3.80

CLOZE

*Resource Sheet 80 page 193*MIDDLE
UPPER

LANGUAGE

Students read the information on Resource Sheet 80 and place the words provided into the correct blank spaces.

The completed passage follows with the answers underlined.

Many birds only visit Banksia Woodland to feed when food is available. Twenty-Eight Parrots normally live and breed in nearby gum tree hollows of Tuart or Jarrah trees and the Black Cockatoos fly hundreds of kilometres to Salmon Gum Woodland to nest.

Honeyeaters migrate around several plant communities to obtain their food requirements throughout the year.

Animals can live their whole lives within the one plant community whereas birds needing several communities often have to travel large distances to obtain food.

Echidnas and Honey Possums are unlikely to be seen as they are nocturnal and are becoming uncommon in the Banksia Woodland.

Termites and Western Spiny-tailed Geckos can be observed during the day.

The decline in the numbers of these animals is related to the loss of habitat, the fragmentation of habitat and habitat decline. These are related to weed invasion, disease, salinity and predation by feral animals.

■ Activity 3.81

POSTER DESIGN

UPPER

ART & CRAFT

Students select a single plant and design and colour a poster of the life associated with this species such as is done in the Banksia Woodland poster, or Nature's Boarding House poster depicting life in the Red River Gum. These posters can be obtained from Greening Western Australia or the Gould League Association at the Herdsman Wildlife Centre.



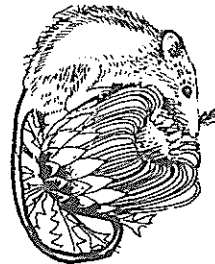
Honey Possum

Resource Sheet 74

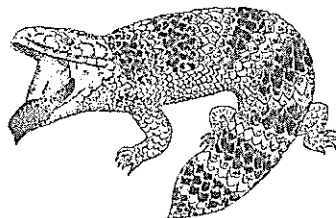
■ Activity 3.63 MATCH THE ANIMALS

page 179

Honey Possum



Bobtail



Honeyeater



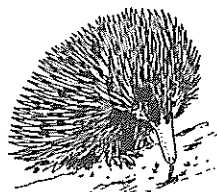
Black Cockatoo



Termite



Echidna



Gecko



Butterfly

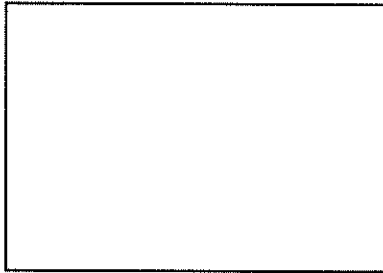


Resource Sheet 75

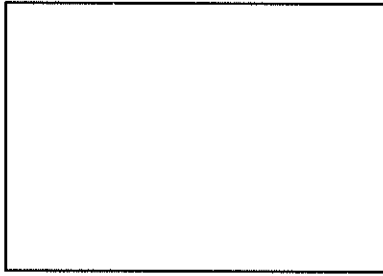
■ Activity 3.63 MATCH THE ANIMALS

page 179

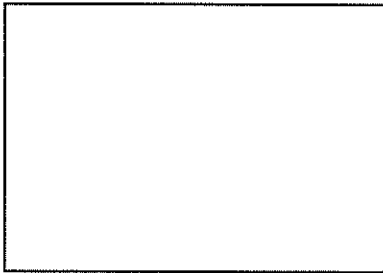
Cut out the animals on Resource Sheet 74 and match them with the sentence. Glue them into the correct box.



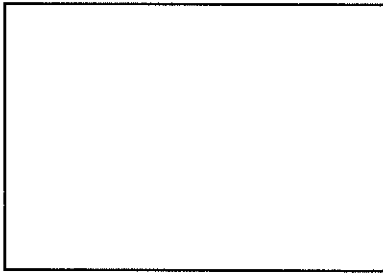
eats insect larvae and seeds



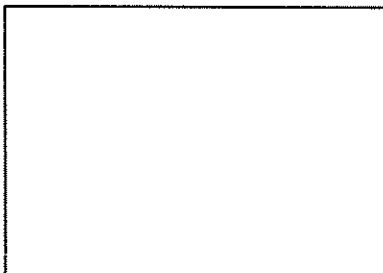
is food for Cockatoos and Honeyeaters



eats nectar and pollen from the flowers



eats termites found in dead branches



shelters under dead branches

Resource Sheet 76

■ Activity 3.64 SPOT THE DIFFERENCE

page 179

There are 10 differences between the two drawings.
See if you can find them.



Resource Sheet 77

■ Activity 3.65 HOME SWEET HOME

page 179

Match the creatures with their nests or homes.

Honey Possum

thick bushes or
hollow logs

Bobtail

under shrubs

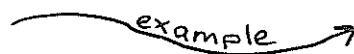
Honeyeater

unused bird nests
or hollow stems of
grass and trees

Black Cockatoo

under loose bark

Termites

example

wood or earth mound

Echidna

nest

Gecko

hollows in trees

Butterfly

plants

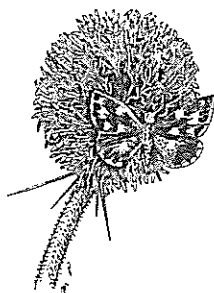
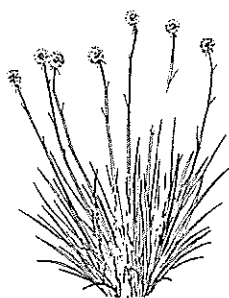
Resource Sheet 78

■ Activity 3.75 SOCIOGRAM

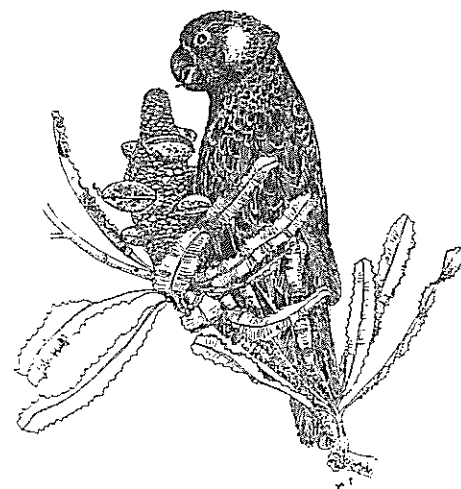
page 183



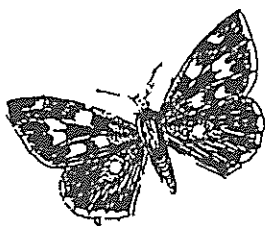
Termites



Pineapple Bush



Black Cockatoo



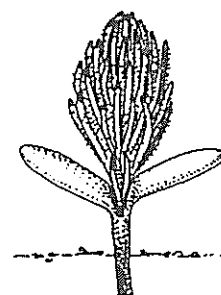
Three Spotted Skipper Butterfly



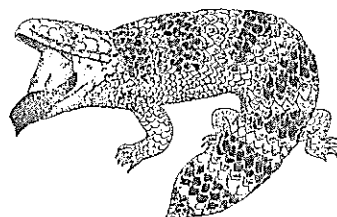
New Holland Honeyeater



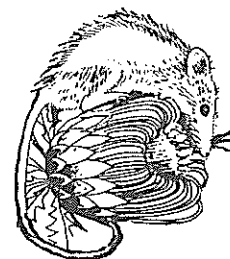
Echidna



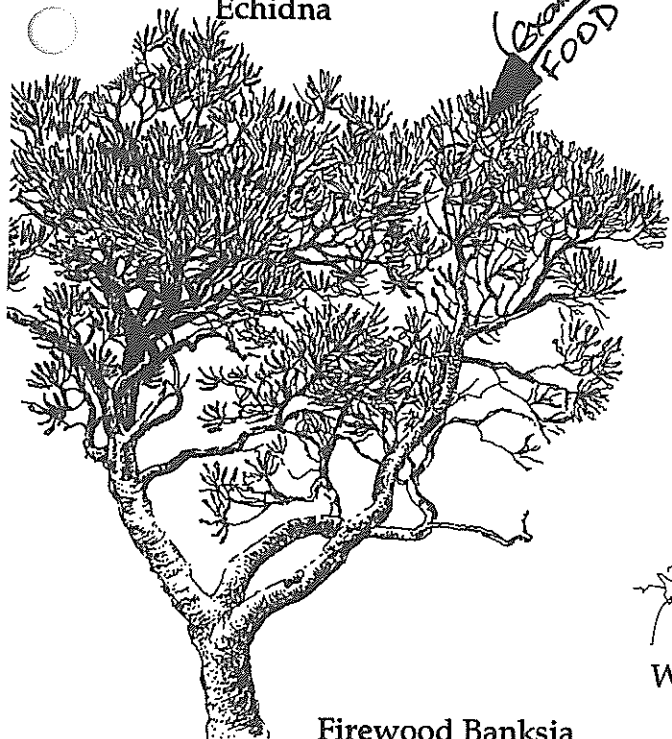
Woolly Bush seedling



Bobtail



Honey Possum



Firewood Banksia



Western Spiny-tailed Gecko

(Group)
FOOD

Resource Sheet 79

■ Activity 3.79 RECORDING INFORMATION

page 184

TITLE: _____

1. Description

2. Distribution

3. Habitat

4. Feeding Habits

5. Reproduction

6. Other

Draw a picture of your creature:



Resource Sheet 80

■ Activity 3.80 CLOZE

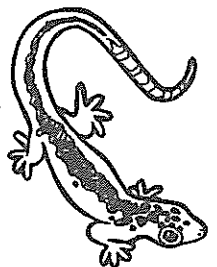
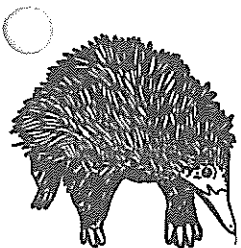
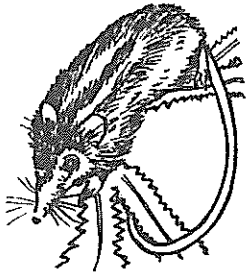
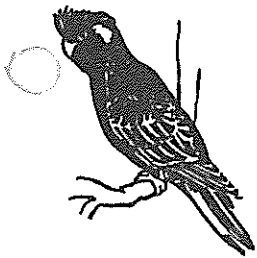
page 185

Read the passage below and place the correct words in the blank spaces.

ANIMALS OF BANKSIA WOODLAND

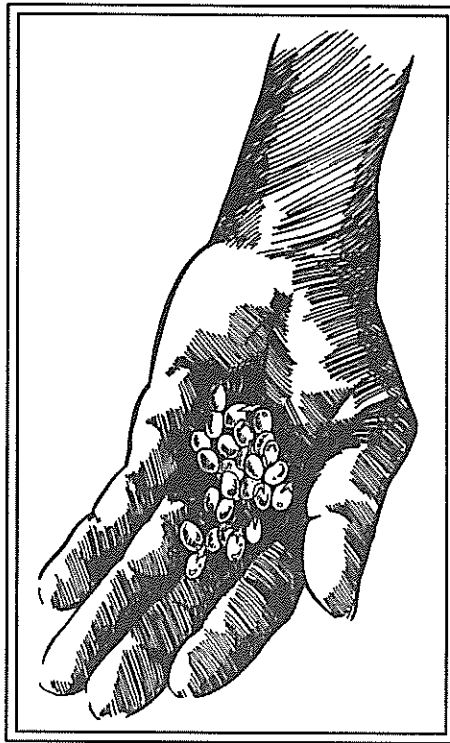
• visit	• habitat	• breed	• nocturnal	• day
• animals	• honey	• feral	• kilometres	• migrate

1. Many birds only _____ Banksia Woodland to feed when food is available.
2. Twenty-Eight Parrots normally live and _____ in nearby gum tree hollows of Tuart or Jarrah trees while the Black Cockatoos fly hundreds of _____ to Salmon Gum Woodland to nest.
3. Honeyeaters _____ around several plant communities to obtain their food requirements throughout the year.
4. _____ can live their whole lives within the one plant community whereas birds needing several communities often have to travel large distances to obtain food.
5. Echidnas and _____ Possums are unlikely to be seen as they are _____ and are becoming uncommon in the Banksia Woodland.
6. Termites and Western Spiny-tailed Geckos can be observed during the _____
7. The decline in the numbers of these animals is related to the loss of habitat, the fragmentation of _____ and habitat decline. These are related to weed invasion, disease, salinity and predation by _____ animals.





*New Holland Honeyeater
collecting nectar*

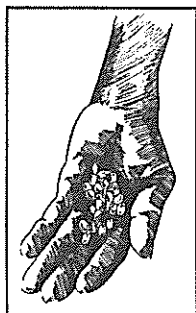


PART FOUR

PEOPLE AND WILD PLANTS

ACTIVITY			YEAR LEVEL			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
4.1	Aboriginal Painting	207	●	●	●							●
4.2	Tapping Sticks	207	●	●	●						●	●
4.3	Bush Glue	207	●	●	●	●						
4.4	Aboriginal Talk	207	●	●	●		●					
4.5	Bush Tucker	208	●	●	●		●	●				
4.6	Aboriginal Art Gallery	208	●	●	●		●					●
4.7	Aboriginal Heritage	208	●	●	●	●	●	●				
4.8	Aboriginal Music	209	●	●	●		●				●	
4.9	Aboriginal Plant Trail	209	●	●	●	●						
4.10	Food Dishes from the Bush	209		●	●	●	●	●				●
4.11	Making a Mia	209		●	●		●					●
4.12	Exploring Bark	210		●	●		●					
4.13	Rope Making	210		●	●		●					●
4.14	Song "Native Born"	210		●	●	●				●	●	
4.15	Map Work	229	●	●	●		●			●		
4.16	Jean's Diary	229		●	●		●			●		
4.17	Alien Nation	229		●	●	●				●		●
4.18	Table Research	230		●	●	●	●			●		●
4.19	Research	230		●	●		●			●		
4.20	"Southland"	230		●	●		●			●		
4.21	Letter Writing	230		●	●					●		
4.22	Be Botanists	231		●	●	●				●		●
4.23	Nyungars of the South	231		●	●	●	●			●		
4.24	Plants and Life	231		●	●		●			●		●
4.25	A Balanced Diet	231		●	●			●		●		
4.26	Playwrite	232		●	●					●		
4.27	Explosion Chart	232		●	●	●				●		
4.28	The Letter	232		●	●					●		

Background



PEOPLE AND WILD PLANTS

The plant and animal life indigenous to Australia originally evolved without the presence of people or any animal that lived like us. People became a part of the Australian ecosystem 50,000 years ago and perhaps even as long ago as 120,000 years. This is a very small amount of time in an evolutionary sense and none of the indigenous plants and animals have evolved in this time to have a balanced relationship with people. The only way a balance can result is by people adapting their lifestyle to respect the ecosystem either by necessity or choice.

Over thousands of years, Aborigines developed a sustainable, hunter-gathering lifestyle living with the Australian land. They understood the weather patterns, plants and animals so well that they could live off the land. When the Europeans explored Australia, they did not understand the weather patterns or recognise plants that could be a source of food. They were often unable to find enough water to fill their water barrels.

The first European settlers had many difficulties establishing themselves in the Western Australian environment. Agricultural techniques and agricultural plants had been developed over a long period of time in Western Europe in response to Western Europe's physical environment. These techniques and crops were not well adapted to the very different physical environment of Western Australia. The Europeans did not understand the basis of the long-term, sustainable lifestyle of the Aborigines which they interpreted as a lack of knowledge of agricultural techniques.

THE ABORIGINES AND THE LAND

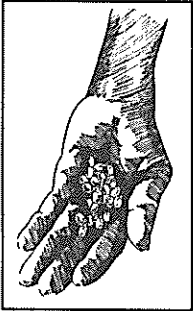
Aboriginal life centres around the land. The Aboriginal people lived as one with the land, regarding it as a living religious icon, an integral part of the Dreaming.

The Dreaming is a general belief and value system for Aboriginal living and governs all relationships, behaviours and personal vocations. It is the embodiment in the land, the plants and the animals of the life-giving power of the Ancestral Beings who created and shaped the world.

It was possible for the Aboriginal people to live in harmony with the natural ecosystem because their lifestyle was adapted to the "checks and balances" of the natural ecosystem of which they regarded themselves a part.

At the time that Australia was discovered and settled by Europeans, there were about 300,000 Aborigines living throughout the continent. They were divided into at least 500 tribes with as many different languages or dialects.

Background



Members of each tribe normally lived in extended family groups or clans of 10-50 people. They lived by hunting and gathering. The men hunted large animals and the women and children gathered plant material and caught smaller animals. Each group migrated around their defined clan territory during the year, settling for a period of time in locations where food and water were plentiful and moving as one food source diminished and another became available. The pattern of migration was related to the weather, water resources and the seasonal supply of food and the journeys of ancestral forces of the Dreaming.

The times of flowering and fruiting of many wild plants were used as indicators of the seasons. The year was divided into six or more periods that were related to the weather and foods available at these times.

Natural resources are not evenly distributed in the landscape. In most cases, the Aborigines were able to find and utilise local materials and plants for all of their needs. However, in special cases, there was movement of raw materials between tribes. Ochre, stones for tools and wood for implements, for example, are known to have been traded between tribes.

The Natural Resources of the Land

Adaptation involves the efficient utilisation of all natural resources, plants, animals and, to a lesser extent, minerals. Many materials could be used directly, but others needed to be highly modified by long and complex processes that required the application of accumulated knowledge and great skills. Such processes had been developed for preparing food and making implements from various natural resources.

The Management of the Bushland

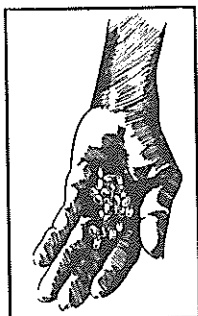
There is evidence that the Aborigines periodically used fire to alter the structure of the plant communities in which they lived. The bushland was burnt in a pattern that kept their major migration routes passable, encouraged new growth that was attractive to kangaroos, concentrating them in a location for easier hunting, and made access to some plant foods easier. Extensive areas of heath and grassland were encouraged by this practice.

The Wild Plants

The Aboriginal people adapted their lifestyle to live in almost all Australian plant communities.

The Aborigines' understanding and knowledge of plants was formidable. Useful plants were allocated names as accurately as botanists' modern classifications. In some cases, the differences

Background



between plants discerned by the Aborigines are only now being appreciated by botanists using sophisticated scientific techniques. Wild plants were used by Aborigines for food, fibre, medicine, tools, weapons, shelter, musical instruments, clothing, religious objects, fuel and toys.

Arrival of the Europeans

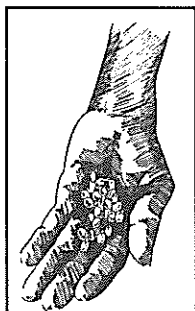
The vast amount of knowledge required to maintain Aboriginal lifestyle was passed on for thousands of years through a rich oral history, reinforced by daily practice and supplemented by continued observation.

With the arrival of the Europeans and their lifestyle based upon the modification of the land to support non-native plants and animals, the Aborigines began to use European foods. As they were displaced from their clan territories and prevented from hunting and burning their traditional lands, they began to cause problems for the white settlers. The white settlers began to offer food as gifts to placate the Aborigines and finally the Government established ration depots to try to replace the loss of access to traditional dietary items. Wild plants and animals were still used to supplement a diet which was centred on flour and sugar. Through less frequent application, the knowledge of living with the land gradually diminished. Diseases, such as measles and influenza, common amongst Europeans but unknown amongst Aborigines, devastated the Aboriginal populations. The more knowledgeable Aborigines, the elders of the tribes, also died from these diseases and with them went much of the accumulated knowledge. A few early Europeans made written records of some of the details of the Aboriginal lifestyle, but these were mostly highly influenced by cultural bias, lack of a common language and the Europeans' poor knowledge and understanding of the Australian land.

Over the past twenty years there has been a greater awareness of the knowledge held in oral history and many Australians of Aboriginal and European descent are now making written records of this. Consequently the most comprehensive records of Aboriginal life are from the areas where Europeans had less impact, such as the north and the desert. Detailed knowledge of Aboriginal life in Western Australia is not extensive and is based upon written and pictorial records made by Europeans, supplemented by memories and practices still retained by Aborigines today.

Artefacts held in museum collections are not numerous. There are perhaps as few as 3,000 items, and archaeological data on plants and plant material is poor as these degrade so quickly. That some of the rich oral history of the Aborigines has survived without much application for so many years is a testimony to the memories of the Aboriginal people.

Background



ABORIGINAL LIFE AT AUGUSTA IN THE 18th CENTURY

The previous section gives an idea of how Aboriginal people lived in Australia before the arrival of Europeans and the importance of wild plants in their life. Activity work for students included in this package revolves around the lifestyle of the Aborigines of the Augusta area in the south-west of Western Australia. This area is chosen to provide a contrast with the lifestyle of the Molloyes who settled at Augusta in 1830s and is developed in Activities 4.24 and 4.25.

The following information is based upon:

- ◆ written records of early Europeans who interacted with the Aboriginal people of the south-west,
- ◆ information accumulated by people who have worked in the south-west area,
- ◆ the plants known from the area, and
- ◆ generalisations of the Aboriginal way of life.

Consequently much of what is described is surmised. Aboriginal names are given wherever possible. Bold Aboriginal names are illustrated in this section or in the glossary.

The Bibbulmun

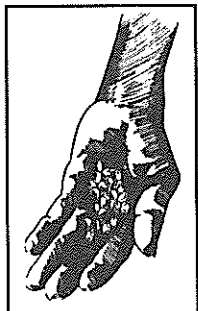
The local Aboriginal group in Augusta was described by Tindale in the 1940s as the Bibbulmun or Bibbulmun. They belonged to the cultural group now called "Nyungar", found throughout the south-west of Western Australia. Several family groups would have occupied territory in the Augusta area. There were probably no more than fifty Aboriginal people permanently living close to the Augusta area.

In April 1830, when the Molloyes arrived in Augusta, it is probable that there were no Aborigines living on the coast in the Augusta area. At this time of the year, the Aborigines travelled inland to avoid the heavy rain and damp winter conditions on the coast.

Generally they travelled as a family group of six or seven. As they travelled, the women and children collected plant foods and small animals, and the men hunted out to the side of the group for larger animals. The plant communities offering the greatest source of food and other materials were the Jarrah - Marri Woodlands and intermittent swamps with their rich assemblages of plants with underground storage parts. Towards summer, groups would move back to the coast to take advantage of the milder conditions that allowed regular fishing and gathering of other plants on the coastal heathlands.

The travelling routes appear to have been kept clear of thick undergrowth by the judicious lighting of fires. Such fires were also apparently used to encourage fresh growth that attracted kangaroos

Background



and wallabies, making them easier to hunt. Plants such as the Bullrush (*Typha domingensis*) were made more accessible by firing whilst others were encouraged to fruit en-masse, such as the Zamia (*Macrozamia riedlei*).

Plants were an essential part of the lifestyle. In general plants were chosen from within the territory of the group. For some implements, materials from a distant location were regarded as superior to those available locally and special trips were made to collect these. They were also obtained by trade between tribes. Such materials probably included the Jam Tree (*Acacia acuminata*) which has a very dense, hard wood used to make clubs and boomerangs, ochre for decoration and diorite rocks were obtained for use as axe heads.

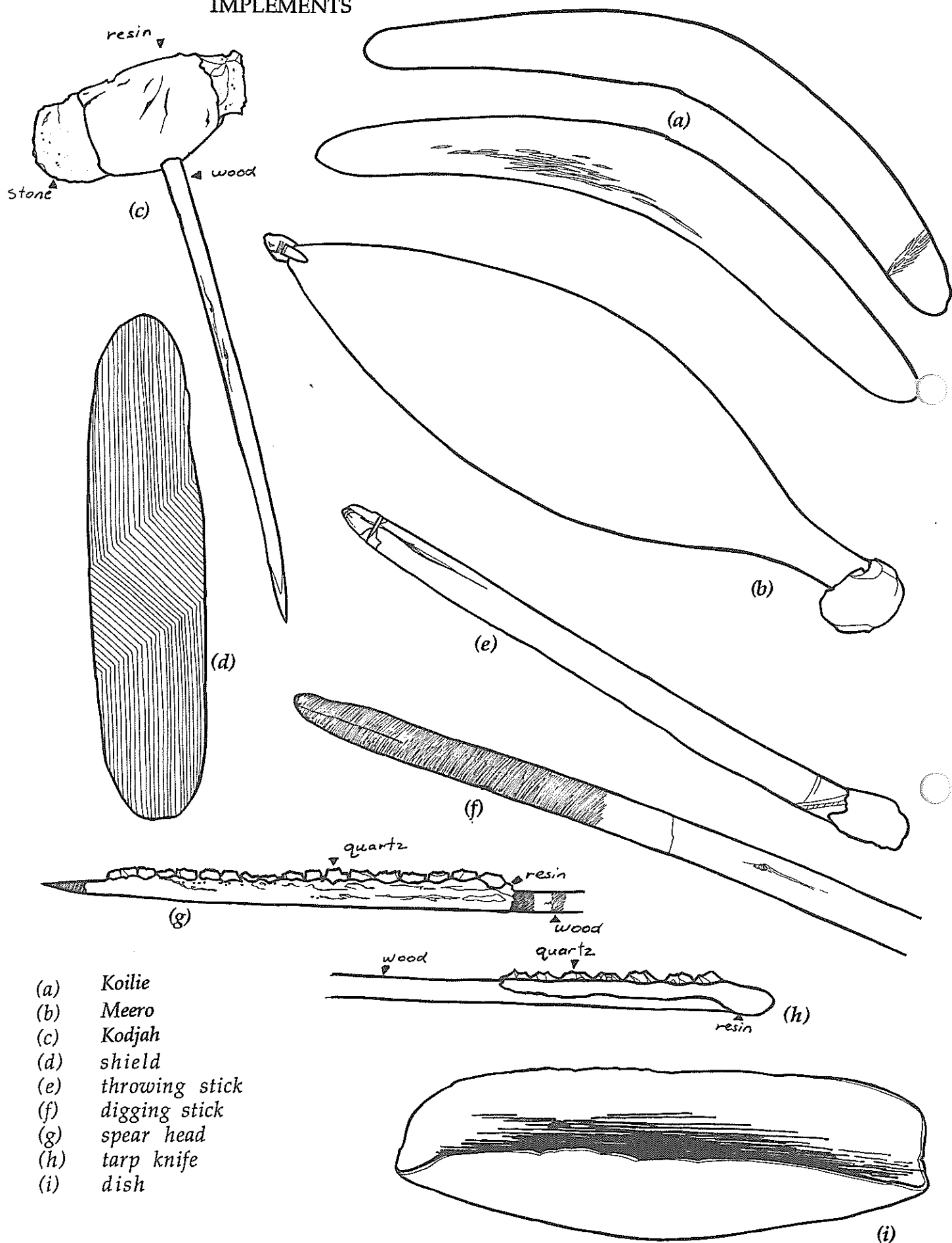
Shelter

Since the Aborigines had to keep travelling to obtain sufficient food, they constructed temporary shelters at their camping places. These shelters were called mias (sometimes incorrectly called mia-mias, which refers to a shelter for childbirth). Jesse Hammond describes these shelters and their manufacture:

".... they build a place of shelter called the *mia* which protected them from the wind and weather. The *mia* was a hut that covered about three-quarters of a circle, the other quarter being its opening. The opening was always on the lee side, away from the wind. The *mia* was about 1½ metres high and about 2 metres across the centre. In building it, a frame was constructed of straight sticks in the ground, the thin ends brought together at the top and tied together with *banjin* (the bark of a kind of scrub - *Pimelea* species), or else with the long thin leaves stripped from the *Zamia*. The frame of sticks would form a dome. Lighter sticks were tied crossways on the dome at every few inches from bottom to top, and over this was placed a covering of paper bark, rushes or fine scrub." (1933, Facsimile Ed 1980)

Implements

Each implement required careful preparation. The correct plant materials were carefully selected according to the uses of the implement. This material was then modified by shaping and smoothing with stone scrapers, firing to straighten and harden, binding with plant fibres or animal sinew and cementing with the resin, Bigo or Piring from Balga, the Grass Tree (*Xanthorrhoea preissii*). The principal tool for gathering was the digging stick. This was used both for digging to obtain roots, tubers, corms and bulbs and as a club for catching small animals. Digging sticks were made from heavy, dense, strong wood such as Gimlet (*Eucalyptus salubris*) and the Jam Tree (*Acacia acuminata*) if this was available. Clubs were also made from such dense woods.

SOUTH-WEST
IMPLEMENTS

- (a) Koilie
- (b) Meero
- (c) Kodjah
- (d) shield
- (e) throwing stick
- (f) digging stick
- (g) spear head
- (h) tarp knife
- (i) dish

Background



Carrying bags made from animal skins were the most common collecting implement but wooden dishes (called Coolamans in Central Australia) were also used. Light-weight woods were used to make the wooden dishes which could also be used as a spade-like digging tool. Temporary collecting dishes were undoubtedly made from the paperbark of *Melaleuca*, commonly found around wetlands.

Spears (Borail, Dedin, Mangar and Ko-art) were made from long, straight and relatively light-weight pieces of wood. Preference was for material from the mallee form of Gimlet but the Aborigines probably also used an acacia growing in wetlands, the flowering stem of Balga and other suitable materials such as the long stems of Pondil or Spearwood (*Kunzea ericifolia*). Meeros (spear throwers) and Koilies (throwing sticks) were made from Jarrah, and Woonda (shields) were made from the wood of the Christmas Tree (*Nuytsia floribunda*). Spears made from the flowering stem of Balga were often used as fish spears as they floated and were easier to retrieve.

Kodjah (stone axes) were also made. The handle was of a hard wood stuck to the stone with resin. The resin Bigo or Piring from the Grass Tree was used as a cement on many occasions.

Knives and spear heads were made using chips of sharp edged stones, especially white quartz Bard-ya and secured with resins.

Food

Many parts of plants were used for food along with most animals. Many plants were not edible until treated in a particular fashion for several days or sometimes weeks.

NOTE: It is contrary to the approach of this Package to collect any wild plant material without the appropriate permission. Most people these days do not have the required knowledge about our wild plants to know which plants are edible and how they should be prepared. The examples of plants used for food are for your interest. This should not be seen as a guide to what you can eat. The Activities suggest a few plants to be used, but these will be commonly cultivated native plants from groups that are easily distinguished.

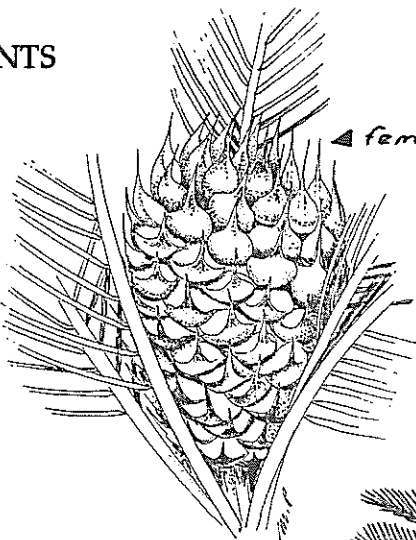
Nectar

Flowers containing much nectar were sucked, drained on a piece of bark or steeped in water to dissolve the sweet nectar, making a sugary drink. Good sources of nectar include the flower cones of *Banksia* especially Mangite (*Banksia grandis*), Eucalypts especially Marri (*Eucalyptus calophylla*) and *Dryandra*. To extract the nectar, the Aborigines would line holes in the ground with kangaroo skins, fill them with water and throw in the collected flowers. The honey from the flowers dissolved in the water, being left overnight to make a honey brew free from ants.

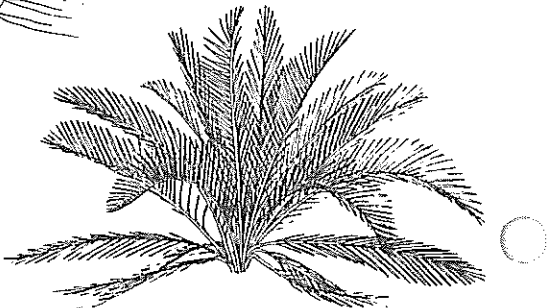
BUSHLAND PLANTS



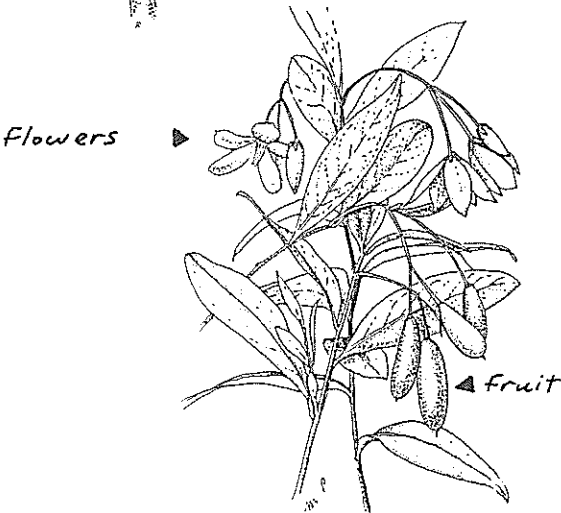
Banjin *Pimelea rosea*



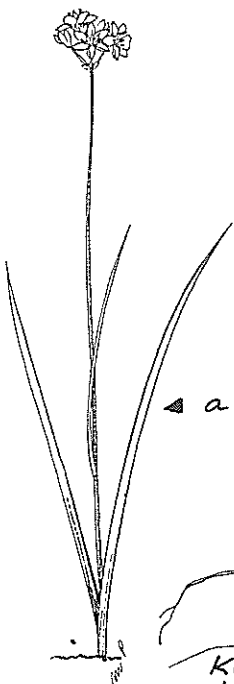
female cone of the
Zamia containing
seeds covered in
bright red fruit



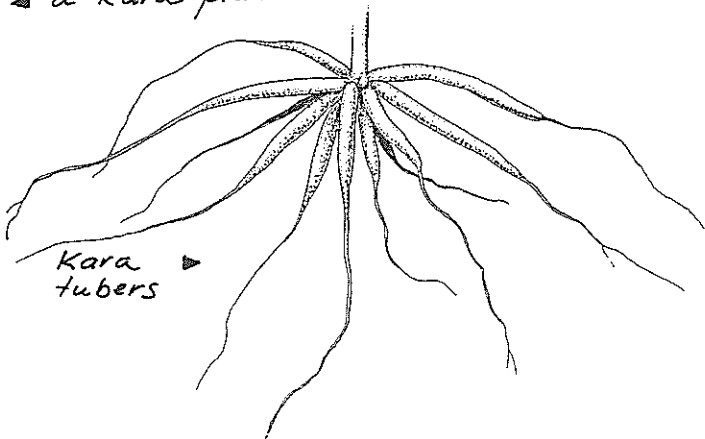
Zamia *Macrozamia riedlei*



Kuruba *Sollya heterophylla*



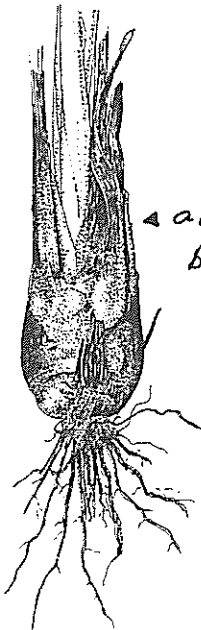
a Kara plant



Kara *Burchardia umbellata*



a Matja plant



a Matja
bulb

Matja *Haemodorum*

Background



Fruit

Most juicy fruit would have been collected, no matter how small. Such plants are Kuruba or Native Bluebell (*Sollya heterophylla*), Native Heaths (*Leucopogon* and *Astroloma*), Koolah or Emu Plum (*Podocarpus drouynianus*), Snotty Gobble (*Persoonia* species), Quandong or Sandalwood (*Santalum acuminatum*) and *Nitraria*. The bright red leathery fruit of the Zamia (*Macrozamia riedlei*) was eaten after preparation to remove poisons. The Aborigines buried the Zamia fruit in the ground where they fermented, changing the sugars from a toxic to a non-toxic form. After three months, they became like preserved dates and could safely be eaten.

Seeds

Virtually any seeds of the Wattle (*Acacia* species) were eaten after grinding and baking into a cake. An example in the south-west area is Coojong (*Acacia saligna*) whose seeds are called Wuanga, Marri seeds, and Baio, the seeds of Zamia (*Macrozamia riedlei*). Baio requires the same sort of preparation as the fruit.

Underground Fleshy Storage Organs

The roots, tubers, corms and bulbs of many species were eaten. Over 80 species of herbs in the south-west are known to have underground parts (Pate and Dixon, 1989). Many of these were probably eaten but there are no records. Some are widespread and are sure to have been eaten. These include the bulbs, Matja of the Bloodroot (*Haemodorum paniculatum*) and other *Haemodorum* species, tubers of Kara or Milkmaids (*Burchardia umbellata*) and other species, the Yanjidi (*Typha domingensis*) and some orchids.

Leaves

Green parts of plants (generally leaves or more rarely stems) were also used by the Aborigines.

Young leaves of Sea Celery (*Apium prostratum*) and New Zealand Spinach (*Tetragonoides tetragonoides*) and the white base of Balga leaves were probably eaten by the Aborigines.

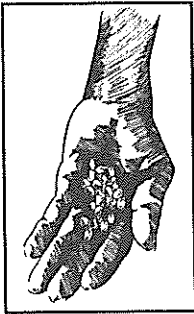
Fibre

The bark of Banjin (*Pimelea* species) was stripped and Flax Lily (*Dianella divaricata*) leaves were used as a source of strong silky fibre.

Medicine

There are 112 species of wild plants recorded as being medicinal agents throughout Western Australia (Reid, 1977). These records are from the drier north-west. Gum leaves, roots and bark are known to have been soaked in water, the liquid then being used to bathe the

Background



head or as a drink to treat colds and fevers. It is reported elsewhere (Meagher, 1974) that Kurren, probably Camphor Myrtle (*Baeckea camphorosmae*), when dried was used for headaches by waving it under the nose.

Musical Instruments

Traditional music in the south-west was singing accompanied by clapping with boomerangs to tell of ancestors' journeys through the landscape.

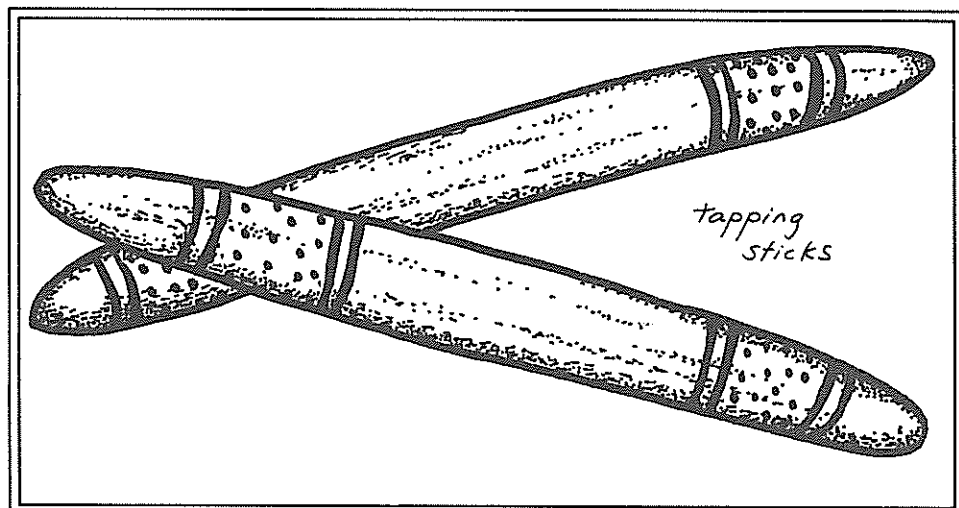
Fuel

All cooking and heating relied on wood burning. Wood that formed long-lasting coals such as Jarrah was preferably selected. Mangite (*Banksia grandis*) cones were used as firesticks. Once lit, the cone will smoulder for a long period of time allowing the fire to be transported. These smouldering cones were apparently held inside the kangaroo skin cloaks in winter to help the Aborigines keep warm and to protect the precious glowing embers.

The activities in this section of the package are designed to develop the following understandings:

1. The Aboriginal people obtained all their living requirements directly from natural materials.
2. The Aboriginal people lived at one with their land.
3. The Aboriginal people practised a hunter-gathering lifestyle.
4. Women and children did the gathering and hunted small animals, whilst the men hunted the larger animals.
5. Plant foods were the mainstay of daily life.

Use the Background material to introduce the students to these understandings through the following activities.



ACTIVITIES

■ Activity 4.1

JUNIOR
MIDDLE
UPPER

ART & CRAFT

ABORIGINAL PAINTING

Using eucalyptus twigs as "brushes", paperbark as paper and ochre paint, students paint a landscape scene of Australian native plants and animals.

Resource: *Paperbark (obtained from plant nurseries)*

Ochre paint (this can be purchased from hardware stores for colouring cement)

■ Activity 4.2

JUNIOR
MIDDLE
UPPER

MUSIC &
MOVEMENT
ART & CRAFT

TAPPING STICKS

Students collect dead branches that are approximately 2 centimetres in diameter and cut into 15 centimetre lengths to make tapping sticks. Strip off the bark.

Students use smaller sticks and ochre paint or school paints to decorate their tapping sticks. Use the cross hatched or circular patterns for decoration like those used by Aboriginal people.

Students play music with their tapping sticks. Did one type of wood work better than another?

Resource: *Dead branches*

(2 centimetres in diameter and 15 centimetres in length)

Ochre paint

■ Activity 4.3

JUNIOR
MIDDLE
UPPER

SCIENCE

BUSH GLUE

Collect the hardened sap from the flowering stem of Grass Trees, Manna Wattles or Eucalypts such as Marri. Once water is added to the sap, this will form a glue which can be kept in glass jars and used at school. The fewer the drops of water, the thicker the glue.

Resource: *Hardened sap*

Jar with lid

Drops of water

■ Activity 4.4

JUNIOR
MIDDLE
UPPER

SOCIAL
STUDIES

ABORIGINAL TALK

Invite some Aboriginal people to visit your school to talk about their relationship with the land. They may be able to show how some of their tools and other implements were made.

■ Activity 4.5

BUSH TUCKER

JUNIOR
MIDDLE
UPPER

Discuss a few easily identifiable native foods, such as Macadamia nuts or nectar from Eucalypts, Banksia or Dryandra. Invite some Aboriginal people to visit your school to talk about bushtucker.

Resource:

SOCIAL
STUDIES
HEALTH

Cribb, A.B. and J.W. (1988). *Wild Food in Australia*. Collins, Sydney.

Low, T. (1989). *"Bush Tucker"*. Collins, Sydney.

Low, T. (1990). *Bush Medicine*. Collins, Sydney.

Bush Food posters are available from the Aboriginal Education Resource Unit, 151 Royal Street, East Perth 6004.

■ Activity 4.6

ABORIGINAL ART GALLERY

JUNIOR
MIDDLE
UPPER

Enquire at the Western Australian Art Gallery and see if they are currently holding any Aboriginal art displays. They may also have paintings by Europeans depicting Aboriginal lifestyles. Compare and contrast these different styles of paintings. The Museum provides student focus questions based on Aboriginal lifestyles when they visit the gallery. Tours may be booked on any specific subject at the Art Gallery.

SOCIAL
STUDIES
ART & CRAFT

■ Activity 4.7

ABORIGINAL HERITAGE

JUNIOR
MIDDLE
UPPER

Visit the Aboriginal Gallery at the Museum. Look at the display to find any artefacts from the south-west of Western Australia. Discuss why there are so few artefacts from the south-west.

Compare the foods used by most Australians today with those collected by the Aborigines in 1830. Look at the five main food groups.

Compare the plants found in the Museum displays with your local bushland plants.

Arrange to borrow the kit on Aboriginal Medicine from the Museum Education section.

HEALTH
SCIENCE
SOCIAL
STUDIES

■ Activity 4.8

JUNIOR
MIDDLE
UPPER

SOCIAL
STUDIES
MUSIC &
MOVEMENT

ABORIGINAL MUSIC

Listen to Aboriginal music. Use class-made or school-owned tapping sticks to join in with the music. Parents may have a didgeridoo and do a demonstration for the class.

Listen to modern Aboriginal music and compare the differences. Discuss also the change in lifestyles that have caused the change in music. The group "Yothu Yindi" may be a good starting point for modern music.

Resources: *Tapes of Aboriginal music*

■ Activity 4.9

JUNIOR
MIDDLE
UPPER

SCIENCE

ABORIGINAL PLANT TRAIL

Arrange to visit Kings Park to explore the Aboriginal Plant Trail in the Botanic Gardens.

■ Activity 4.10

MIDDLE
UPPER

SCIENCE
SOCIAL
STUDIES
HEALTH
ART & CRAFT

FOOD DISHES FROM THE BUSHLAND

Guildford Grass is a weed from South Africa and is found in most lawns. Use the leaves of this plant as fibre for the next part of this activity. Obtain paperbark from a nursery.

Students make a carry basket out of paperbark, using the Guildford Grass leaves to sew the bark together. Punch holes in the bark and tie the basket together using grass fibres.

Students use a piece of stick as a digging stick to dig the Guildford Grass bulbs out. Scrape off the bark and sandpaper the stick smooth with blunt chisel-shaped ends.

Students collect the bulbs of the Guildford Grass in their basket and imagine that these bulbs are for food.

Resource: *Paper bark*

Guildford grass bulb and leaves

■ Activity 4.11

MIDDLE
UPPER

SOCIAL STUDIES
ART & CRAFT

MAKING A MIA

Resource Sheet 81 page 211

Build an Aboriginal shelter called a mia. Discuss the instructions on Resource Sheet 81 before students commence construction of their mia.

If your school grounds do not have enough space or dead and broken branches, you may need to seek permission to do this on private property or make miniature mias in the classroom.

Resource: *branches*

■ Activity 4.12 EXPLORING BARK

MIDDLE
UPPER

In an area of bushland, ask students to look at different types of bark and think which one they would use for what purpose. For example, which one would be used for a carrying dish?

SOCIAL
STUDIES

■ Activity 4.13 ROPE MAKING

MIDDLE
UPPER

Tear Guildford Grass or Watsonia leaves into very thin strips and twine or plait them to form a rope.

Resource: *Guildford Grass or Watsonia leaves (Note: These are not native plants but are abundant weeds.)*

SOCIAL
STUDIES
ART & CRAFT

■ Activity 4.14 SONG "NATIVE BORN" *Resource Sheet 82 page 212*

MIDDLE
UPPER

Teacher reads through the lyrics while the class follows.

Students to note:

- who they think wrote the words
- parts they liked
- parts they did not understand.

Share and discuss notes from above.

Lead discussion on:

- eucalypt/wattle references
- people mentioned: Joseph Banks and Albert Namatjira
- "Familiar things are strange while strangers play upon the lawn."

Play the song for the students.

Direct the students to look at the environment surrounding the school; the "familiar things" and discuss those which actually belong. Relate the sentiments in the song to revegetation projects.

Discuss the symbolism in the song linking Wild Plants and Aboriginal Australians - the "Native Born."

Students to decorate the Resource Sheet 82 with appropriate designs and symbols.

Resource: *"Native Born" by Archie Roach. From the CD "Charcoal Lane". (Aurora (c) 1990 Mushroom Records)*

SCIENCE
LANGUAGE
MUSIC &
MOVEMENT

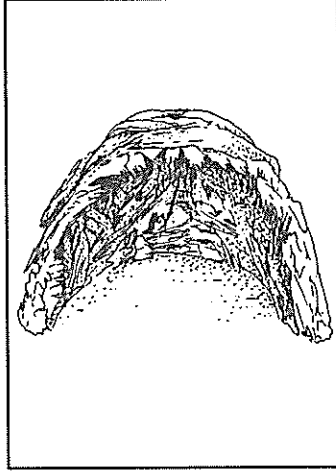
Resource Sheet 81

■ Activity 4.11 MAKING A MIA

page 209

1. Read the description below written by Jesse Hammond

"How to Make a Mia"



"..... they build a place of shelter called the *mia* which protected them from the wind and weather. The *mia* was a hut that covered about three-quarters of a circle, the other quarter being its opening. The opening was always on the lee side, away from the wind. The *mia* was about 1 & 1/2 metres high and about 2 metres across the centre. In building it, a frame was constructed of straight sticks in the ground, the thin ends brought together at the top and tied together with *banjin*, or else with the long thin leaves stripped from the *Zamia*.

The frame of sticks would form a dome. Lighter sticks were tied crossways on the dome at every few inches from bottom to top, and over this was placed a covering of paper bark, rushes or fine scrub." (1933, Facsimile Ed 1980).

2. Make out a list of the type of plant materials you will require. Select the best available materials. Note: In order to preserve our native plants, it is suggested that you use only introduced plants in making your mia. Select materials with the right properties that are available in your school grounds.
3. Choose a site to build your mia. Ensure that you can place the opening as directed.
4. Collect the materials and begin your temporary shelter.
5. Have a good look at the mia you have built. Have you built it well enough to keep out the weather, especially the rain? Do you think that the Aborigines who built the shelter that Jesse described would have made a more weather-proof mia? Consider the value of someone showing you how to do something compared with using a description from a book. How would this affect the sorts of materials you used? What would be the effect of the amount of practice you have had?
6. Have your lunch sitting around your mia. Are there any plants in your lunch? Did your family collect or grow any of them yourself?
7. After lunch, collect some pieces of wood and use them for tapping sticks. Spend some time relaxing with a sing-along using your tapping sticks for accompaniment.

Resource Sheet 82

■ Activity 4.14 SONG - "NATIVE BORN"

page 210

Albert Namatjira painted
 Not so much the things he saw
 But what he felt inside
 And how he loved the Flinders Range
 The only thing he ever wanted
 The reason that he painted for
 Was that everybody share the dream
 His land would never change
 But change it did and through the years
 They introduced some foreign plants
 Familiar things are strange
 While strangers play upon the lawn
 And mother land has shed her tears
 For lives that never stood a chance
 And Albert Namatjira cried, as we all cry
 The Native Born.

So bow your head old Eucalypt and Wattle Tree
 Australia's bush is losing it's identity
 While the cities and the parks that they have planned
 Look out of place because the spirit's in the land
 Look out of place because the spirit's in the land.

Do you remember Joseph Banks
 Who stood upon this sacred earth
 And what he felt inside when he looked around and saw
 The land to whom we give our thanks
 Our mother land who's given birth?
 To trees and plants and animals he'd never seen before?

So bow your head old Eucalypt and Wattle Tree
 Australia's bush is losing its identity
 While the cities and the parks that they have planned
 Look out of place because the spirit's in the land.

But no one knows or no one hears
 The way we used to sing and dance
 And how the Gum Tree stood and stretched
 To greet the golden morn
 And mother land still sheds her tears
 For lives that never stood a chance
 And Albert Namatjira cried as we all cry
 The Native Born

We cry, the Native Born.

*"Native Born" by Archie Roach from the CD Charcoal Lane (Aurora (c) 1990 Mushroom Records P/L)
 Reproduced with permission of Mushroom Records.*

Background



THE EUROPEANS AND THE NEW LAND

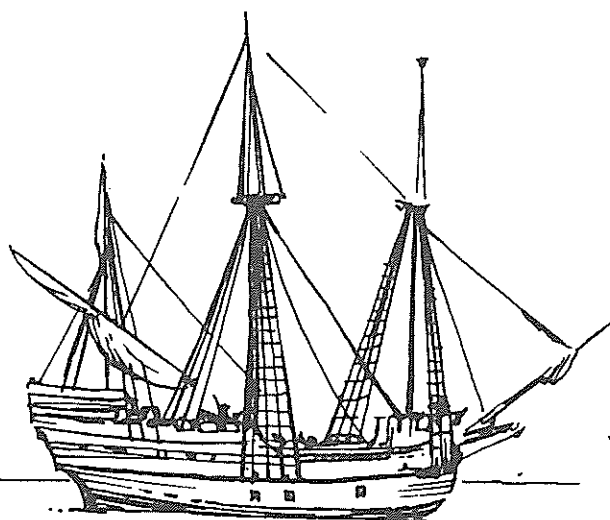
Our early Western European explorers were travellers into the unknown and can be likened to the adventurers of science fiction today. They ventured out in their ship (a completely self-sufficient world) with a captain, a navigator, the crew and an expert or two on plant and animal life.

In the Great South Land - Australia - they found a country unlike any they had experienced before. It was covered in plants and animals that were beyond their comprehension. Bushland covered Australia and in it lived numerous animals.

The abundance of plants in this new-found land misled the explorers. As the plant covering was green and dense, they assumed that the soils were rich and suitable for cultivation. In reality this was a land of shallow infertile soils with very little rain. The highly adapted nature of the vegetation, being slow growing and deeply rooted was not yet appreciated by these newcomers. The differences between the plants of Western Europe and Western Australia were immense (see Tables 1 and 2 on pages 214 and 215).

The scientists on the exploration vessels and some of the early settlers appreciated the uniqueness of the Western Australian flora, but lacked an understanding of the physical environment that had shaped the plants. These environmental factors are only beginning to be fully appreciated today. Perhaps the struggle to adapt the Western European agricultural techniques and plants to a very dissimilar environment hindered the development of a widespread appreciation of the plants of this new land.

It is hard for us living in Australia today to understand how these early visitors to Australia must have felt. The activities begin on page 229 and are suitable for Years 5, 6 and 7. They involve the students in the early study of the exploration of Western Australia and the lives of one of the first settlers.



Sailing ship

TABLE 1

Some important differences between the physical environment and consequently in the plants between Western Europe and Western Australia.

Pate and McComb (1981), Beard (1990), Taylor (1990) and Morris (1979).

PHYSICAL ENVIRONMENT

Feature	Western European	Western Australian
Growing Season		
time	Spring and Summer (April to September)	Mainly Winter and Spring (June to October)
length day	long, twilight	short, no twilight
Soil		
type	loams are common, sand is relatively rare	sands are common, loams are relatively rare
depth	topsoil often over 1 m deep	topsoil generally less 30 cm deep
nutrients	rich in nutrients, especially phosphorous and nitrogen	nutrient poor, especially phosphorous and nitrogen due to long term leaching
Water		
rainfall	throughout the year, abundant	confined to a wet season, limited
run-off	abundant, exceeds that used by the plants	limited, rarely exceeds that used by the plants
free water	freshwater ponds, lakes and rivers are very common and last for the whole year	freshwater ponds lakes and rivers are rare and generally seasonal
evaporation	rarely exceeds rainfall	generally exceeds rainfall
Light		
intensity	low light	high light
temperatures	moderate to cold	high to moderate

TABLE 2

PLANT CHARACTER

Character	Western European	Western Australian
Growing Season		
time	Spring and Summer (April to September)	Mainly Winter and Spring (June to October) with some plants growing all year and others aestivating in summer
Roots		
depth	relatively shallow rooted with a moderate spread	deep rooted and/ or very spreading
root adaptations	suited to acquiring readily available nutrients	many features to enable the plant to acquire limited nutrients eg mycorrhizal roots, proteoid roots.
Leaves		
colour	bright green	dull, grey green or dark green
shape	broad, oval	highly variable often reduced and spiky
hardness	soft and thin	hard and thick
waxy covering (cuticle)	thin thick	
Flower		
colour	many whites few bright colours	many bright colours
size	small	large, if small, often in large groups
nectar	rare and in small amounts	common and abundant
Pollinators		
	wind and insects	wind, insects, birds and mammals
Fruit		
food store in seed	large	small
texture	few hard most soft and juicy	few soft and juicy most hard and woody

see drawings pages 237 and 238 for illustrations



EUROPEAN DISCOVERY

THE VOYAGE

Early French exploration of Western Australia through the eyes of Jean, a fictitious 13 year old member of the D'Entrecasteaux Expedition which explored the Esperance area in 1792.

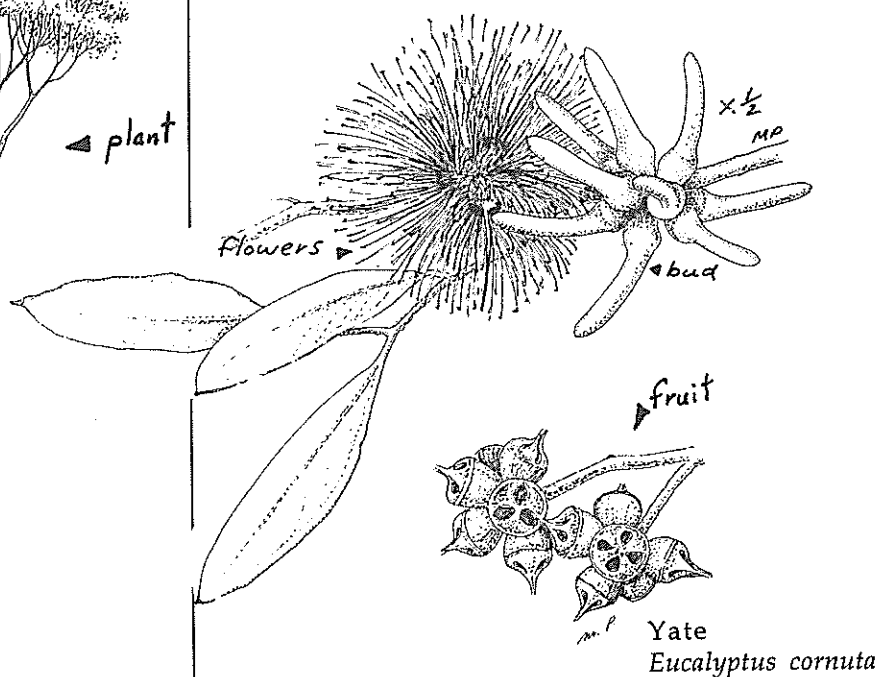
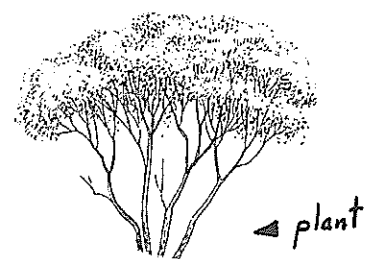
See map of expedition on page 217.

Jean was the fictitious servant of Jacques Julien de la Billardiere on the French ship *La Recherche*. This was one of the two ships leaving France in 1791 to search for the missing explorer, La Perouse, and to carry out scientific work on the mysterious southern coast of Australia.

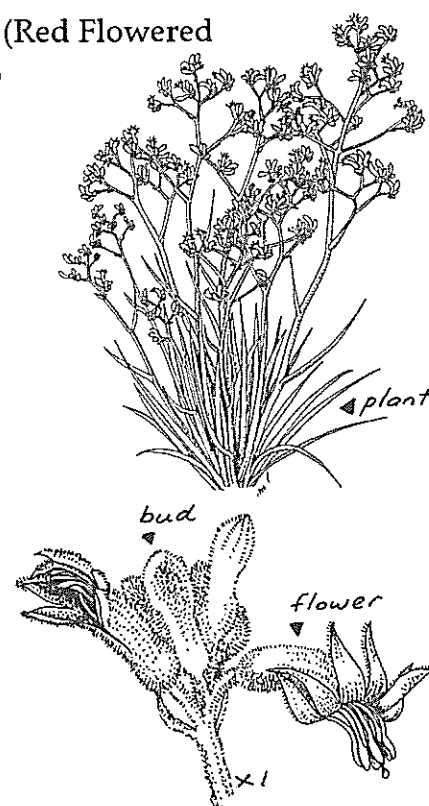
Jean's journal was amongst the papers seized by the English on the ship's return from the East Indies. His translated journal showed that one member of the expedition was Jacques Julien de la Billardiere, who was collecting plant material of the South Land and recording observations in his notebook. Jean was his servant. When all of the materials were eventually returned to France, La Billardiere published his observations and named a series of plants. La Billardiere or Labill, in its abbreviated form follows the names of all plants named by La Billardiere.

Some of the plants La Billardiere collected and named are:

- ◆ a Eucalyptus with yellow flowers and spiky fruit (Yate, *Eucalyptus cornuta* Labill., the first Western Australian gum to be named)
- ◆ an iris-like plant with red woolly flowers (Red Flowered Kangaroo Paw, *Angiozanthos rufus* Labill.)

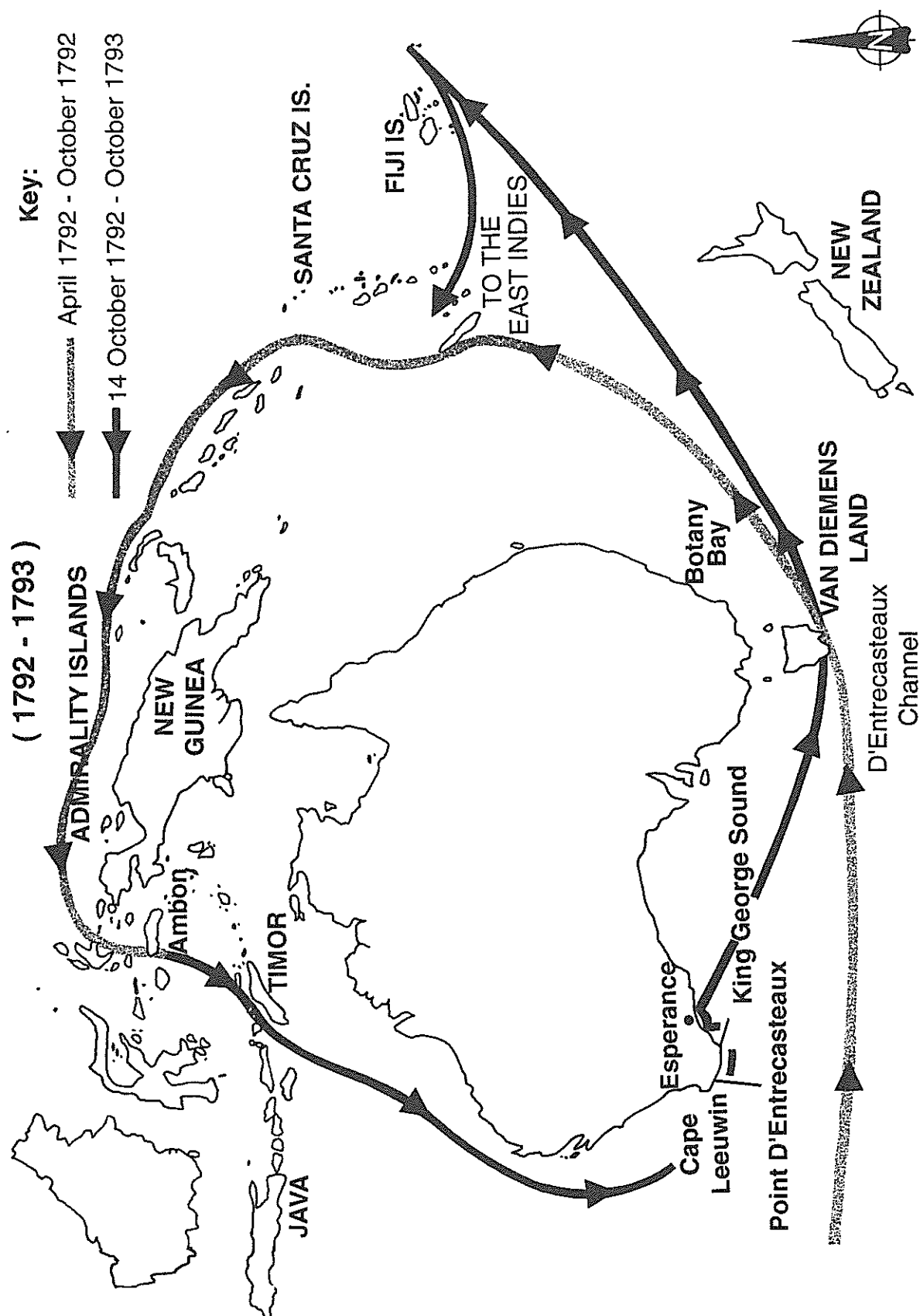


Activities 4.15 - 4.22 are based on this section.

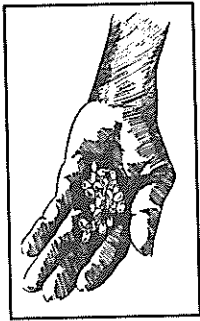


Red Flowered Kangaroo Paw
Angiozanthos rufus

ROUTE OF THE D'ENTRECASTEAUX EXPEDITION



Background



EUROPEAN SETTLEMENT

ABORIGINES AND EUROPEANS IN THE AUGUSTA AREA IN THE 1830s

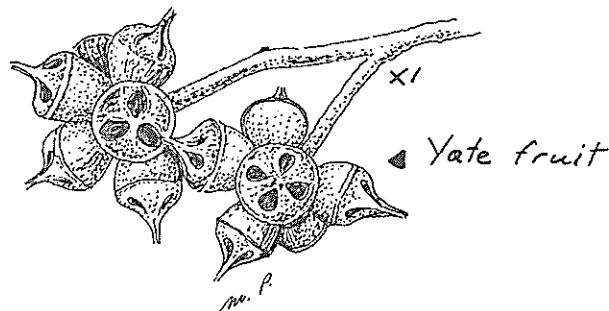
When the first Europeans arrived in Western Australia there were probably about 50 Aborigines living in the Augusta area. Aboriginal people had been living in Australia for tens of thousands of years. They were part of the Bibbulmun group from the Nyungar Tribe who lived throughout the south-west of Western Australia. Over the thousands of years that they had lived in Australia, they had used the wild plants and animals for their food.

The first European settlers to arrive in Western Australia found a country that was covered in wild plants. They found these plants strange and were unable to recognise wild food plants. They brought enough stores of food with them to last until they were able to grow their own food, and, in doing so, the wild plants were cleared.

The way the Europeans farmed and the plants they grew were just right for the soils and climate of Europe, but they did not suit the Western Australian soils and climate very well. At first the new crops grew very poorly. Eventually the settlers developed fertilisers to change the soil and developed plants that grew well in these soils. This took many years.

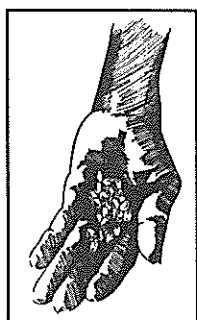
Many of the new settlers and their children, who played in the bushland amongst the wild plants, got to know and love the beautiful wildflowers that only grew in this new land. These wild plants were so unusual that some of the settlers were able to collect seeds of these plants and exchange them with people in Europe for goods they needed in this new land.

Our country is vast and to the early European settlers, the bushland seemed endless. As farms and towns grew, more and more of the strange wild plants were cleared. There are not many of us today who are lucky enough to have some bushland next door.



Activities 4.23 to 4.27 are based on this section.

Background



THE MOLLOYS OF AUGUSTA

Students are introduced to Western Australian plants through the eyes of one of the first families to settle in Western Australia. The family and situation are true, but the letter used as the basis for the activity is fictitious.

The letter is developed from the information in publications dealing with the life of Georgiana Molloy. (see References). Georgiana Molloy was one of the early plant collectors in the Colony. Her many letters were preserved by her family and friends and provide a wealth of information on her life in the new Colony.

In the second half of the 19th Century, the wealthy class in England spent much of their time pursuing their hobbies. A common hobby was the cultivation of rare and unusual plants from the far ends of the earth. Consequently Western Australia's flora was of great interest to many individuals in England and Europe.

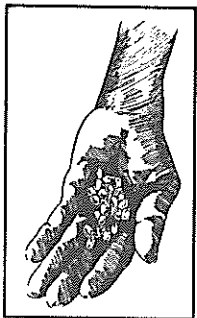
Some of the early settlers in Western Australia sent pressed plants and seeds from these plants to the enthusiasts in England and Europe. A few of these collectors, such as James Drummond, collected widely and were able to supplement their incomes by selling their extensive collections to interested people in Europe. Most of these collectors were unpaid and pursued these activities for interest in the area in which they lived. The stimulation of corresponding with others who shared an interest in plants was sufficient reward for these people. Georgiana Molloy was such a collector in the Augusta area. A fictitious correspondence from her eldest daughter, Sabina Molloy, to her grandmother in England is used for this. (see Activity 4.28 on page 232)

THE MOLLOYS

Captain Molloy was nicknamed "Handsome Jack". He had a long and distinguished career in the army, serving in the Peninsula Wars and at the Battle of Waterloo. On his semi-retirement, on half-pay, he met and married Georgiana Kennedy in August 1829. Georgiana was 14 years his junior.

The Captain had decided the best future for his family was in the new colony in Western Australia, the Swan River Colony. Consequently he invested a considerable amount of money in outfitting his family for settlement in the Swan River Colony.

Background



The newly married couple brought with them:

- ◆ five adult servants and their three children
- ◆ animals - horses (mare and stallion), ducks, fowls, pigs, sheep and cattle
- ◆ requirements for farming, seeding and planting (garden seed, tobacco, wheat, oats, barley, maize, fruit trees, potatoes)
- ◆ provisions for 12 months
- ◆ furniture and household goods

The list of goods and servants included everything that was thought to be necessary to establish a home like the one that Georgiana had on her father's country estate. All that would be obtained from the new country would be wood and stone for building, grazing land for the animals and soil in which to plant the seeds for a crop.

Land was given to settlers in the new Colony according to the value of the goods and the number of servants brought to the Colony. The Molloyes invested nine hundred and sixty pounds, ten shillings, and five and one-half pennies in the Colony, which gave them a grant of 12,813 acres (5189 hectares).

The Molloyes arrived in one of the first ships to bring settlers to the Colony, the *Warrior*, on 12th March 1830. After much discussion, the family took up their grant of land at Augusta.

They arrived in Augusta in April along with two other families who had sailed from England with them: the Turners and the Bussels. While the land was being surveyed, the Molloyes and their servants lived in tents on the beach, near where the Turner Caravan Park is located today. Georgiana's first baby, a little girl, was born in the tent but died a few days later.

Using local materials, rushes, timber and clay, the Molloyes and their servants built a house. It stood in a clearing amongst a forest of trees that Georgiana describes as of:

"stupendous size and hardness (Karri, Eucalyptus diversicolor), that took six men 2-3 days to cut them down and dig up the roots, and as much time to cut them up." (Hasluck p.82).

A flower garden was planted around the house and vegetable garden nearby. These were planted with seeds and cuttings brought from England and the Cape of Good Hope in South Africa where they had stopped on the voyage to the Colony. They planted the bulbs of tall white lilies and Pink Gladiolus from the Cape, seeds of Oleander, Pinks, Sweet Peas, Nasturtium, Mignonette, melons, Cape Gooseberries, vines and peaches and cuttings of figs and Geraniums. Eventually, as larger areas of ground were cleared and ploughed, crops were planted.

Background

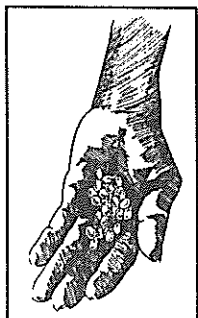


TABLE 3
PLANTS OF THE MOLLOY'S HOUSE AND GARDENS



Oleander



Grapevine



Geranium



Sweet pea



Gladiolus



Nasturtium



Melon



Fig

Background

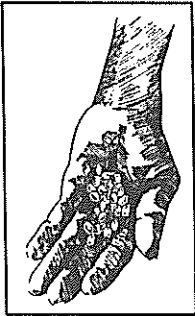
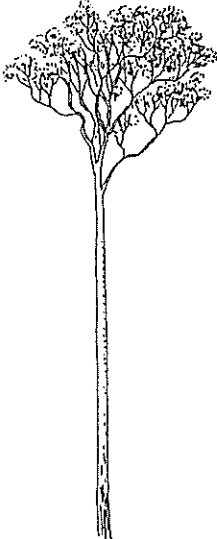


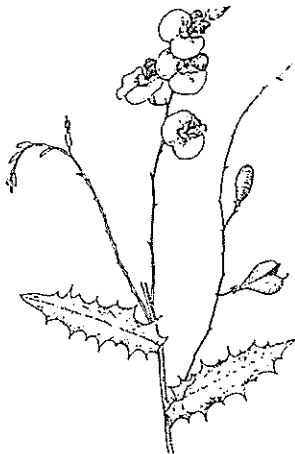
TABLE 4
NATIVE PLANTS OF THE AUGUSTA REGION



Marri



Karri



Camphor Myrtle

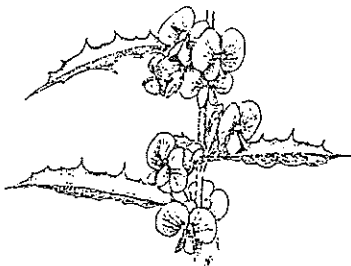


Holly Leafed Chorizema

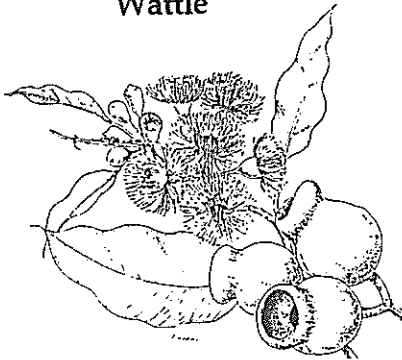


Wattle

Boranup Bossiaea

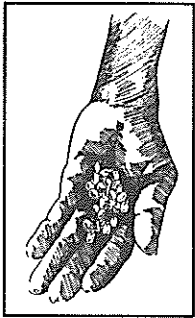


Holly Leafed Hovea



Marri

Background



Many of these crops did not thrive in Augusta and people to help work the land were in short supply. The Molloyes were gentry. They did not expect to do this work but supervise servants in the tasks that were needed to be done: Georgiana in the house and the Captain on the farm. As servants became less available, the Molloyes had to do more of the work. However, even with their efforts and those of the few servants they retained, they were not able to grow sufficient food to supply their needs. Some animal food was obtained from the bushland and inlet, such as swans, cockatoos, kangaroos and water birds. The settlers lacked the knowledge and the inclination to collect the plant foods the Aboriginal people used. The time taken in hunting was begrudged as it took the men away from their farm duties, gathering wild plant food would have been even more time consuming. The settler's food requirements were always supplemented by imported supplies. At one stage, the supply ships were overdue and the settlers survived on fish.

Georgiana soon grew to love the beauty of the place and wrote:

"This is certainly a very beautiful place..... unbounded limits of thickly clothed dark green forests." (Hasluck p.88)

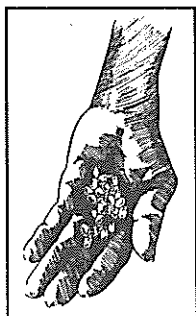
However Georgiana was not at first impressed by the native plants:

"I am of the opinion that these flowers are not so interesting as our own, and after the novelty is past, soon cease to please; they possess no association, nor does anything about them attract but the lustrous colour. Very few have any scent and I quarrel much with their excessively small corollae." (Hasluck p.162).

In November 1831 their second child, a thriving baby girl called Sabina, was born. Three more children were born at Augusta: Mary, John and Amelia. With so few servants and none of the labour-saving devices of today, Georgiana worked very hard to feed and clothe her family. There was little time to pursue the leisurely activities of fancy sewing, reading, drawing, walking, conversing and entertaining that were the activities of women of the gentry in England.

In December 1836, Georgiana received a letter from a Captain James Mangles. Captain Mangles was a wealthy Englishman and a cousin of Lady Stirling, wife of the Governor of the Colony. A box, containing seeds from England, accompanied the letter. The letter requested that Georgiana make use of the contents of the box and in return, fill the box with a collection of local plant seeds and pressed pieces of these same plants.

Background



In the second half of the 19th Century, it was the fashion amongst the wealthy gentry in England to cultivate and study the curious plants of the new lands. Consequently Western Australia's flora was of great interest to many individuals in England and Europe. Anyone introducing a new plant of interest was very popular. Wealthy individuals like Captain Mangles pursued these fashionable interests with much vigour and expertise.

Although Georgiana was busy with her family, this letter came at a time when she needed a diversion. Her only son, John, had just been drowned in the well. Georgiana loved her garden flowers and this soon extended to an appreciation of the native flowers when she began her collections for Captain Mangles. Georgiana wrote to Captain Mangles:

"..... and cordially thank you for being the cause of my immediate acquaintance with the nature and variety of these plants that we have exchanged for the productions of our own country"

(Hasluck p.164)

Georgiana and her children spent much time in the forest collecting seeds and specimens.

"I cannot describe to you the brilliancy of surrounding wilderness, and this year when I ramble with my little children running like butterflies from flower to flower" (Hasluck p.176)

and

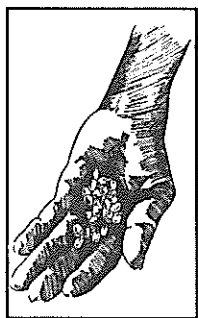
"Indeed, Sabina I shortly found to be infinitely more au fait at discovering and remembering the abode of differently described plants than I was myself. I have known her unexhausted patience go three and five times a week to watch Nos. 83 and 74, lest the seeds should be opened and shed. She is 6 years old! Sabina has already imitated me in forming a collection of dried flowers fastened by ligatures, and Mary, who is also serviceable in discovering and collecting, to say nothing of pulling flowers for Captain Mangles, has made up several strange parcels for your acceptancy....." (Hasluck p.176)

Georgiana and her children worked hard to collect the seeds as

"Seeds ripen at the broiling time of the year." (Hasluck p.238).

Georgiana collected several pieces of each plant she collected seed from. Each plant was pressed and numbered. One of each pair of pressed plants was sent to Captain Mangles with the seeds and a request made that the names be returned to her. She also requested seeds of rhubarb, herbs, melons, apples, pears, raspberry and gooseberry. These requests were met and Captain Mangles also sent books and other items that would be of use to Georgiana and her children.

Background



The land at Augusta was not very productive and was very heavily forested. Captain Molloy searched for more suitable land elsewhere. Such land was found in 1839 and much to Georgiana's regret, they left Augusta to live at the Vasse, near Busselton. Georgiana was very sad to be leaving her garden and its wonderful surroundings as well as the bushland and its flowers she had come to love.

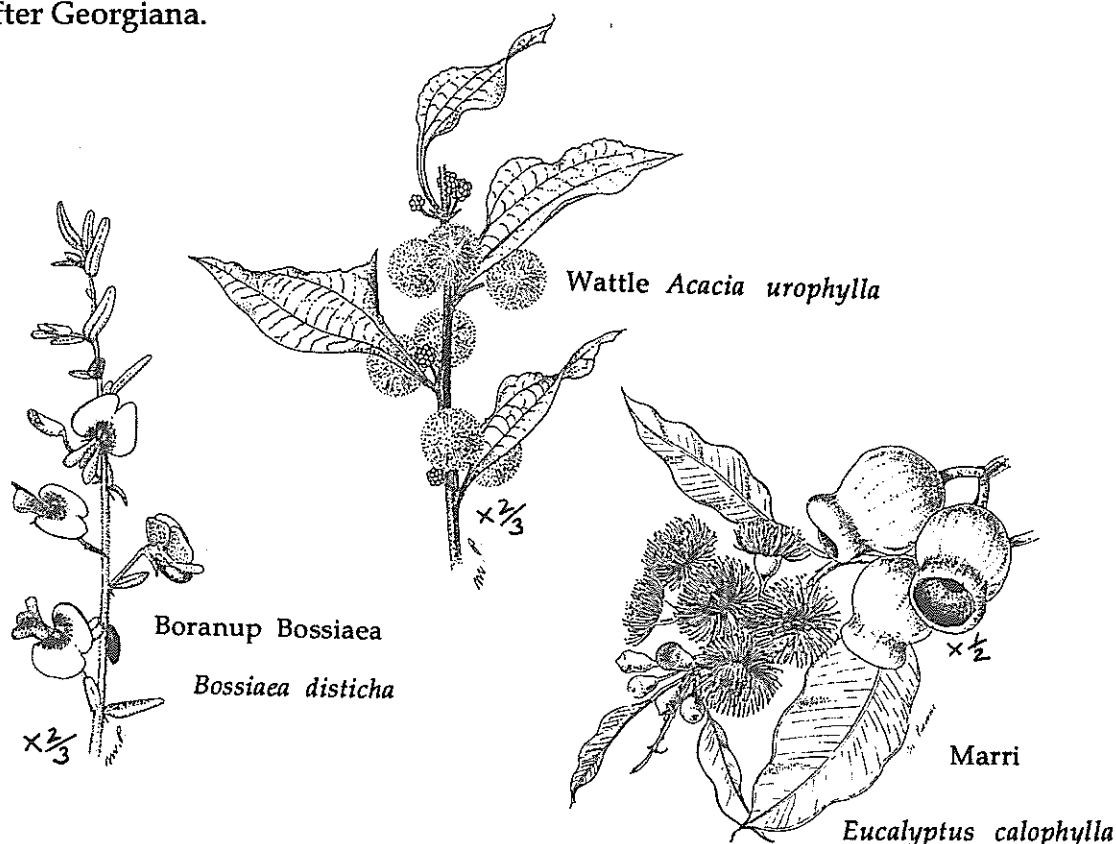
Georgiana had two more daughters, Flora and Georgiana, at the Vasse. There was little time to continue her collections for Captain Mangles as after the birth of her seventh child, (her fifth surviving child), she became very ill. Georgiana was so ill that she died in 1842 at the Vasse. Sabina, who was 11 years old, reared her four sisters with the help of her father and servants.

Captain Molloy died 30 years later when he was 90 years old. Molloy Island on the Blackwood River near Augusta is named after Captain Molloy and a small park on the beach at Augusta is on the site of the Molloy's house.

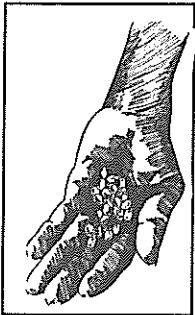
Georgiana collected many plants new to science. Many of these were named in England by Dr Lindley, a botanist who worked with Captain Mangles. Some of these are:

- ◆ Wattle, *Acacia urophylla* Benth. ex Lindley
- ◆ Boranup Bossiaea, *Bossiaea disticha* Lindley
- ◆ Marri, *Eucalyptus calophylla* Lindley

These species are present in the bush at Augusta today. One species of Boronia, collected by James Drummond, *Boronia molloyae* is named after Georgiana.



Background



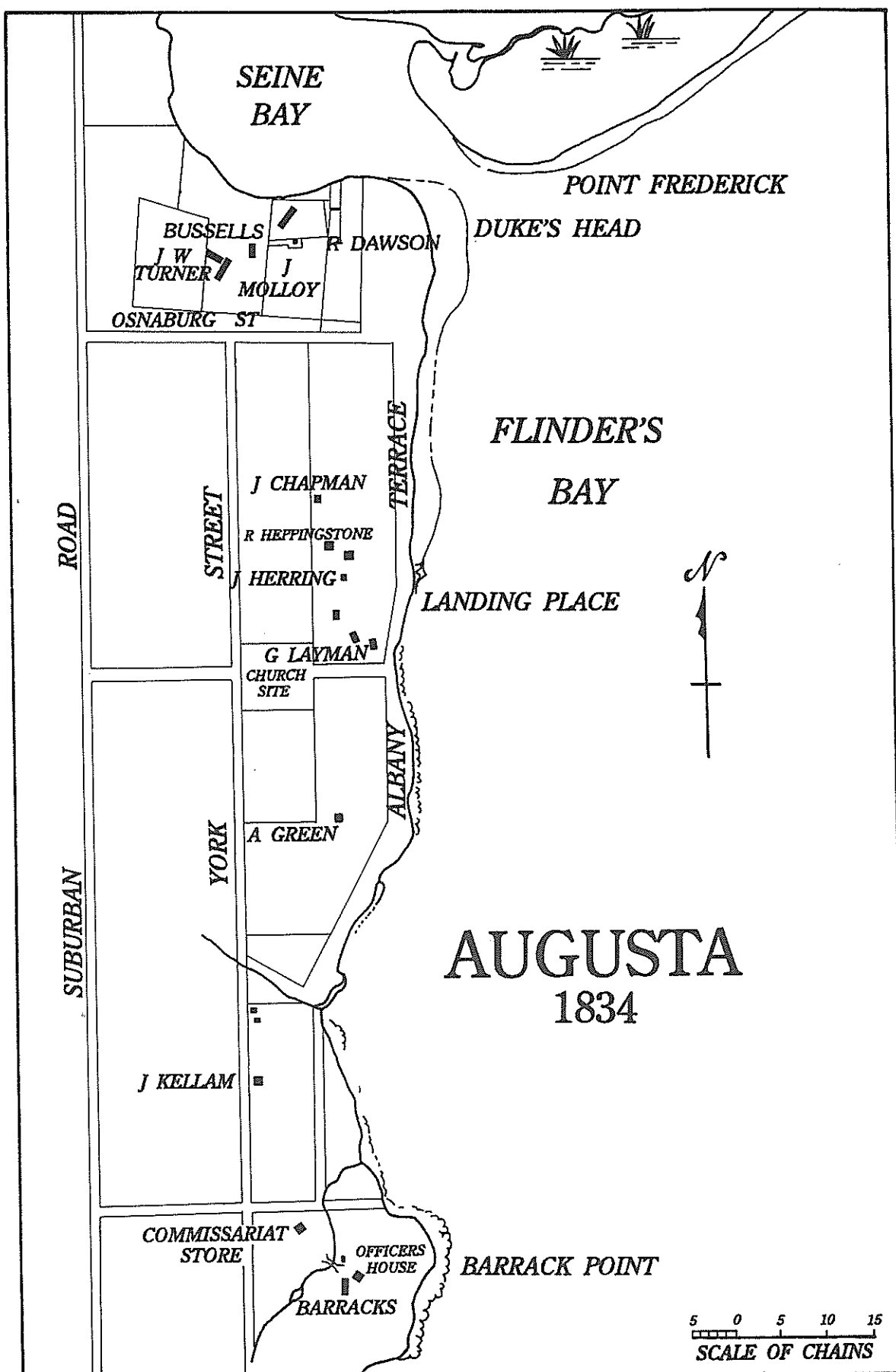
THE BIBBULMUM AND THE EARLY SETTLERS AT AUGUSTA

Immediately on settling at Augusta, the Molloyes began clearing the Australian wild plants to cultivate the plants they had brought with them from England. At no point did they contemplate collecting wild foods. They did hunt the wild animals but they very much resented this as it took time away from their pursuit of agriculture. The numbers of Europeans at Augusta was so small that they would have been able to survive on bushland foods had they collected them. However they did not have the knowledge or the motivation to do so. Also, their lifestyle revolved around one permanent abode and they were not prepared to move with the seasons as the Aboriginal people did.

The Bibbulmum Aborigines were able to see the rich food resources available for a limited number of people. Being closely attuned to the land and its many seasons, they were able to move on to other areas before food was depleted at any one of their camps. With their detailed understanding of the bushland, they were able to establish practices that maximised the yield of the land. They used fire for this by making areas more accessible, encouraging flowering and fruiting of the plants and creating kangaroo-preferred pasture so that hunting them was easier. Food harvesting rules were also an integral part of the Dreaming.

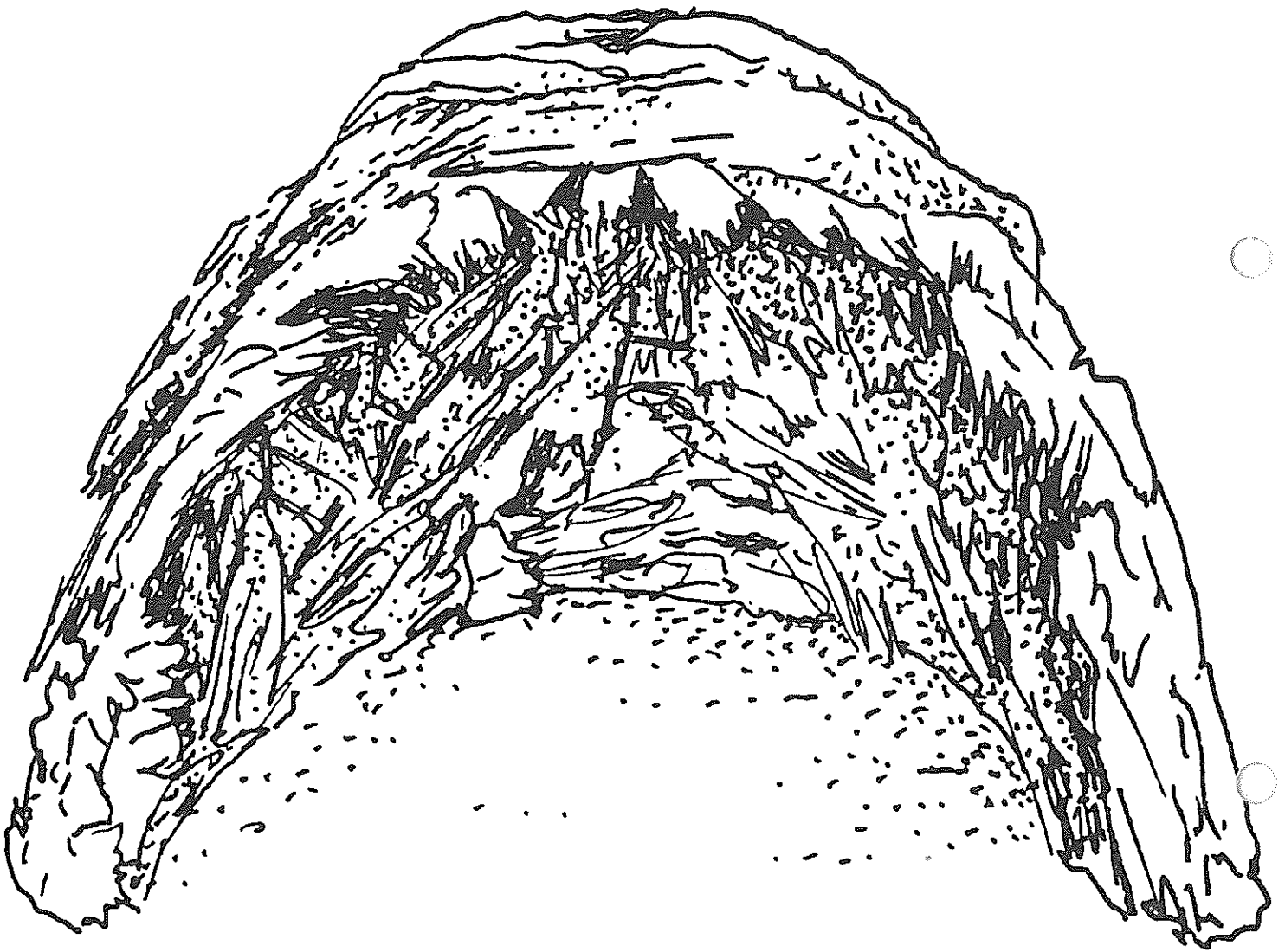
Records indicate that the relationships between the two groups were not always peaceful. Some conflict occurred when the Aborigines saw the European garden crops such as potatoes and found it difficult to understand why they too could not dig them up. The Europeans tried to stop the Aborigines firing the bushland as it destroyed the dry pasture for their livestock. The inadvertent introduction of disease by the Europeans, particularly measles, decimated the local Aboriginal population in the 1880s.

The Europeans were not able to maintain an agricultural settlement in Augusta. Eventually they all left as the plants of the area were so difficult to clear and the bushland too thick to be used for grazing. The area was resettled later by graziers and timber workers. Today fishermen, retirees, graziers and holiday makers live in Augusta.



(1 chain = 20.1m)

Hasluck, A. 1990 Portrait with Background. Fremantle Arts Centre Press. Fremantle.



*An aboriginal shelter
called a 'Mia'*

■ Activity 4.15

MAP WORK

*Resource Sheet 83 page 233*JUNIOR
MIDDLE
UPPERSOCIAL
STUDIES
LANGUAGE

Students locate Esperance on a map.

Students look for other places on the map with French sounding words and names. Write them in a list and next to each write down what they think the words may mean.

Resource: *Atlas***Extension:** *On a map of the world, (Research Sheet 83) students plot Jean's sea voyage from France to Esperance.**Students work out from the diary how many months the journey took.**What hardships would there have been with life on the ship?*

■ Activity 4.16

JEAN'S DIARY

*Resource Sheet 83,84 pages 233 - 236*MIDDLE
UPPERSOCIAL
STUDIES
LANGUAGE

Students take it in turn reading orally from Jean's diary. As it is read, students highlight or underline the name of the towns, countries and plants. When completed, Jean's voyage is plotted, stopping at the towns and countries along the way.

Resource: *World globe
Torch/lamp
Atlas***Extension:** *Discuss what the students know about France. Talk about the Northern and Southern Hemisphere and the position of the sun in relation to climate. Use a torch and globe to demonstrate this.**Introduce the concept of why plants need sunlight, rainfall and soil and how each affects plant growth.**Compare the needs and the environment of the ferns in the Karri Forest in the south, with that of the succulent plants of the arid interior.*

■ Activity 4.17

ALIEN NATION

MIDDLE
UPPERSCIENCE
LANGUAGE
ART & CRAFT

Read the following passage to the class.

*"You are an Alien from Planet Nirvana, having just landed in the Australian bushland in 1792. You are intrigued at the variety of plant life. The other Aliens back on Nirvana have never seen plants.**Describe to your partner, a fellow alien, in as much detail as possible, a Western Australian plant which you know well.**Remember, your partner only knows colour and shape, and has never seen a plant."*

The partner draws the plant as it is described.

Extension: *Choose a few students who have given a vivid description to their partners, to describe the plant to the class. The class can guess what plant it is.*

■ Activity 4.18

MIDDLE

UPPER

SCIENCE

SOCIAL
STUDIES

LANGUAGE

ART & CRAFT

PLANTS - MADE IN WA OR MADE IN EUROPE

Resource Sheet 85 page 237 (Plants - Made in WA or Made in Europe)

Resource Sheet 85 compares some Western Australian and Western European woody plants. Students write a report to compare one of these pairs including information:

- | | |
|-----------------------------------|-----------|
| ◆ where found (country of origin) | ◆ leaves |
| ◆ climate preference | ◆ flowers |
| ◆ unusual features | ◆ fruit |

Some other plants students could research in the same way are on Tables 3 and 4 on pages 221, 222.

Resource: *Tables 1, 2, 3, and 4 on pages 214, 215, 221, 222 and Resource Sheet 85.*

■ Activity 4.19

MIDDLE

UPPER

SOCIAL
STUDIES
LANGUAGE

RESEARCH

Students research a country in Western Europe in the 1700s and describe what life was like in that country at that time.

■ Activity 4.20

MIDDLE

UPPER

SOCIAL
STUDIES
LANGUAGE

"SOUTHLAND"

Complete some activities from the "Southland" package.

Resource: *"Southland" Education package obtainable from the Western Australian Ministry of Education.*

■ Activity 4.21

MIDDLE

UPPER

LANGUAGE

LETTER WRITING

The 200th Anniversary of "The Voyage" by La Recherche was celebrated in Esperance in 1992.

Write to the Esperance Shire Council to find out what celebrations occurred during the Anniversary.

■ Activity 4.22 BE BOTANISTS

MIDDLE
UPPER

SCIENCE
LANGUAGE
ART & CRAFT

Students are botanists on the French voyage to Australia.
Students go out into the school grounds and select five plants which they think are native plants and sketch them in detail as a botanist would have done, giving them a name.

■ Activity 4.23 NYUNGARS OF THE SOUTH

MIDDLE
UPPER

SCIENCE
SOCIAL
STUDIES
LANGUAGE

The "Nyungar Kit" is an excellent resource package with colour photographs and activity cards based on the life-style of these South West Aboriginal people.

Cards can be worked on at an individual, group or class level.

Resource: "Nyungar Kit" obtainable from the Western Australian Ministry of Education)

■ Activity 4.24 PLANTS AND LIFE *Resource Sheets 86, 87 page 239, 240*

MIDDLE
UPPER

SOCIAL
STUDIES
LANGUAGE
ART & CRAFT

Discuss the chart on Resource Sheet 86 about plants and life in Augusta in 1830. Using Resource Sheet 87, complete the sheet by drawing the particular item, basing your information on the table.

Resource: Activity Card 7 (Karri Forest)

■ Activity 4.25 A BALANCED DIET *Resource Sheets 88, 89 page 241, 242*

MIDDLE
UPPER

HEALTH
LANGUAGE

Discuss Resource Sheet 88 on obtaining a balanced diet in Augusta in 1830.

Enlarge Resource Sheet 89 to A3.

Using resources from the library, make a food group chart using pictures and headings. Circle or highlight the appropriate title.

■ Activity 4.26

PLAYWRIGHT

*Resource Sheet 90 page 243*MIDDLE
UPPER

Students write a play about the Molloy family at Augusta and their visits to the forest.

Use the sketches of plants on Resource Sheet 90 to aid the students descriptions.

LANGUAGE

■ Activity 4.27

EXPLOSION CHART

MIDDLE
UPPER

Students research the following plants. Place a plant name in the middle of an A3 piece of paper. On each explosion chart, students add a piece of information that they have learnt about that particular plant.

SCIENCE
LANGUAGE

- | | |
|-------------------------------------|---------------------------------|
| ◆ * Red and Green Kangaroo Paw | <i>Anigozanthos manglesii</i> |
| ◆ Native Wisteria/Wild Sasperella | <i>Hardenbergia comptoniana</i> |
| ◆ Coral Vine | <i>Kennedia coccinea</i> |
| ◆ * Quandong | <i>Santalum acuminatum</i> |
| ◆ * Drumsticks/Drumhead Grass Tree | <i>Kingia australis</i> |
| ◆ Western Australian Christmas Tree | <i>Nuytsia floribunda</i> |
| ◆ * Holly Leafed Chorizema | <i>Chorizema ilicifolium</i> |
| ◆ Feather Flower | <i>Verticordia densiflora</i> |
| ◆ * Wattle | <i>Acacia urophylla</i> |
| ◆ * Holly Leafed Hovea | <i>Hovea chorizemifolia</i> |
| ◆ Pixie Mops | <i>Petrophile linearis</i> |

*Illustrations in pack

■ Activity 4.28

THE LETTER

*Resource Sheets 90, 91, 92 page 244, 245*MIDDLE
UPPER

Students read Sabina's letter to her Grandmother (Resource Sheet 91) and answer the questions on Resource Sheet 92.

Answers to the word jumble:

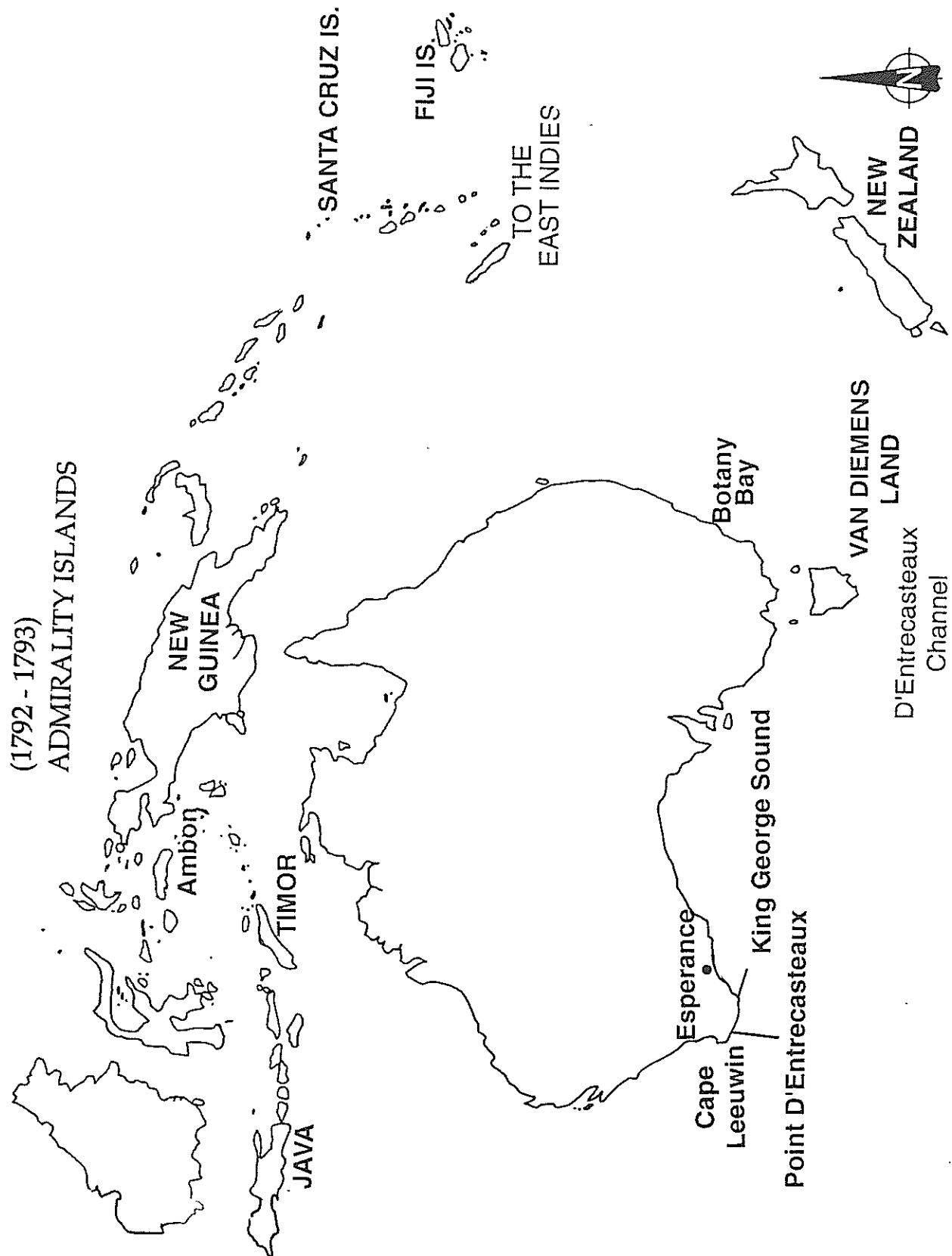
LANGUAGE

- | | | |
|-----------------|-----------|------------|
| 1. forest | 5. leaves | 9. flowers |
| 2. karri | 6. holly | 10. pea |
| 3. garden | 7. gum | 11. wattle |
| 4. conservatory | 8. woody | 12. seeds |

Resource Sheet 83

- Activity 4.15 MAP WORK
- Activity 4.16 JEAN'S DIARY

page 229
page 229



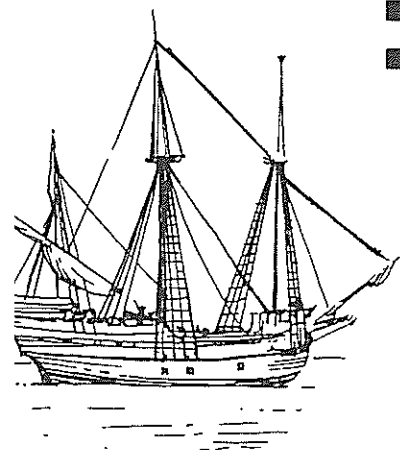
Resource Sheet 84

■ Activity 4.15 MAP WORK

page 229

■ Activity 4.16 JEAN'S DIARY

page 229



Extract from Journal of Jean, aged 13, the servant of Jacques Julien de la Billardiere on *La Recherche*.

29th September 1791

We are finally leaving on our search for La Perouse's Expedition that has been lost for three years. I hope someone comes to look for us if we do not return!

Our ship, *La Recherche*, is very crowded. 113 people are packed onto this tiny ship. But this is not all we share the ship with. There is enough stored food for two years, gifts for the people living in the lands we wish to explore and weapons in case these people are not very friendly.

My work on the ship will be to help the scientists, Jacques Julien de la Billardiere and Charles Riche on the voyage. The scientists expect to find many new plants and animals.

16th February 1792

We left Cape Town today to sail to the East Indies to retrace the voyage of La Perouse.

20th February 1792

We have not reached Australia yet and it does not look like we will be getting there for a while.

The winds are so poor we have had to change course and are going south to pick up the westerlies that will take us south of Australia into the Pacific.

25th July 1792

We did not quite miss Australia. We managed to anchor at Cape Van Dieman (Tasmania).

Our stores of water were very low and had a terrible taste so we stopped to fill our water barrels at the Cape. We still have plenty of food but this tastes terrible too, but then it always has done. Salted meat and dry biscuit only stop you starving - they are not food to enjoy.

My masters have found lots of new plants and animals. None of these look good for eating.

The land is very green and lush. The ship's gardener planted seeds in a vegetable patch hoping that on our return voyage we will be able to replenish our stores from this garden in the wilderness.

Resource Sheet 84 *continued*

■ Activity 4.16 JEAN'S DIARY

page 229

October 1792

Food at last! I am getting plenty to eat. I like bamboo shoots and sago, but most of the crew eat very little, this type of food not being what we are used to. I do not think it is too bad. At least it fills your stomach and is not full of weevils! We were able to buy some of our own stores at Timor and now the deck is covered in pigs and poultry that we will kill as needed.

If we get really hungry, we can eat the cockroaches that run all over the ship. My masters are very worried that these pests will eat our stored plants and seeds that we have been collecting from these new lands. We have so many dried plant specimens and animals skins already that the collection has had to spread into the great cabin. The officers have complained. They do not understand the great value of our new discoveries and how difficult it is to keep them in good condition on this damp, musty, insect-ridden ship. I know too well it is my job to check the dried plant specimens all the time to make sure they are not eaten.

We are going to sail back to Australia now, hoping that we will be able to stop this time.

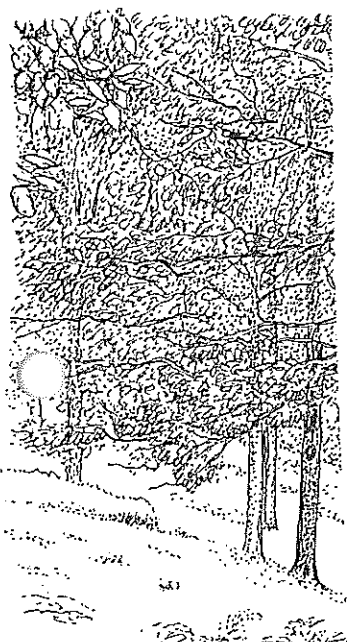
5th December 1792

Our first glimpse of the south coast of Australia at 4.30am this morning. The land is very dull being covered with dull green plants, unlike the rich green of home in the summer time and the lush forests of the East Indies and Cape Van Dieman. The officers are very disappointed as we are short of water again and the country looks very dry.

The weather is terrible and so we have had to find a safe place to anchor. L'Esperance was able to find a passage into a safe bay through the islands and rocks. The captain was so pleased with the ship and the sailor, Le Grande, who guided the ship into the bay that he has named the bay Port Esperance and the headland at the entrance to the bay Cape Le Grande.

At last we are able to get off the ship and look at the plants and animals.

Most of our time was spent on the island which has been called Observatory Island because of our work done here. The island is covered in the same dull green or dark green plants that we can see on the mainland.



*An English
woodland*



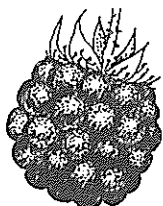
*Plants on one of the
islands near
Esperance*

Resource Sheet 84 continued

■ Activity 4.16 JEAN'S DIARY

page 229

▼ a succulent
Blackberry fruit



The plants are very strange, not like our plants at home in many ways. The plants have thick, woody leaves of the most amazing shapes. They do not become brittle when dried like the thin leaves on our plants from home. Many of the plants have hard woody fruit which are not suitable to eat. We have found no soft fruit like our berries. We continue to find a great variety of plants of very unusual form with large bright flowers. There are very few with green or white flowers like ours at home.

It is very disappointing for the scientists as most of the plants have no flowers. We are collecting the seed of as many as possible so that we can try to get them to grow back home.

17th December 1792

We have left Port Esperance in a great hurry as we have been unable to find any water.

We would have left a day earlier but Mr Riche was lost on the mainland where he went to collect plants. If he had not found his way out of the bush, we would have had to leave him behind. Poor Mr Riche had no food and was only able to stay alive because he ate thousands of tiny berries from a little bush that he found.

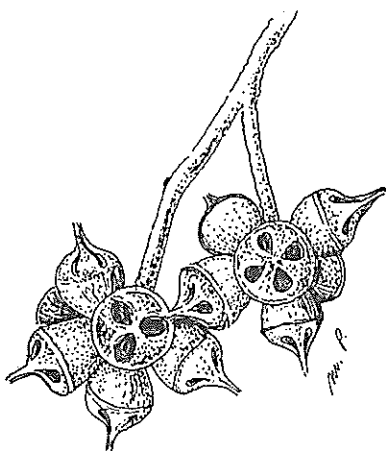
14th February 1793

We made it back to Van Dieman's Land just in time. Luckily the streams here are not dry.

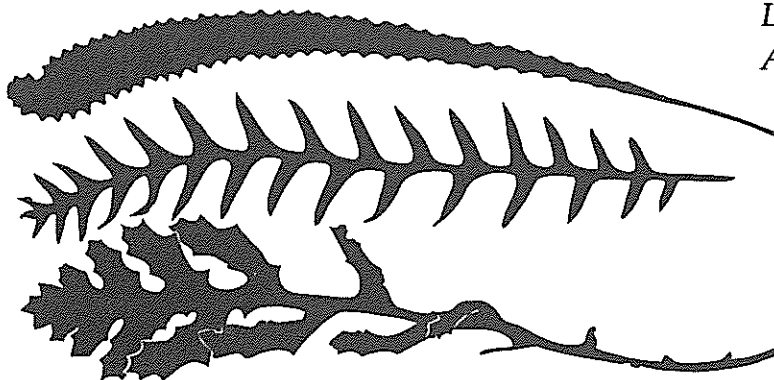
We visited the same bay where we landed on our last stop where we had planted our vegetable garden. The cabbages, potatoes, radishes, cress, endive and sorrel have survived but the plants are too scrawny to be eaten.

We are leaving Australia for the East Indies again and then we will sail home to France.

▲ woody
Yate fruit



Leaves from some
Australian plants



Banksia

Dryandra

Dryandra

Resource Sheet 85

■ Activity 4.18 TABLE RESEARCH

page 230

A WESTERN AUSTRALIAN TREE

A WESTERN EUROPEAN TREE

YATE

ASH

◀ trees hold
leaves all year

in summer trees ▶
have leaves but
these are dropped
for winter

▲ groups of bright green
nectar rich flowers on
which birds can land
and then carry pollen
from flower to flower

groups of male ▶
flowers packed in
a head, wind
blows pollen to
similar heads of
female flowers

▲ thick dull
green leaves

▲ soft bright
green leaves

◀ seed's in hard
woody fruit

seeds in soft ▶
winged fruit

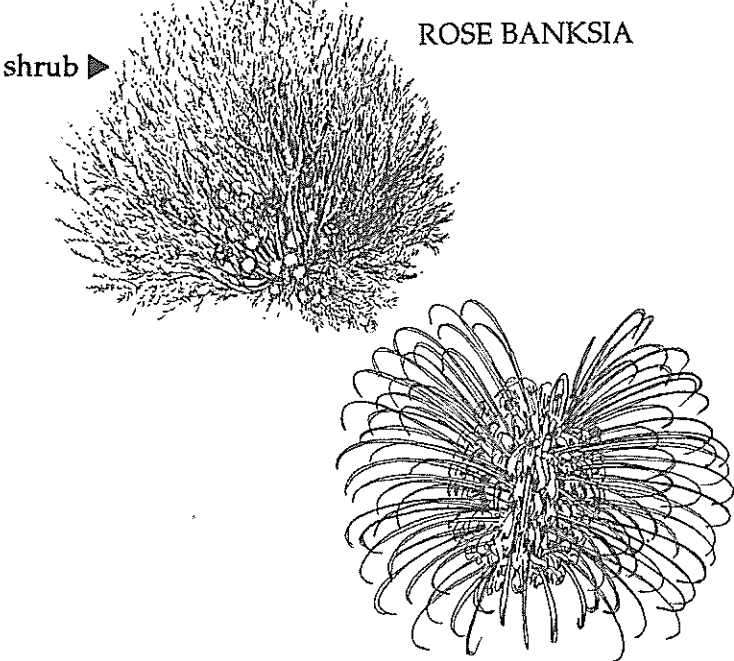
Resource Sheet 85 continued

■ Activity 4.18 TABLE RESEARCH

page 230

A WESTERN AUSTRALIAN SHRUB

A WESTERN EUROPEAN SHRUB

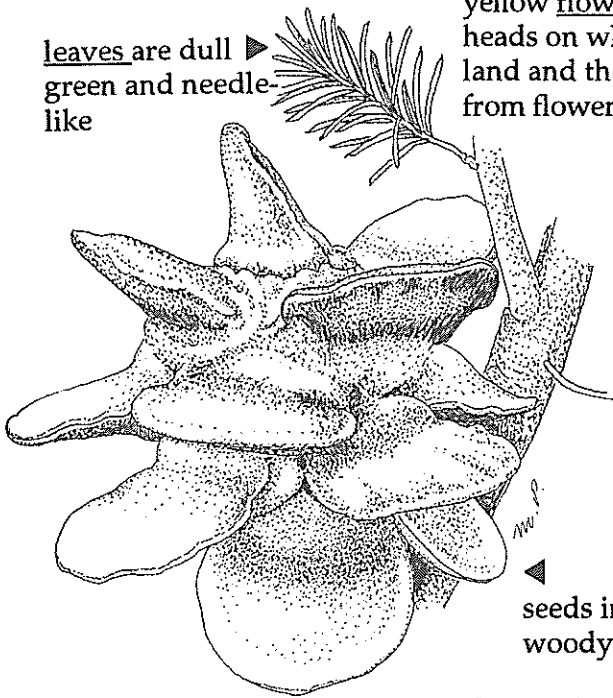


shrub ►

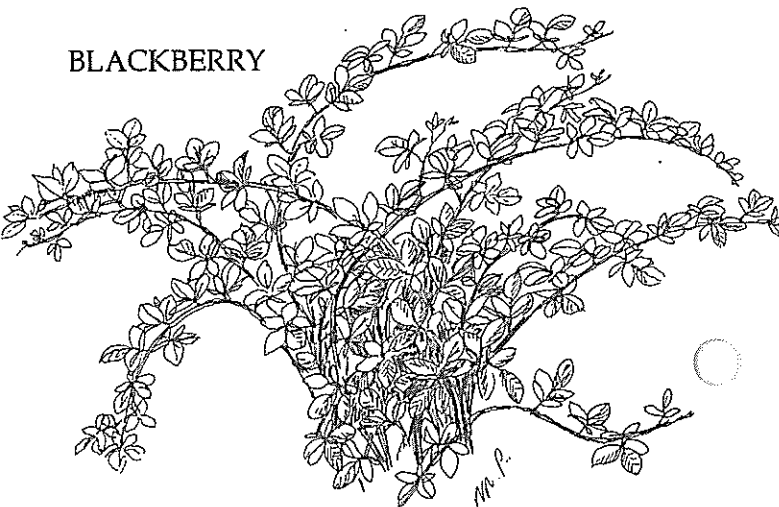
ROSE BANKSIA

leaves are dull green and needle-like

▲ hundreds of nectar rich yellow flowers packed in heads on which birds can land and then carry pollen from flower to flower

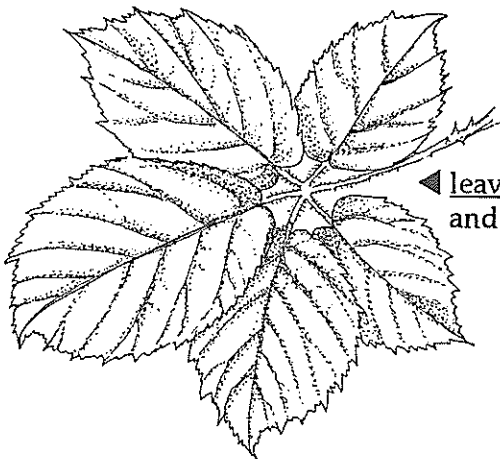


▲ seeds in hard woody fruits



BLACKBERRY

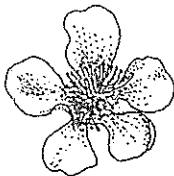
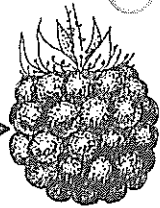
shrub ►



◀ leaves are soft and bright green

white flowers in loose heads
bees collect pollen and carry pollen from flower to flower

seeds in soft juicy fruit



Some other plants to research and compare

COUNTRY		WESTERN AUSTRALIA	WESTERN EUROPE
WOODY	TREE	Sheoaks, Banksias, Eucalypts	Elms, Beech, Oak
	SHRUB	Peas (Chorizema, Hovea) Wattle, Hakeas	Hazel, Hawthorns, Thyme
NON-WOODY		Kangaroo Paws, Native Iris, Trigger Plants	Foxglove, Primrose, Violets

Resource Sheet 86

■ Activity 4.24 PLANTS AND LIFE

page 231

Plants and Life in Augusta in 1830						
Australian Settlers	Aborigines			Europeans		
Tribe	Nyungar			Anglo Saxon		
Group	Bibbulmun			English		
Family (Number)	Unknown (5 or 6)			Molloy (5)		
Necessity of Life	Example	Plant Part Used	Source Plant	Example	Plant Part Used	Source Used
Shelter						
temporary	Mia	sticks, fibre rushes, scrub, bark	wild	tent	plant, cotton	wild and imported
permanent	none			house	wood (stone)	wild and imported
Tools						
digging	digging stick	strong dense wood	wild	spade	(steel) wood	wild and imported
hunting	Gidgee (spear) Meero (spearthrower)	Balga flower stem wood, gum	wild	gun	(steel) wood	wild and imported
chopping	Kodjah (axe)	Balga flower stem, gum (and special stone)	wild	axe	(steel) wood	wild
Food						
protein	Coojong	seeds of wattle	wild	split peas	dried pea seeds	cultivated and imported
carbohydrate	Koolah	bulbs of Milkmaids	wild	wheat	seeds	cultivated and imported
vitamins and minerals	Geebung	fruit of Snotty Gobble	wild	greens	leaves of plants eg. spinach	cultivated and imported
Fibres	Banjlin	bark of Pimelea	wild	cotton	fibres from fruit of cotton plant	Imported only
Medicine	Kurren	leaves of Baeckea	wild	castor oil	oil from castor oil plant	cultivated and imported
Fuel	Jarrah	wood of Jarrah tree	wild	Jarrah	wood of Jarrah tree	wild

Resource Sheet 87

■ Activity 4.24 PLANTS AND LIFE

page 231

PLANTS AND LIFE IN AUGUSTA IN 1830.

Aboriginal	European
Shelter	Shelter
Tools	Tools
Food	Food

Resource Sheet 88

■ Activity 4.25 A BALANCED DIET

page 231

Obtaining a balanced diet in Augusta in 1830			
FOOD GROUP	SOURCE FOOD	Examples used by the different tribes	
		BIBBULMUM	EUROPEAN
CARBO-HYDRATES	plant seeds	wild plant seeds - Coojong, Marri, Baro	cultivated grasses - wheat, barley IMPORTED
	plant sugars	wild plant nectar from flowers on Mangite, Marri and Dryandras	cultivated plant sap - sugar cane and sugar beet IMPORTED
	animal sugars	*not available	* domesticated honey bees - honey IMPORTED
	plant leaves	wild plant - leaf bases of Balga	cultivated plants - spinach leaf base IMPORTED
	plant fruit	wild plant - Kunlba, Koolah, Geebung, Quandong, Zamla fruit	cultivated plants - grapes (dried and raisins), apples, pears IMPORTED
	underground fleshy storage parts	wild plants - Matja, orchids, Kara, Yandjidi	cultivated plants - potatoes, parsnips IMPORTED
PROTEIN	plant seeds	wild plants - Coojong, Marri, Baro	cultivated plants - split peas, almonds IMPORTED
	animals	wild animals - fish, birds, reptiles (snakes and lizards), insects, eggs, wallabies and kangaroos	domesticated animals - cattle, chickens, eggs, dairy products wild animals - fish, birds, kangaroos, wallabies
FAT	animals	wild animals - as above but most are low in fat	domesticated animals - rendered from animals eaten and dairy products
VITAMINS MINERALS	plants and animals	all foods provide these - the great variety would supply all needed	variety low until the plants could be grown
WATER	rain	springs and streams	springs and streams
<p>*None of the native bees in the south-west of Western Australia produce honey. A single species in the north-west, produces small amounts.</p>			

Resource Sheet 89

■ Activity 4.25 A BALANCED DIET

page 231

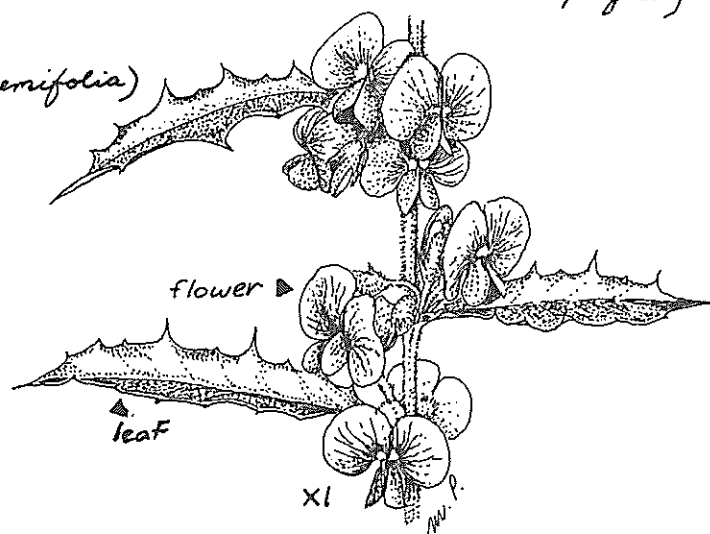
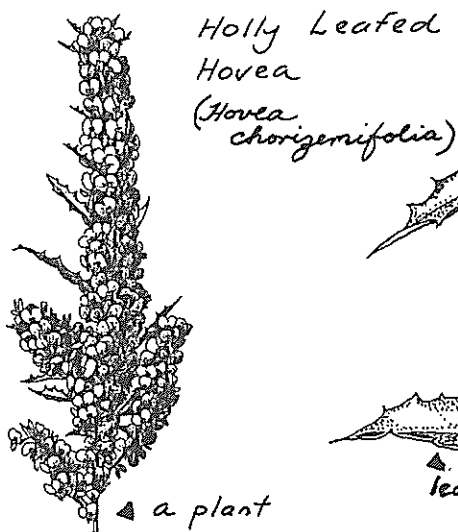
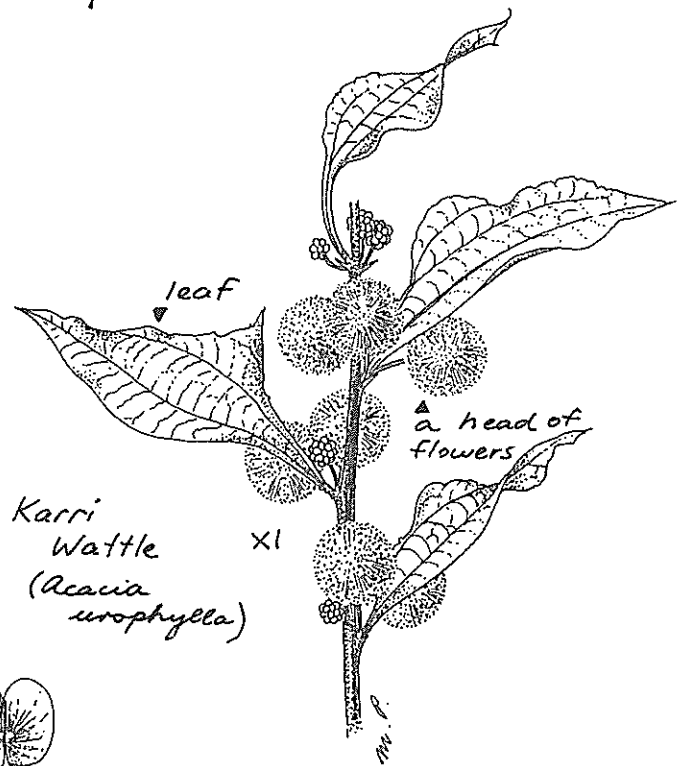
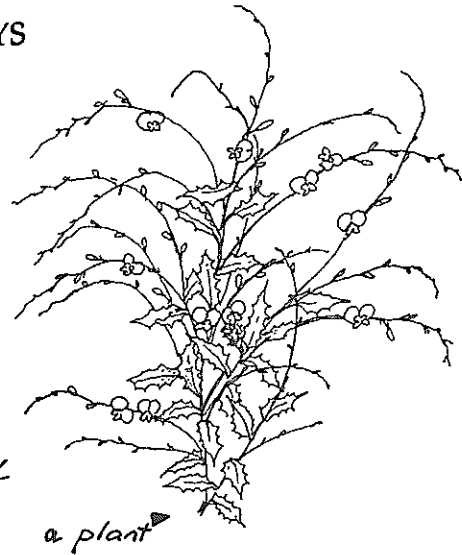
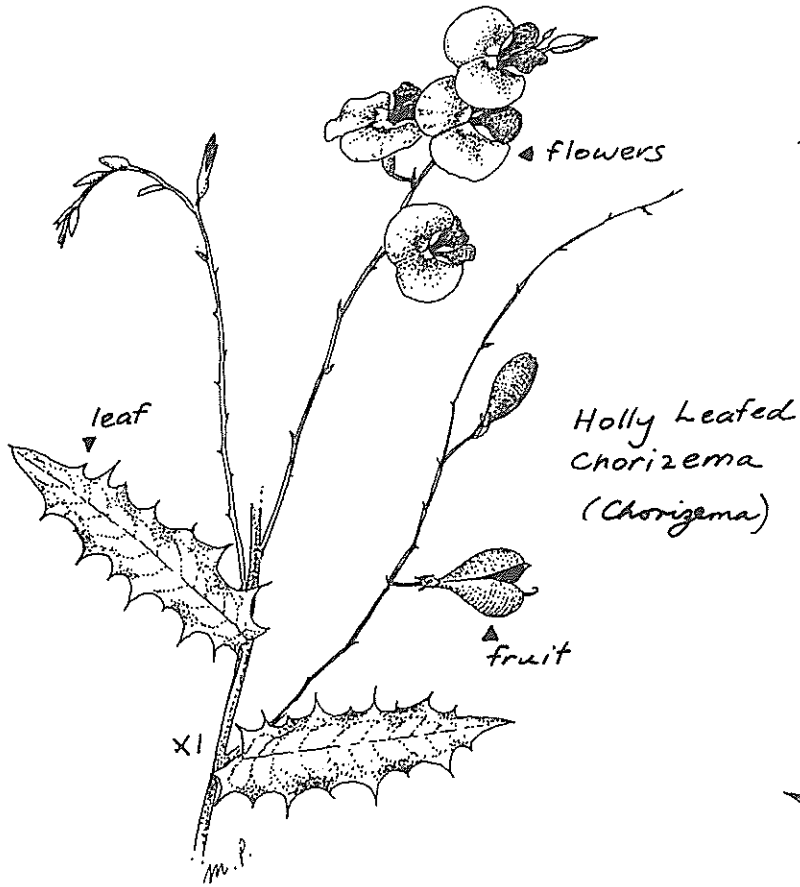
BIBBULMUM	EUROPEAN
Carbohydrates	Carbohydrates
Protein	Protein
Fat	Fat
Water	Water
Vitamins	Vitamins
Minerals	Minerals

Resource Sheet 90

■ Activity 4.26 PLAYWRIGHT

page 232

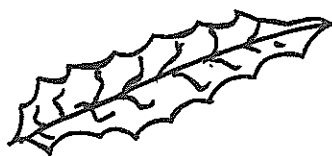
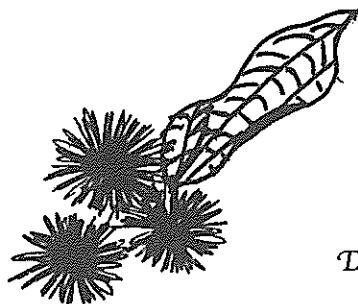
PLANTS FOUND BY THE MOLLOYS



Resource Sheet 91

■ Activity 4.28 THE LETTER

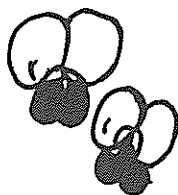
page 232



The Molloy Estate
Augusta
Swan River Colony
Australia
February 1840

Dear Grandmother

Mother and I, with my little sister Mary, have been out to the forest today. There are hundreds of huge tall trees in the forest. Mother says they are forty times taller than me. I would need to be a bird to see the top of these trees. Mother says that these are a gum called Karri and that no gum trees grow in England. This is very strange as all the tall trees here are gum trees. My favourite gum tree is the Marri as it has big woody fruit that Mary and I can pretend are little people in our games.



Mary and I run through the forest pretending to be butterflies and run from one place to another finding all the most beautiful flowers.

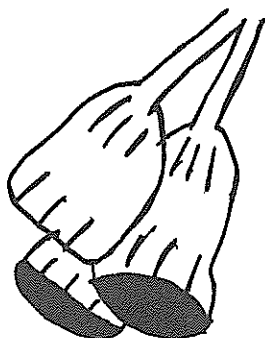
We went to visit one of my favourite spots to see what flowers were blooming so that we will know where to go later to collect seed. We sent the seed to Captain Mangles in England. Perhaps you could visit his garden and see our plants growing in his conservatory.

We saw some lovely purple pea flowers with prickly leaves that mother says are like the leaves of holly in England. There are two other plants growing nearby that have leaves like holly too. One is a pea with red, pink and orange flowers and the other a wattle with soft yellow ball-like flowers. Mary called the wattle flowers 'balls!' We thought this was very funny.



Mother let Mary and me pick some of these flowers to send to Captain Mangles. When we got home, I drew them for you before Mother pressed them. I kept some of their holly leaves to send to you. The leaves are so hard and leathery that they last for ever.

Mother told me how holly is very special at Christmas. Its bright red berries and green leaves are very bright at Christmas when all is so cold and most plants have no leaves or flowers. This seems very strange to us in Augusta as Christmas in Australia is hot when I will be visiting my holly-leaved plants to collect its seeds. Not many of our plants flower in summer because it is so hot. In England it is the opposite. There are no flowers in winter when there is snow on the ground.



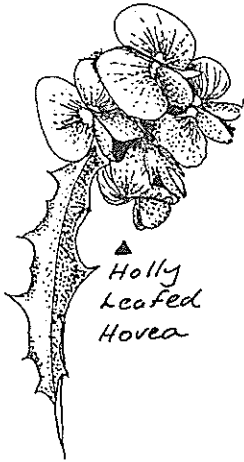
It is like Christmas when Captain Mangles returns the box that we sent him with all our seeds and pressed plants. Captain Mangles fills the box with garden seeds, books for Mother and Papa, books for Mary and me and other surprises.

With all my love
Sabrina

Resource Sheet 92

■ Activity 4.28 THE LETTER

page 232



▲
Holly
Leaved
Hovea

Read Sabina's letter to her Grandmother and answer the following questions:

1. Find Augusta on a map of Western Australia. List five differences that could be found between Augusta today and Augusta when Sabina lived there.

i. _____

ii. _____

iii. _____

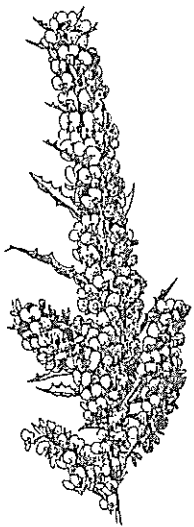
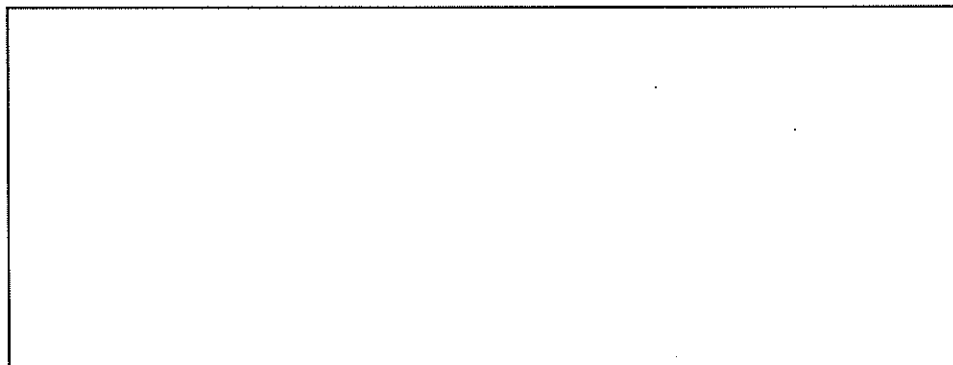
iv. _____

v. _____

2. Some of the forest that Sabina visited is still growing today. What changes have taken place in the Augusta area that makes the above statement begin with "Some".

3. Sabina talks about three of her favourite flowers from the forest. She decorated her letter paper with the drawings of these flowers.

Draw, then colour in one of the plants she describes.



▲
Holly Leaved
Hovea plant

Resource Sheet 92 continued

■ Activity 4.28 THE LETTER

page 232

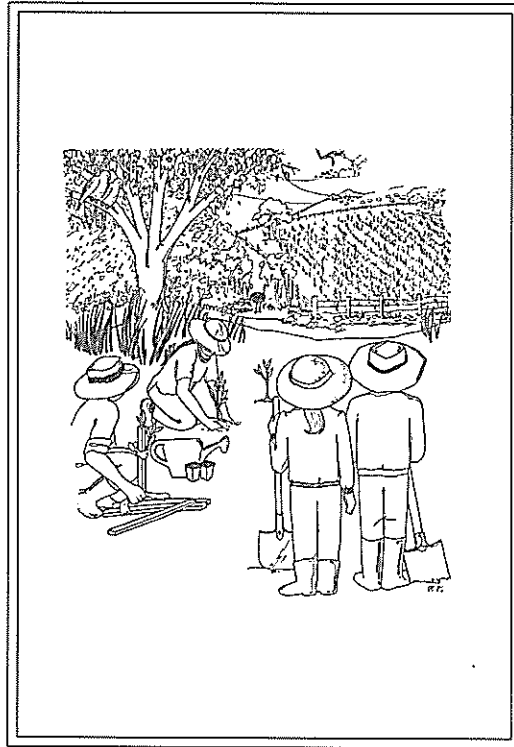
4. How is Christmas in Australia different from Christmas in England?
Think about the weather and the length of the day.
5. Describe the feelings you would have of being the first person to walk through a piece of untouched bushland as Sabina would have done.

6. Complete the following sentences using one of the words below:
hot leathery admired flowers famous England

- a. Western Australia is a _____ and dry land.
- b. Western Australia is the home of hundreds of _____ that are only found in Western Australia.
- c. Many plants have hard and _____ leaves and bright flowers.
- d. These wonderful flowers were much _____ when Australia was first settled by people from _____
- e. Un-jumble the following plant words from Sabina's letter:

- | | |
|-----------------|--------------|
| 1. tsreof | 7. mug |
| 2. rikar | 8. w d o y o |
| 3. agrned | 9. elwrosf |
| 4. ooacrvtnesry | 10. aep |
| 5. elvaes | 11. altwet |
| 6. hloly | 12. dsese |

▲
a leathery
leaf



PART FIVE

WILD PLANTS - TODAY AND OUR FUTURE

ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
5.1	Wild Plants, People and Change	255	•	•	•	•	•	•				
5.2	Bushwatch Diary	255	•	•	•	•	•			•		
5.3	Bushland and Gardens	255		•		•		•				•
5.4	Where the Wild Plants Still Grow - near City Beach Primary School	256		•	•		•		•			
5.5	Where the Wild Plants Still Grow - in our local area	257		•	•		•		•			
5.6	The Remnant Bushland Survey	257		•	•	•	•			•		
5.7	How Many Plants are in Our Local Bushland?	258		•	•	•			•			
5.8	Some of My Favourite Wild Plants in Our Local Bushland	258	•	•	•	•				•		
5.9	Looking After Our Local Bushland	258		•	•		•					
5.10	Values Clarification	258			•		•	•		•		

Background



WILD PLANTS - TODAY AND OUR FUTURE

The European colony in Western Australia grew steadily, gradually spreading throughout the whole State, clearing bushland for agriculture, pastoralism, urban settlement and mining.

Clearing of bushland throughout Australia has resulted in biological and physical changes, leading to widespread land degradation and loss of biodiversity of plant and animal life.

On the other hand, clearing of bushland was necessary to enable us to grow our own food, extract the natural commodities we require, build houses, sporting facilities, roads, railways etc. for economic and social value and, ultimately, for our well-being.

It is finding the balance between our need for resources (such as food, housing, fuel, roads, minerals, etc.) and the loss of the natural environment as a result of our use of the resources which is the underlying principle of sustainable land use.

Sustainable land use

Sustainable land use is the optimal use of our land-based resources to meet the needs of the present without compromising the ability of future generations to meet their own needs. (World Commission on Environment and Development, Bruntland Report, 1987).

Agriculture, for example, plays an important role in the Australian economy and society. In 1990 Australian agriculture produced \$23,585 million worth of commodities. Exports brought \$7,244 million into the Australian economy. (Australian Bureau of Statistics). However, continued production of food year after year relies on the maintenance and management of our soil / plant / animal ecosystems. In the past our lack of knowledge and understanding of the local ecosystems has led to a problem of land degradation where the natural environment is seriously degraded.

"... land degradation in Australia is a national problem of major proportions and immediate urgency, which threatens severe economic, ecological and, in time, political consequences it is unquestionably the foremost example of insufficient attention to ecological principles leading to resource use and development that cannot be sustained. "

(National Conservation Strategy for Australia, Interim Consultative Committee Final Report, August 1985. Ch 7. pp 51-52).

"The seriousness of the land degradation problem facing Australia is so great that it is difficult to comprehend, but there should be no doubt that if the trend is not reversed, it could have serious consequences for the economy and the environment. "

(House of Representatives Standing Committee on Environment and Conservation. Fiscal Measures and the Achievement of Environmental Objectives. 1987. p 59).

Background



To maintain the economic and social value of agriculture as well as maintain the natural environment, it is important that land degradation is redressed. Vegetation loss is at the core of many aspects of land degradation in Australia.

Effects of clearing of bushland

(From: Brechwoldt, R. (1986). *The Last Stand*. Australian Government Publishing Service, Canberra, (see also Hobbs, R. and Wallace, K. (1991). *Remnant Vegetation on Farms is a Valuable Resource*. W.A. Journal of Agriculture. 2.)

Loss of cultivated and natural vegetation due to salinity

Native perennial vegetation uses most of the rain that falls on an area. Trees and shrubs intercept a large amount of rainfall on their foliage, much of it evaporating before it reaches the soil surface. The soil under native vegetation allows much water to infiltrate due to its open structure. Removal of the vegetation allows more water to recharge the deep water table. The water table rises and dissolves stored salt as it moves through the soil bringing salt to the surface.

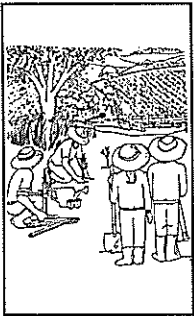
Loss of flora and fauna

Through clearing of bushland, we have lost many plant and animal species. Since European settlement, 94 plant, 2 bird and 13 mammal species have become extinct in Australia and an even larger number of plant and animal species are considered endangered today. This is considered to be one of the highest rates of extinction in the world.

Loss of genetic diversity

Within species and between species there are differences or variations. Maintaining this genetic diversity has been identified as an important aim of conservation strategies. In natural environments, populations of organisms with a high genetic diversity have the best chance of coping with unfavourable environmental changes, because at least some individuals will survive. The traits which enable the survival of these certain individuals may then be passed on to the offspring. An example is the root-rot disease Dieback caused by the fungus *Phytophthora* spread by human activity. (See Appendix 3, page 283). Loss of diversity limits the ability of populations and even whole ecosystems to respond to environmental changes. It also represents a loss of genetic resources that may be useful to humans in the future. Loss of much of the native vegetation had led to an impoverishment of the genetic diversity, either by destroying complete populations or by drastically reducing their range.

Background



Loss of nutrient cycling

Plants play a major part in recycling of nutrients. Trees, for example, can recover nutrients leached from the surface soil layers and nutrients produced by the weathering of subsoils. Some native plants (for example, *Acacias*) can fix atmospheric nitrogen, converting it to nitrate and thereby increasing soil fertility. Most of the pastures and crops that have replaced much of our native vegetation can do this. Lupins and clover are important in agricultural practice because of their ability to fix nitrogen in addition to their crop and pasture value.

Loss of landscape - our natural heritage

Education, research, tourism and recreation are important uses of bushland. With the decline of native vegetation, these uses are severely compromised.

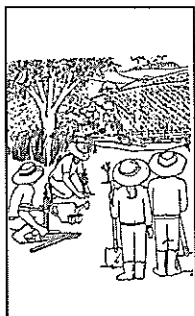
Bushland areas in the city are subject to many pressures from demands for space for houses, roads, amenities and factories. The remnants that remain are often competing with introduced plants which change the habitat immensely. These plants often thrive at the expense of the native plants as they are free of the predators that live in their country of origin. This competition drastically affects the bushland community.

The natural Australian landscape plays an integral role in the development of a national identity. The plants do much to shape the landscape. Our country is vast and to the early settlers the bushland seemed endless. This is not so today. With increased urbanisation and the clearing of bushland, much of the Western Australian landscape is becoming indistinguishable from other parts of the world with similar climates. We can retain our natural heritage but this can only be achieved if there is widespread appreciation of our plants, we understand the factors that shaped them and we take responsibility for their maintenance.

Where do we go from here? The three Rs.

Retention, restoration and replacement - the three Rs - are the course for our future. If we consider the 6.5 million hectares of agricultural land in Western Australia, we see that we have cleared over 85% of the bushland. However to maintain sustainable systems of agriculture and retain present levels of biodiversity we need to replace some of this vegetation. Estimates indicate that we need to retain and restore all the bushland remaining and revegetate 5 - 15% of the land with natural vegetation. We are not able to regenerate original bushland, so estimates of the number of plants required for this suggest that we need to plant 640 million to 1.9 billion trees and shrubs. We also need

Background



to be planting understorey species wherever possible to recreate as much of the original ecosystem as we can. It is not possible to regenerate original bushland and so efforts to retain what natural bushland we have is of extreme importance.

But what can we do?

In completing this package, students will have developed a good understanding of:

- ◆ the unique features of our wild plants
- ◆ how to recognise wild plants and
- ◆ how to recognise some specific wild plants
- ◆ plant communities, their structure and diversity, the student's local plant community and the State's plant communities
- ◆ the great diversity of life in a plant community and the inter-dependence of these.

With these understandings, students are well prepared for projects of retention, restoration and revegetation. Many projects already exist in the community.

The students will gain a real sense of worth if they can help to protect something within their community. They will learn that they can affect the world around them and help to be responsible for their future. It will help them to develop a sense of responsibility and the attitude that they can have an effect on things, not just be recipients of what is decided by adults.

A series of contacts and/or projects are listed below. By contacting the appropriate body, students may wish to become involved in a current project or model their own project on one of these.

Retention

Retention involves recognising bushland areas and acting to preserve this bushland.

Australia is one of the few countries in the world that still has areas of native plants that have not been modified extensively by people. The great forests of Western Europe that we read of in literature are highly modified by people and, in many cases such as the New Forest, were replanted, hence its name. These forests also have very different species of plants in them, especially when compared with our bushland. Our pristine bushland, with its assemblage of many different plants (most of which only grow in Western Australia) is unique and of heritage value to Western Australia and to the world.

In the city:

Many groups are involved in retention activities:

State Government: Department of Conservation and Land Management, Environmental Protection Authority

Background



- Local Government
- Commonwealth Government
- Community conservation groups: Conservation Council; Wildflower Society; Naturalist's Clubs; bushland "Friends " groups; the National Trust; Ecoplan volunteers
- Heritage Commission

In the country:

- Community Groups: Landcare; Conservation Groups; Country Women's Association
- Local Authority
- State Government: Department of Agriculture; Department of Conservation and Land Management; Environmental Protection Authority
- Commonwealth Government
- Heritage Commission
- Greening Western Australia's community tree plantings

Refer to 'Obtaining Help' on page 299 for contact details of some of these groups.

Restoration

Restoration involves management of bushland to restore the natural processes and includes such activities as:

- fencing
- removing rubbish
- weeding and pest control

In the city:

- APACE Community Nursery
- AABR Australian Association of Bushland Regenerators
- Friends groups
- Conservation groups

In the country:

- Landcare groups
- Conservation groups eg: Nickol Bay Naturalist's Club
Busselton Naturalist's Club

Revegetation

Revegetation is the active planting to replace vegetation already lost. The most appropriate plants for use in revegetation are the local wild plants which make up the total local plant community.

Revegetating for communities:

- seed orchards - Joanna Seabrook from the Wildflower Society

Background



- bushland gardens - City Beach Primary School
- 'Grow Us A Home' - Greening Western Australia

Revegetating for shelter belts and other reasons:

- One Billion Trees Program - Greening Western Australia
- One Million Trees Program (Men of the Trees)

Case Studies:

There are many examples of retention, restoration and revegetation in Western Australia. Greening Western Australia recognises the achievements of individuals, community groups, schools, government authorities and industry in the annual John Tonkin Greening Awards.

Examples:

- | | |
|-------------|--|
| Individual: | David Rupe (1992)
Alan Barton (1993) |
| Community: | Denmark Environment Centre restoration (1990)
Wetlands Conservation Society (1991)
Corrigin LCDC (1993) |
| Schools: | City Beach Primary School (1990)
Miling Primary School (1991)
Samson Primary School (1991)
Parkerville Primary School (1992)
South Perth Primary School (1993) |
| Government: | Main Roads Department (1989, 1991, 1992)
Leschenault Inlet Management Authority (1990) |
| Industry: | Pancontinental Goldmining Ltd (1991)
Pioneer Concrete (1992)
BHP Iron Ore (1993) |

To become involved in projects of retention, restoration and revegetation, students should explore the following activities which develop:

1. concepts of vegetation change
2. how to map remnant bushland
3. identifying the wild plants in the local bushland community
4. how to maintain and restore remnant bushland

ACTIVITIES

■ Activity 5.1

JUNIOR
MIDDLE
UPPER

SCIENCE
SOCIAL
STUDIES
HEALTH

WILD PLANTS, PEOPLE AND CHANGE

Resource Sheet 93 page 259

Discuss:

- i. the changes which have taken place in going from the first picture to the second (Resource Sheet 93).
- ii. which changes are beneficial and which are not?
- iii. what should be done about the changes that are not beneficial?

Extension: *As a class, discuss the changes which have occurred in the wild plants as a result of the changing land-use depicted in the book "Window" by Jeannie Baker.*

■ Activity 5.2

JUNIOR
MIDDLE
UPPER

SCIENCE
SOCIAL
STUDIES
LANGUAGE

BUSHWATCH DIARY

Students visit their local bushland throughout the year and make a diary to record what they see and any changes they observe.

Each student should make observations at the same spot each time and record information which could include:

- ◆ date
- ◆ plant types
- ◆ marks made on leaves by insects
- ◆ buds
- ◆ flowers
- ◆ seeds
- ◆ fruits
- ◆ seedlings
- ◆ materials on ground
- ◆ numbers of animals and birds
- ◆ activities of animals and birds
- ◆ changes since last visit.

Each students work may be collated into a class Bushwatch Diary.

■ Activity 5.3

MIDDLE

SCIENCE
HEALTH
ART & CRAFT

BUSHLAND AND GARDENS

Discuss the differences between bushland and gardens. Find some appropriate pictures from books or magazines and compare.

Using magazines, cut out pictures to form two displays: a bushland environment and a suburban garden environment.

Have the sheets ready for the students to paste on their plants, but be on hand to advise them as to whether the plant is native or introduced.

Resource: *Magazines*

■ Activity 5.4

WHERE THE WILD PLANTS STILL GROW

- near City Beach Primary School

*Resource Sheets 94 - 97 page 260 - 264*MIDDLE
UPPERSOCIAL
STUDIES

In some areas of Western Australia there is no bushland left and the land is covered with built structures, plants of other countries from around the world and a few scattered wild trees and shrubs. Most bushland areas will be obvious but at times it will be difficult to distinguish planted native trees and gardens from wild trees and bushland.

Some useful hints to distinguish remnant bushland:

1. Bushland will have a greater variety of plants, many of which are not commonly seen in the gardens.
2. Plants of the same kind, that is, of the same species, will grow in small and large irregular groups or as random individuals but never in rows.
3. Isolated wild trees and large shrubs will be of interesting shapes, rarely in regular patterns and often in small groups all of the same age.
4. Bushland is made up of various mixtures of trees, shrubs, herbs, grasses and sedges.

City Beach Primary School's catchment area has been selected as an example in mapping remnant bushland in the local area.

The Schools catchment boundaries include Bold Park. Bold Park is an area of bushland about which there is sufficient information available to illustrate ways of communicating the make-up of bushland.

Aerial maps, Planning Department maps and street maps are suitable to use as the basis for the mapping exercise. Contact your local Shire Office or the Central map agency at the Department of Land Administration to obtain copies of your area.

By studying these maps and photographs, the areas that may be bushland can be identified. The areas identified will need ground study (called ground-truthing) as in some cases, bush-like areas will actually be parkland or gardens of non-native plants. By placing Resource Sheet 96 on a plastic overlay and putting it over Resource Sheet 95, you will see the areas of bushland remaining.

Areas with scattered clumps or individual wild trees and large shrubs will need to be established using a ground search.

Students follow the instructions on Resource Sheet 97 to practice mapping remnant bushland around City Beach Primary School.

Resource: *Photocopies of Resource Sheets 95 and 97*

Plastic overlay of Resource 96

"Bold Park" pamphlet from the Friends of Bold Park Bushland, PO Box 198, Subiaco 6008.

"The Vegetation and Flora of Bold Park" by G J Keighery, J Harvey and B J Keighery in The W.A. Naturalist, Vol 8, pp100-121.

■ Activity 5.5

WHERE THE WILD PLANTS STILL GROW

*- in our local area**Resource Sheets 99 - 101 pages 265 - 267*

MIDDLE

UPPER

SCIENCE

MATHS

1. Choose an area to be searched for bushland. Select an area already familiar to your students such as your school's and town's locality, whichever is the smaller.
2. Go over the outcomes of Activity 1.1, the Rules for Visitors. Decide with the class if you need to notify the caretakers of the bushland of your visit.
3. Obtain local maps and aerial photographs of this area. This could take some time so plan to obtain these before you do the search. The Activity can be done without the aerial photographs but the Activity will need to be modified.
4. Indicate the direction of north clearly on the map and make sufficient copies of the map and aerial photograph to allow one per student or group. Keep one copy for the class copy. You may wish to enlarge this copy.
5. From the scale on your maps, prepare an individual scale ruler for each student or group.
6. Determine how you will divide the area into zones for the ground search by the groups of students.
7. Use the search of the school zone to train the students for their individual search.
8. Students map their local bushland following the guidelines on Resource Sheet 98.

Resource: *Aerial photograph*
 Street map
 Scales
 Transparent paper

■ Activity 5.6

THE REMNANT BUSHLAND SURVEY

Resource Sheets 99 - 101 pages 265 - 267

MIDDLE

UPPER

SCIENCE

SOCIAL

STUDIES

LANGUAGE

Discuss the Introduction section to the Remnant Bushland Survey (Resource Sheet 99) with the class.

Work through the survey form (Resource Sheet 100).

Map the position and shape of the bushland on Resource Sheet 101.

■ Activity 5.7 HOW MANY PLANTS ARE IN OUR LOCAL BUSHLAND? *Resource Sheet 102 page 270*

MIDDLE
UPPER

SCIENCE
MATHS

Students estimate the numbers of plants in their local bushland.

Resource: *Hoop*
Recording sheet
Clipboard and pencil
Transparent grid

■ Activity 5.8 SOME OF MY FAVOURITE WILD PLANTS IN OUR LOCAL BUSHLAND *Resource Sheet 103 page 272*

JUNIOR
MIDDLE
UPPER

SCIENCE
LANGUAGE

Students describe their favourite wild plants in the local bushland following the guidelines on Resource Sheet 103.

Resource: *Clipboard and pencils*
Camera (optional)

■ Activity 5.9 LOOKING AFTER OUR LOCAL BUSHLAND

MIDDLE
UPPER

SOCIAL
STUDIES

Students form their own "Friends" group to help manage their local bushland to conserve it for the future.

■ Activity 5.10 VALUES CLARIFICATION

UPPER

SOCIAL
STUDIES
HEALTH
LANGUAGE

Present the students with the following scenario:

A developer would like to build a retirement home on the area of bushland that you know. How do you feel about this? Prepare an argument for or against the development, and debate this in your class.

Resource: *"Who Decides?" role-play (available from the Environmental Protection Authority)*

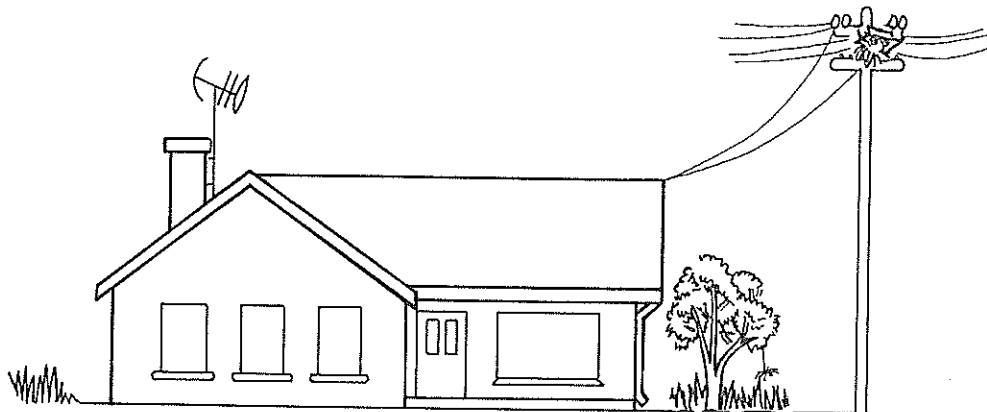
Resource Sheet 93

■ Activity 5.1 WILD PLANTS, PEOPLE AND CHANGE

page 255

The removal of the wild plants from the land to make room for houses, farms, roads and cities has had a huge effect.

1. List the changes that have taken place in going from the first picture to the second.
2. Which changes are beneficial and which are not?
3. What should be done about the changes that are not beneficial?
4. Use coloured pencils to improve the barren look of picture two.

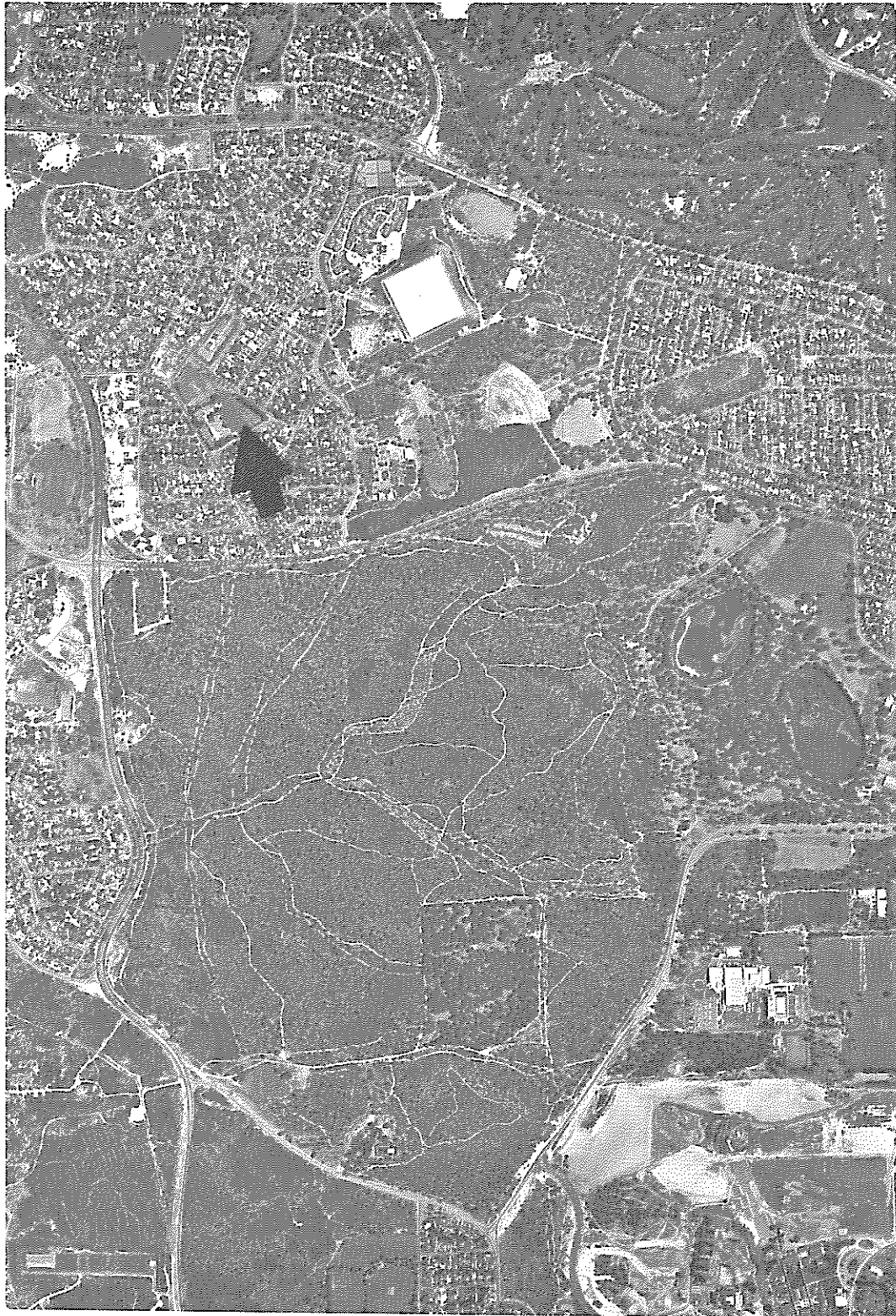


Resource Sheet 94

■ Activity 5.4 WHERE THE WILD PLANTS GROW
- near City Beach Primary School

page 256

(Aerial photograph)

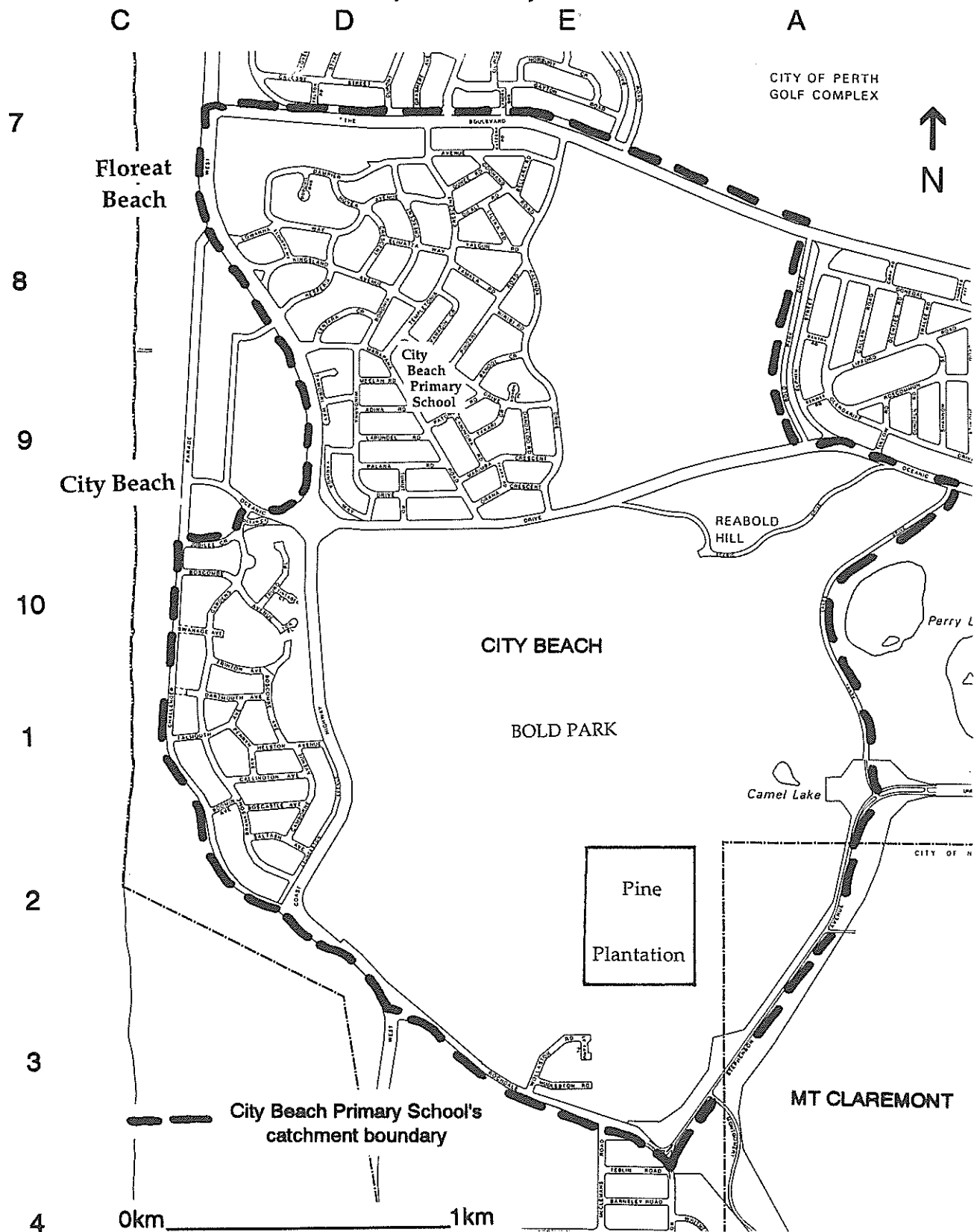


*Aerial photograph reproduced by permission of the Department of Land Administration
Perth, Western Australia, under Copy Licence 384/93.*

Resource Sheet 95

■ Activity 5.4 WHERE THE WILD PLANTS GROW
- near City Beach Primary School

page 256



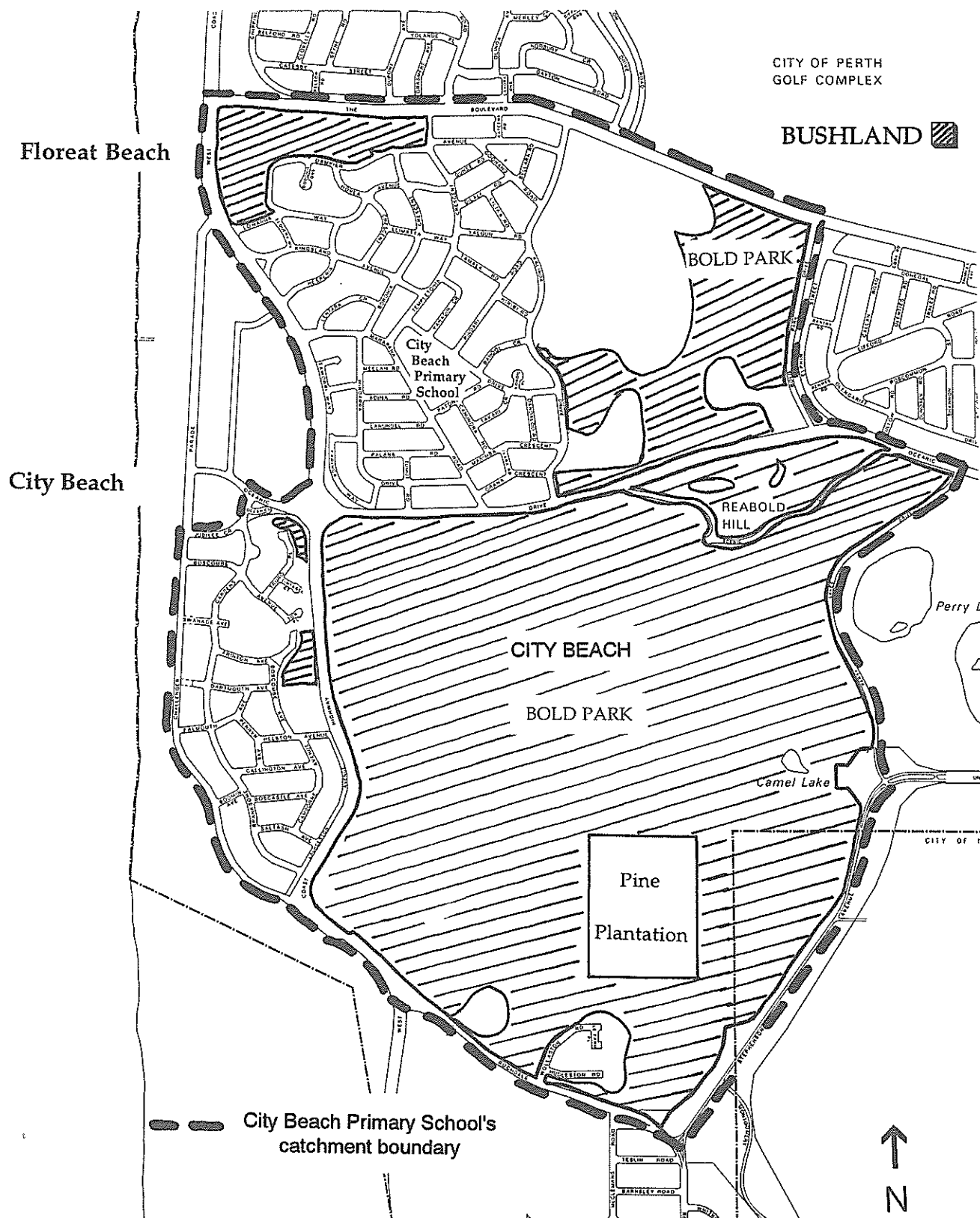
Printed and adapted with the permission of the City of Perth

Resource Sheet 96

■ Activity 5.4

WHERE THE WILD PLANTS GROW
- near City Beach Primary School

page 256



Printed and adapted with the permission of the City of Perth

Resource Sheet 97

Activity 5.4 WHERE THE WILD PLANTS GROW
- near City Beach Primary School

page 256

Bushland where the wild plants grow is becoming less easy to find each year. Some suburbs of Perth are lucky enough to have lots of bushland, and others have very little.

How much bushland is left near your school? You can map the bushland in your school area and this activity helps you to do this. First, have a go at looking at an area around the City Beach Primary School so you can have some practice in using aerial photographs.

What to do:

1. Using Resource Sheet 95 find City Beach Primary School. Mark its position with an arrow. What is its grid reference?
2. Jessica and James live half way along the north side of Dampier Ave (D7). Mark their home with an arrow. Donna lives on the west side of Challenger Pde (D2) near West Coast Hwy. Mark her home with an arrow.
3. Find these two places on the aerial photograph (Resource Sheet 94). City Beach Primary School is marked with an arrow.
4. Find the areas that look like bushland on Resource Sheet 94. On the map (Resource Sheet 95) colour these bushland areas green.
5. Compare your map with the overhead your teacher has (Resource Sheet 94), which was first drawn from aerial photographs and checked using a ground search.
6. How does your teacher's map compare with Resource Sheet 94 that has the bushland coloured in?
7. Why is it difficult to tell what is bushland and what is parkland?
8. Do you know of any pockets of bushland near you? Where are they?

You will notice that what looks like bushland on the aerial photograph is not actually bushland, but parkland with scattered trees. This happens because the trees meet at the top, the same as the bushland. Bushland must have smaller plants below the trees or tall shrubs, and these can only be discovered by visiting the place. This is called "ground truthing."

Resource Sheet 98

■ Activity 5.5

WHERE THE WILD PLANTS GROW

page 257

- in our local area

Have a look at your local area to see what bushland is left near you.

What to do:

1. Place your map on the desk so that the north arrow is facing north. Your teacher will have an arrow on the board indicating where north is.
2.
 - a. Locate your school on the map. Mark the spot with a marker pen.
 - b. Locate your home on the map. Mark the spot with a marker pen.
3. Find each of these places on the aerial photograph.
4. Find the areas that look like bushland on the aerial photograph. Colour these green.
5. Your teacher will divide your study area into zones with 4 - 5 students to each zone. With your group, plan the investigation of the bushland areas found in 4 above, using the aerial photograph.
6. The whole class will investigate the school zone for bushland areas and areas with scattered clumps or individual wild shrubs and trees. On the class map:
 - leave the bushland areas green
 - colour areas with scattered clumps or individual wild shrubs and trees brown over the green.
7. On the class map, mark in all the bushland areas and all areas with scattered clumps or individual wild shrubs and trees, as you did on the map.
8. When the class copy is complete, each group should complete their map to show the bushland throughout the whole area.

Resource Sheet 99

■ Activity 5.6 THE REMNANT BUSHLAND SURVEY

page 257

Introduction

Have you noticed many dead or dying plants near your home? Lots of local people have observed that much of our native bushland and especially trees, appears to be dying. Wherever you look, there is bushland in trouble.

School students are helping to look after our bushland. They start by making a survey of their local bushland area.

To make a survey, you go to the patch of bushland nearest to your home, observe how healthy the bushland is and find out from parents, relatives or older friends what that patch used to be like. The survey is based on the Roadside Conservation Survey and shares the same belief that important information can be obtained from lots of people, not just the experts.

The survey will help you learn about what are important things to look for when you visit any bit of bushland. It will also provide useful information for farmers, community groups and government departments on how the bushland in your area is changing.

Doing the Survey

Make a large, clear sketch of the area, with a north arrow if possible, to show the areas of remnant bushland and disturbances. (See Resource Sheet 93)

For many animals, small areas of bushland can be important stepping stones or corridors letting them move between various other areas of bushland, as well as being homes in themselves. In highly cleared areas, these pockets or connecting strips become really important. Even trees by themselves can be used as homes, so they are worth saving.

Disturbances - anything that isn't bushland

These include things like electricity and telegraph lines, water pipelines, sand and gravel quarries, metal dumps, fire breaks, horse or people tracks, and any dumped rubbish; but only count them if they are quite obvious.

Resource Sheet 99 continued

■ Activity 5.6 THE REMNANT BUSHLAND SURVEY page 257

Conservation Value

There are ways of deciding if your local bushland has a high conservation value and is worth looking after. Some factors which may affect your decision to conserve the bushland include:

- ◆ the area seems to have a diversity of native plants and / or animals
- ◆ the area seems to have few weeds or disturbances
- ◆ the area has healthy native trees, shrubs and a ground layer (not made up of weeds).

Unhealthy bushland can be helped, but it takes more effort and money, so it makes sense to save the really good, healthy bushland first. However we need to know where that bushland is.

Anything Else

Include anything else interesting which you noticed or thought about when you were out in the bushland. Was it noisy because of birds or cars? Can you remember how it has changed or did you have to ask someone? Can anyone remember a fire going through the area recently? What would you like to see happen for the future?

If you would like to do a drawing of a tree, bird or anything else that you like, just use the back of the survey.

(Reproduced with permission of Shona Keneally, Community Catchment Centre, Pinjarra).

Resource Sheet 100

■ Activity 5.6 THE REMNANT BUSHLAND SURVEY page 257

STUDENT: _____

SCHOOL: _____

DATE: _____

TIME: _____

NEAREST ROAD NAME: _____

NEAREST ROAD INTERSECTION: _____



How many different types of animals did you see?

Sit quietly under a tree for a few minutes or longer and make a tally. If you didn't see any birds but heard them, include them.

Birds

☐

Insects

☐

Animals

(including rabbits, frogs, lizards etc.)

☐


How many different types of plants did you see?

Remember to look at the tree, shrub and ground layer.

0 - 5

☐

5 - 19

☐

Over 20

☐

Native bushland layers.

(tick all three boxes if there are all three layers). Is there

an Upper layer (over 3 metres high)

☐

a Middle layer (1 - 3 metres high)

☐

a Lower layer (under 1 metre high)

☐

Disturbances:

(See the first page to decide if something is a disturbance eg: a dump)

Continuous

☐

Many

☐

Isolated

☐

None

☐

Type: _____

Main use of land next to where you are surveying:

Scattered trees or shrubs

☐

Completely cleared

☐

Uncleared land

☐

Plantation of trees

☐

Factories or houses

☐

Anything else: _____

Width of Remnant:

1 - 5 metres

☐

5 - 20 metres

☐

over 20 metres

☐

over 70 metres

☐

Resource Sheet 100 continued

■ Activity 5.6

THE REMNANT BUSHLAND SURVEY

page 257

Average diameter of trunk or stem of plants present
(the bigger the trunk, the older the plant):

0 - 30cm

☐

30 - 60 cm

☐

60cm or more

☐**Weeds:**

Few weeds

☐

Half weeds

☐

Mostly weeds

☐

Covered in weeds

☐

Main types of weeds (only if you know them)

Value for conservation

(see the explanation sheet to help you decide):

High

☐

Medium

☐

Low

☐

Reasons: _____

Things which make the bushland important for animals (biological value):

Connects uncleared areas

☐Flowering shrubs for
nectar-feeding animals☐Large trees with hollows
for birds nests☐Hollow logs on the
ground for other animals☐

How does the quality of the bushland
compare to its condition ten years ago
(ask parents or older friends who
might know):

Much better

☐

Better

☐

Same

☐

Worse

☐

Much Worse

☐

Reasons _____

Any other things you noticed or thought about that might be interesting:

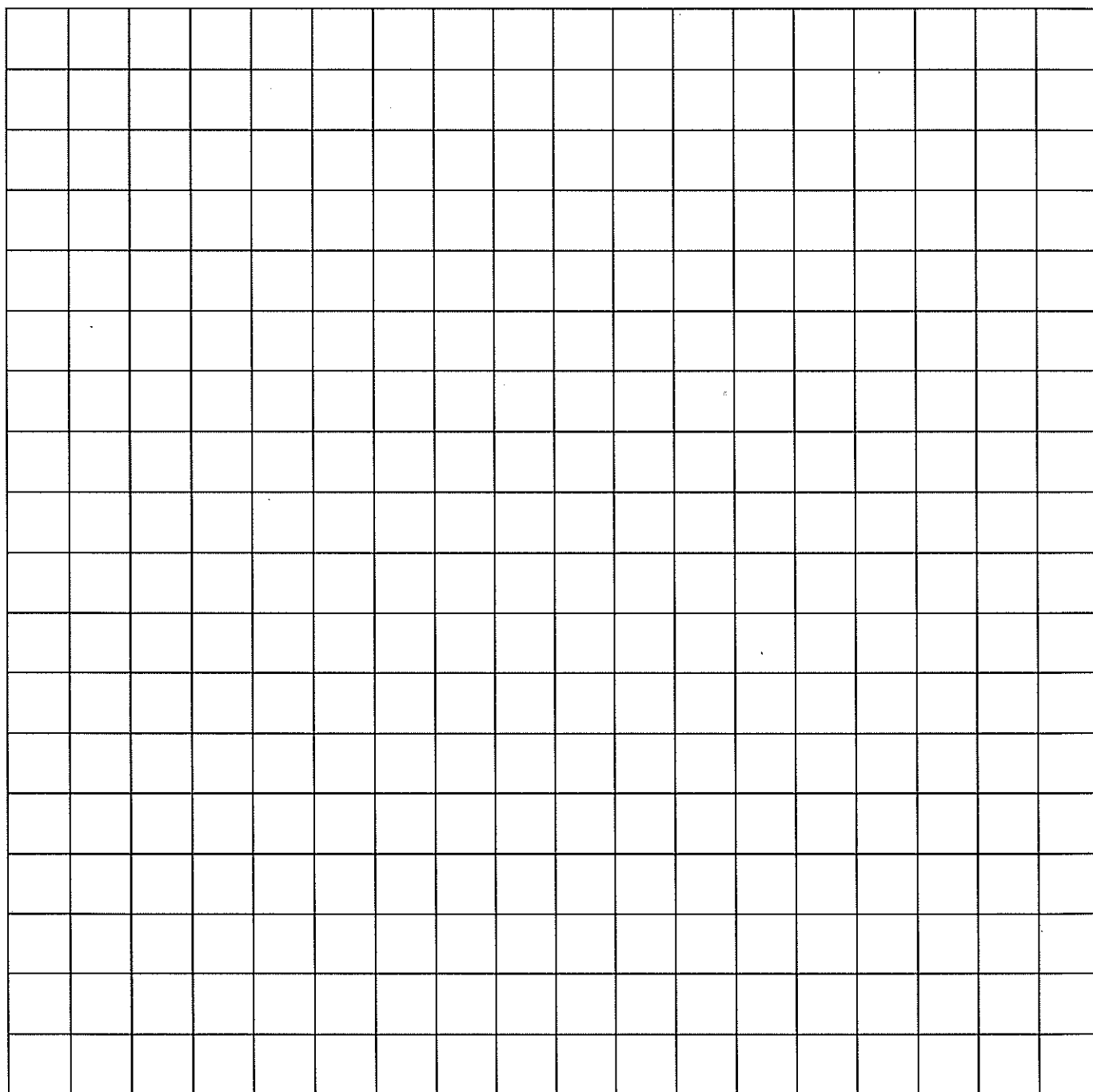
Resource Sheet 101

■ Activity 5.6

THE REMNANT BUSHLAND SURVEY

page 257

Sketch a map of the position and shape of the bushland. Include the length of each border and the nearest road names. Mark on the map the position of each major group of plant species that you find.



Resource Sheet 102

■ Activity 5.7 HOW MANY PLANTS IN OUR LOCAL REMNANT BUSHLAND?

page 258

Did you know that our bushland is world-renowned for the variety of plants that grow in even small areas of bushland? Even though Western Australia has very poor soils, the wild plants have adapted to grow in great profusion and variety.

Let us see how many plants grow in your bushland.

What to do:

1. Re-read your "Bushland Code of Conduct" (refer Resource Sheet 1).
2. Select one of the bushland areas you found to study further.
Our class, Year _____ at _____
Primary School choose the bushland at _____
The bushland is cared for by _____
and they have given us permission to study the plants.
3. Visit your bushland. Take one school hoop per group and material to record with.
4. Record the number of plants by throwing the hoop over your head (this gives you a random sample of the plants in the bushland) or place the hoop as directed by your teacher.
 - ◆ Count the number of plants in your hoop. Remember to record the trees and shrubs that are too big to fit in your hoop but will hang over it.
 - ◆ Now count how many of each different plant types there are in each hoop.

The trees and shrubs are too big to fit in your hoop, so you must record the plants that hang over the hoop.
5. Repeat step 4 for a different spot until your class has done records for 20 hoops. You have now sampled about 10 square metres of bushland.
6. From your map, calculate:
 - ◆ the area of your bushland in square kilometres. (There are 1 million square metres in a square kilometre)
 - ◆ an estimate of how many plants you have in your bushland
 - ◆ an estimate of how many different types of plants there are in your bushland.

Resource Sheet 102_{continued}

■ Activity 5.7

HOW MANY PLANTS IN OUR LOCAL REMNANT BUSHLAND?

page 258

What is the area of your bushland?

How many plants do you have in your bushland?

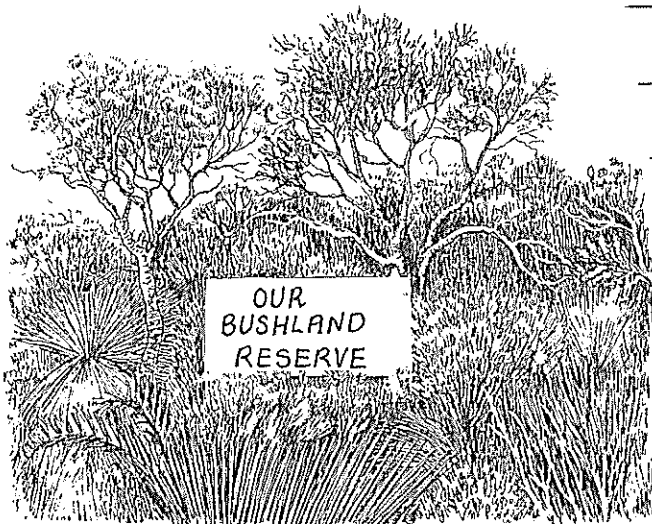
How many different types of plants are there in your bushland?

What is the area of your garden?

How many plants do you have in your garden?

How many different types of plants are there in your garden?

What do you notice about the differences between your bushland and your garden?



Resource Sheet 103

■ Activity 5.8

SOME OF MY FAVOURITE WILD PLANTS IN OUR LOCAL BUSHLAND?

page 258

Do you have some favourite flowers in your bushland? Let's look at these and describe them.

What to do:

In the bushland:

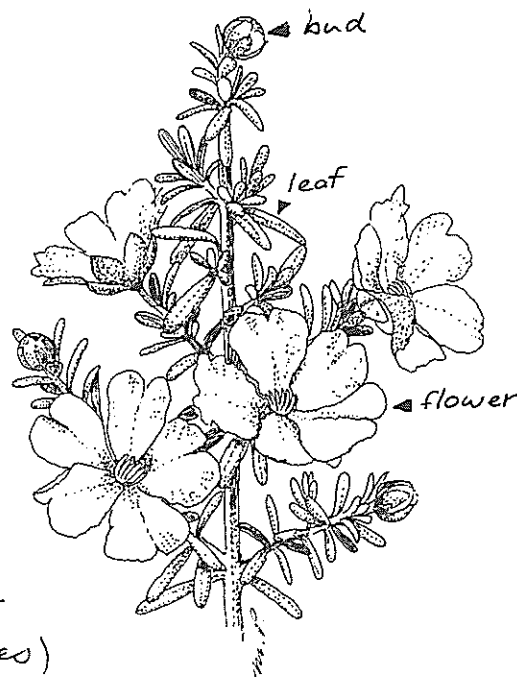
Draw or photograph three of your favourite wild plants from your local bushland.

Look carefully at the shape of your plant, particularly its buds, flowers, leaves, bark and fruit. Draw as many of these parts in your picture as you can find.

At school:

Imagine you are living surrounded by your bushland. Write a letter about the bushland to a friend at another school in Western Australia or to an overseas visitor.

Make up a special piece of writing paper for your letter and include your drawings or photographs in your letter. Compare the place you are living in with the place your relative or friend is living in, and write about a favourite plant that you see in your bushland.



a common plant found
in bushland around
Perth, Yellow Buttercups
(*Hibbertia hypericoides*)



APPENDIX 1

MAKING AN HERBARIUM

*Astroloma Macrocalyx*

<u>Number:</u>	<u>Date:</u>	<u>Collected by:</u>
<hr/>		
Common name: <hr/>		
Scientific name: <hr/>		
Where found: <hr/>		
Soil type: <hr/>		
Aspect: <hr/>		
Colour: <hr/>		
Plant form: <hr/>		
Other notes: <hr/>		
<hr/>		

*Specimens are displayed with
identification and collection details.*

Background



MAKING AN HERBARIUM

An herbarium is a plant museum which holds a collection of preserved samples of plants collected from a study area. The Western Australian Herbarium holds an extensive collection of plants found throughout the State and is a useful resource when identifying and researching plants. An herbarium is also important as it provides an historical record for pieces of remnant bushland.

To make a class herbarium you need to collect, press and display specimens on cards.

1. COLLECTION

Specimens should be pressed as soon as possible after collection. Finer flowers should be pressed "in-the-field" before they shrivel. More woody plants can be kept in a plastic bag with a few drops of water and pressed on return from the field trip.

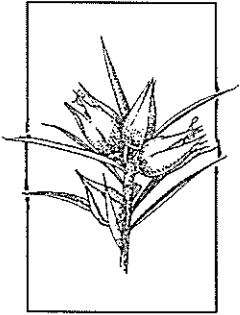
Note:

- (i) Licences are required for collecting plant material for both scientific, educational and commercial purposes. You will need a scientific/educational licence to collect plant material. This is obtainable from the Department of Conservation and Land Management at a cost of \$10.00. (1993). Your teacher may be able to obtain a licence for your class to complete this activity at no charge.
- (ii) Various restrictions apply to picking in some areas. You or your teacher should contact the Department of Conservation and Land Management for details.

As each item is collected, tag it with a specimen number and date. Note in your field note-book:

- ◆ specimen number
- ◆ date
- ◆ name (if known)
- ◆ where collected
- ◆ who collected it
- ◆ type of soil plant is growing in
- ◆ aspect (eg: on the lee side of a slope, on top of a hill, in a valley)
- ◆ other helpful identification information (eg: flower colour)
- ◆ description of the plant the specimen came from (eg: plant form, height, width)

Background



2. PRESSING

To make a press you will need:

- (i) 2 boards - the size of a newspaper folded in half
- (ii) ropes to tie boards together (cotton ropes work the best)
- (iii) 20-30 pieces of corrugated cardboard (same size as boards)
- (iv) double layers of newspaper

Prepare for pressing by:

- (i) placing one board on a flat surface and one piece of corrugated cardboard on top
- (ii) put an unfolded, double layer of newspaper on top of that
- (iii) lay your specimen out on the newspaper so that it can be seen clearly
- (iv) fold the newspaper on top of your specimen and add another piece of corrugated card on top
- (v) continue with another double layer of newspaper and specimen and more card until all items are ready for pressing
- (vi) place a final piece of corrugated card on top of the pile and add the second board
- (vii) rope together very tightly and leave to dry

It is suggested that the press is propped up on its corner so that air can flow through the cardboards and drying is quicker. Normally drying takes a few days in summer and 7-10 days in winter. If the plants are wet or fleshy, the wet pressing papers should be changed after the first 1 or 2 days to avoid mouldy specimens.

Note: Alternately, an old telephone book and bricks can be used as a press:

- (i) place your specimens in newspaper as before
- (ii) interleave them through the telephone book
- (iii) place bricks on top

Using this method newspapers should be changed every 2-3 days.

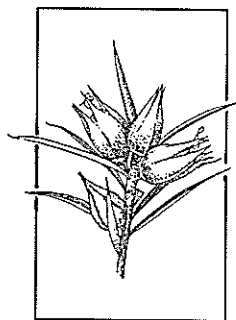
3. DISPLAYING

Specimens are presented on individual cards together with identification and collection details. Attach your specimen to the card with craft glue or sticky tape.

Add the following information:

- ◆ Scientific name
- ◆ Common name
- ◆ Family

Background



- ◆ Description of plant
- ◆ Where collected
- ◆ Date collected
- ◆ Who collected it
- ◆ Soil type
- ◆ Aspect (eg: on the lee side of a slope, on top of a hill, in a valley)
- ◆ Any other comments

To store your herbarium, cards may be placed individually in plastic wallets, sealed in "Contact" or laminated, filed in boxes and stored in the dark. To prevent insect damage, kill any insects by freezing the cards every six months for three days.

The cards should be filed in:

- a. alphabetic family order and then in
- b. alphabetical order of genus/species

It is suggested that your class make an herbarium of both native species and weed species found in your local remnant bushland.

As classes from your school prepare an herbarium every year, an historical record of changes in plant species to be found in your local remnant bushland can be developed.

Number:

Date:

Collected by:

Common name:

Scientific name:

Where found:

Soil type:

Aspect:

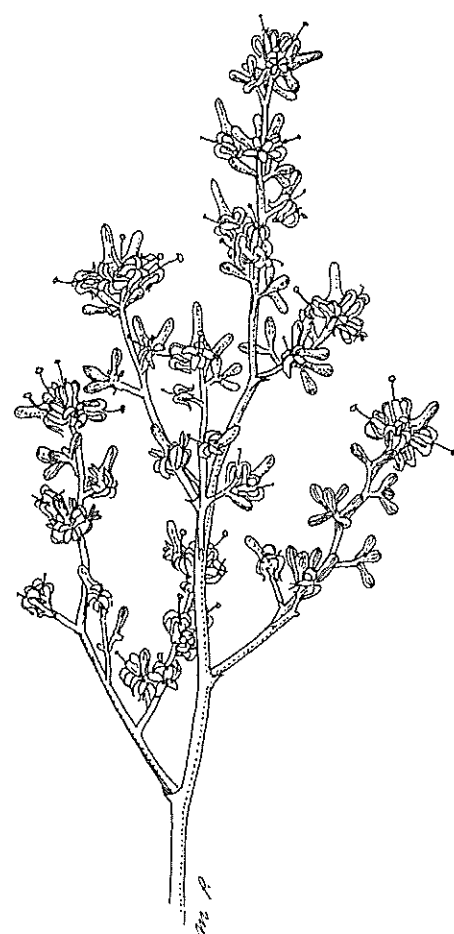
Colour:

Plant form:

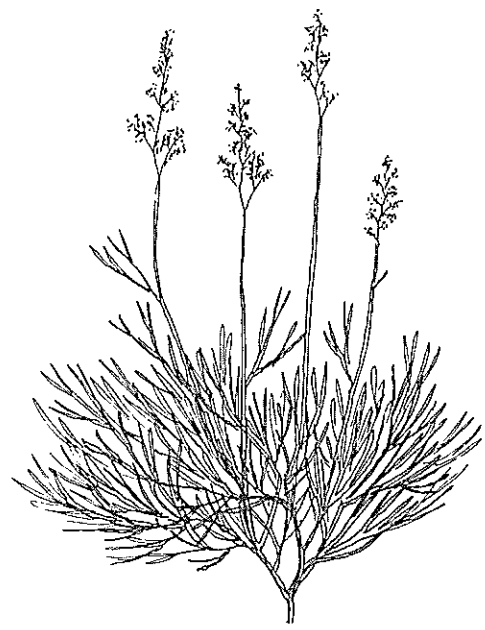
Other notes:



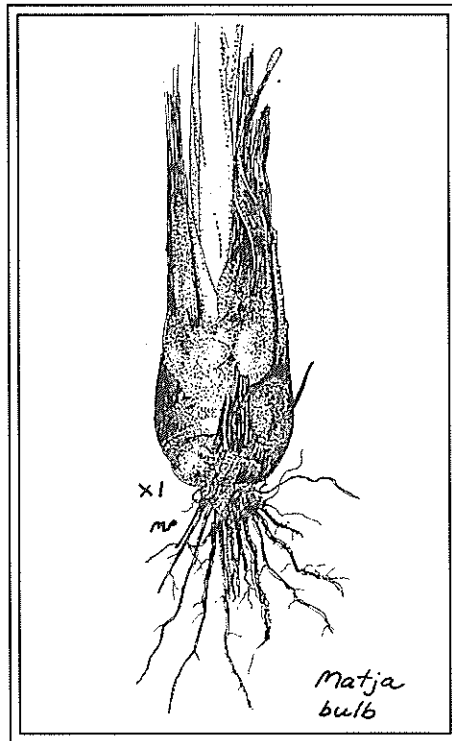
seeds



flowers

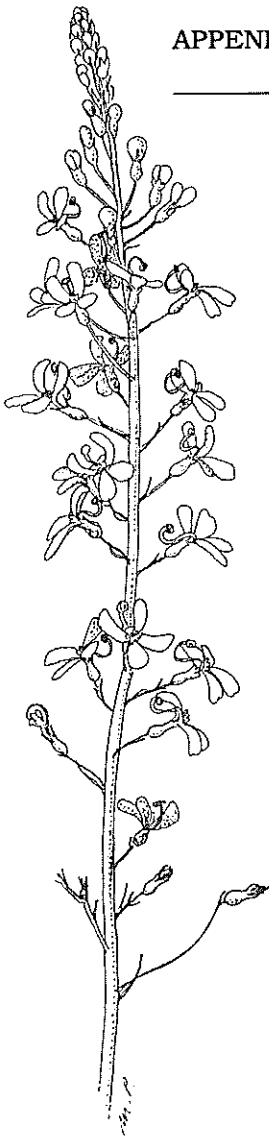


Stirlingia latifolia



APPENDIX 2

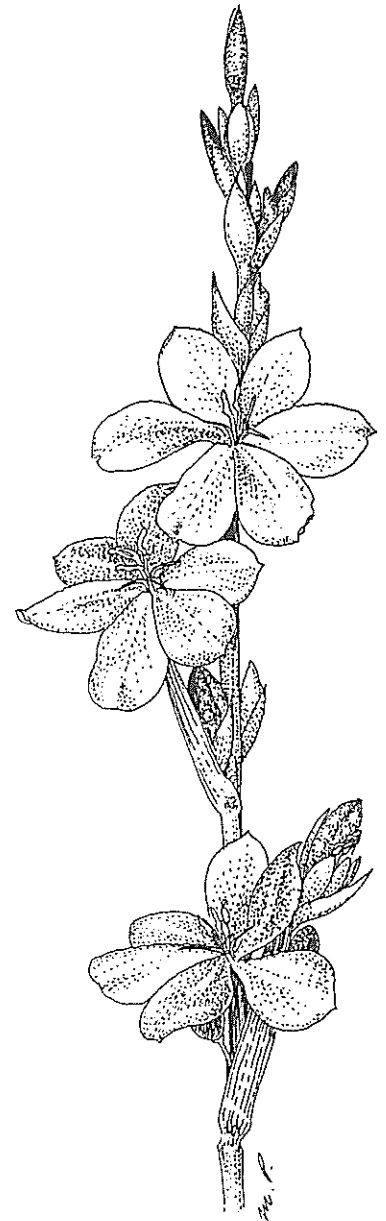
ESTABLISHING NATIVE PLANT GARDENS



*Stylidium
brunonianum*

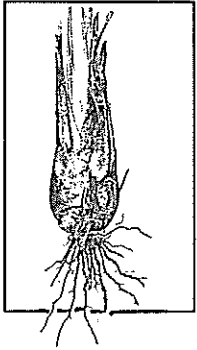


lobelia tenuior



*Onthosanthus
multiflorus*

Background



ESTABLISHING NATIVE PLANT GARDENS

Why?

Establishing a Western Australian native plant garden by revegetating an area in the school grounds with local plants to resemble a local natural plant community will provide:

- ◆ a habitat for local wildlife
- ◆ an on-site resource for language, science, maths, art and social studies.

Specific outcomes include:

- ◆ students acquire basic skills of seed collection and plant propagation
- ◆ students recognise local plants and the associated animals and birds
- ◆ students develop awareness of environmental issues
- ◆ students take an active role in creating their local environment.

What to do:

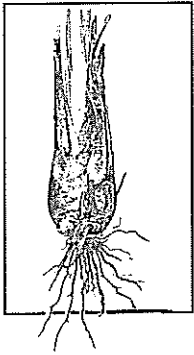
With the involvement of the students and wider school community:

1. Locate an area of the school grounds that can be used as a native plant garden.
2. Decide upon the plants you wish to include in your garden.

Your selection should include representatives of the most common groups found locally, to develop an awareness of local native plants in the area. A mixture of shrubs, trees and non-woody plants will develop an awareness of plant communities.

3. Make a plan of your native garden.
4. Prepare the area.
5. Collect local seed and propagate into plants or obtain seedlings. Obtain permission and/or permits to collect seeds or make cuttings of plants.

Background



6. Plant seedlings or direct seed to take maximum advantage of the rains.
7. Weed your garden as it becomes established.
8. Record the development of your garden.

More detailed information about how to set up a native plant garden can be found in:

Powell, R. and Lake, C. (1993). Growing Local Plants for Education. Department of Conservation and Land Management, Perth.

The establishment of a school native garden can be extended to become a whole school project.

◆ A THEMATIC NATIVE PLANT GARDEN

The selection of plants can be related to a theme or themes and the garden established to reflect this.

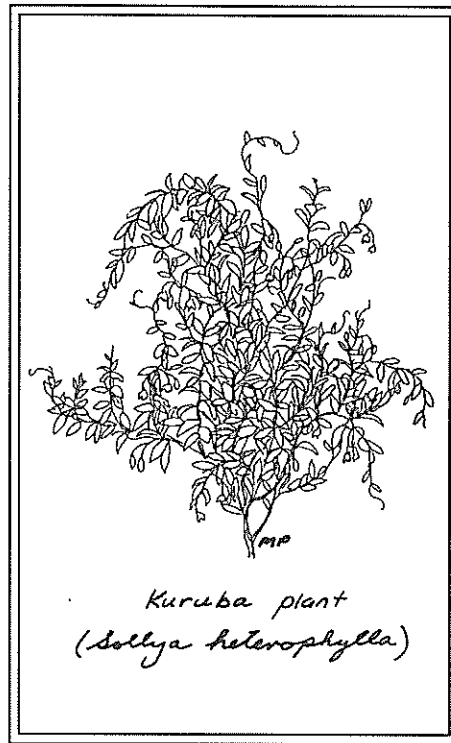
Some themes are:

- ◆ a mini botanic garden with plants from the main plant groups in Western Australia and / or from the main regions in Western Australia
- ◆ a rainbow garden including plants with the flowers of the rainbow
- ◆ a scented garden
- ◆ a bird garden
- ◆ an Aboriginal plants garden

Ensure that the whole school community has ownership of the gardens. This is important both in the establishment of the gardens and the on-going maintenance of the gardens. Native gardens need care just like any garden.

Greening Western Australia organises the "Grow Us A Home" Arbor Day program each year to help students, teachers and the wider school community to plan and carry out a planting project to contribute to the protection and restoration of the environment and, at the same time, learn about local ecosystems.

Further help is available from APACE community nursery in North Fremantle and Greening Western Australia.



APPENDIX 3
"DIEBACK" PLANT DISEASE

APPENDIX 3

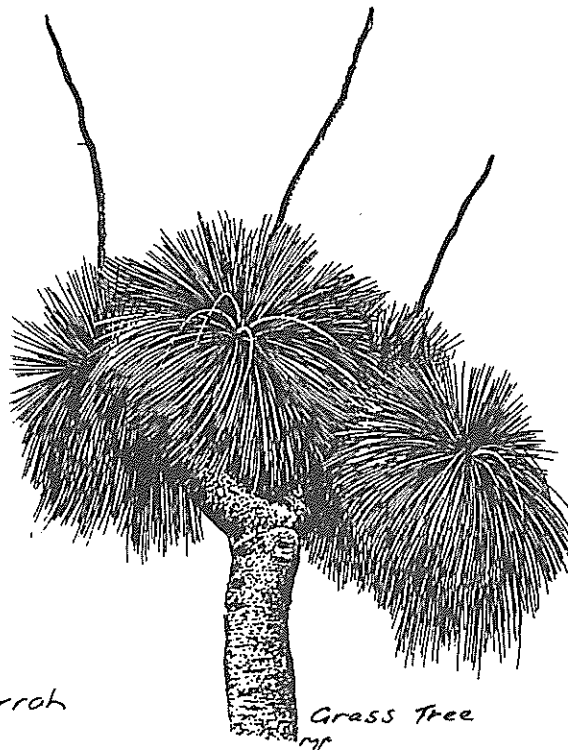
ACTIVITY			YEAR LEVELS			CURRICULUM AREAS						
Number	Title	Page	Junior	Middle	Upper	Science	Social Studies	Health	Maths	Language	Music & Movement	Art & Craft
A.1	Map Reading	287		●	●		●		●			
A.2	Fiendish Fungus	287		●	●	●				●		
A.3	Jingle	287		●	●					●	●	
A.4	Timeline	288		●	●		●		●			
A.5	Latin Words	288		●	●					●		
A.6	Dictionary Meanings	288		●	●					●		
A.7	Word Sleuth	289		●	●					●		
A.8	Crossword	289		●	●	●				●		
A.9	Crack the Code	289		●	●				●	●		
A.10	Poster Design	290		●	●					●		●

Background



"DIEBACK" PLANT DISEASE

The plant disease "dieback", caused by the root fungus, *Phytophthora cinnamomi*, is becoming increasingly widespread in Western Australia, killing a wide range of native plant species, including Banksias, Grass-Trees, Pea plants, Hibbertias and Jarrah trees. Some introduced plants grown as crops, such as avocados and lupins, are also affected by this fungus.



◀ a forest Jarrah

Grass Tree
MP

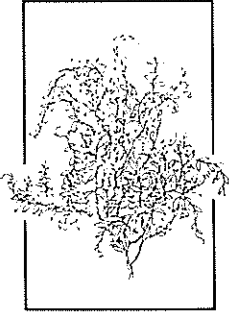
The fungus kills plants by attacking their root systems and interfering with their ability to absorb nutrients from the soil. The fungus lives in the soil amongst plant roots and is spread by water or the movement of infected soils and plants.

Elimination of the disease is difficult and expensive.

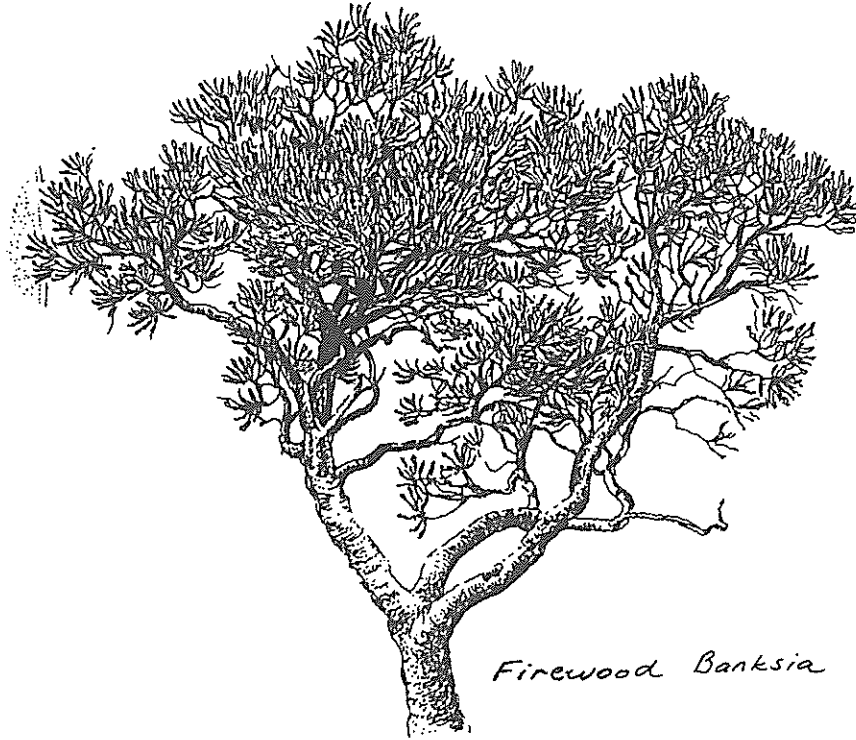


◀ a Swan Coastal Plain Jarrah

Background



Phosphoric Acid can be injected into the tree or a foliar spray can be used. The application of fungicides as a soil drench has also been successful. Regular applications must be applied. Children and schools can help to prevent *Phytophthora* by working with CALM rangers and administering the Phosphoric Acid in supervised programs.

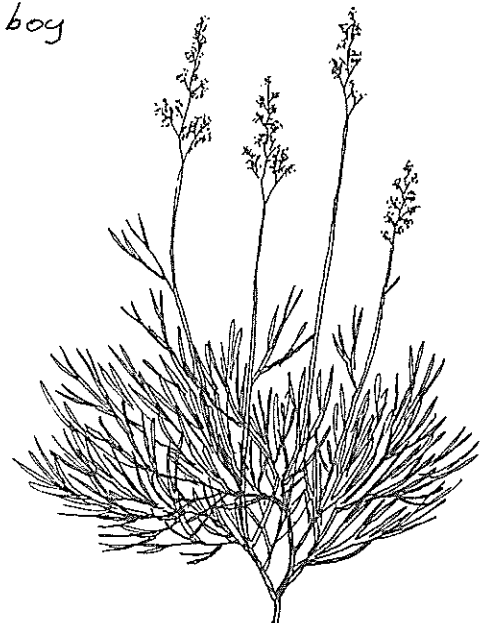
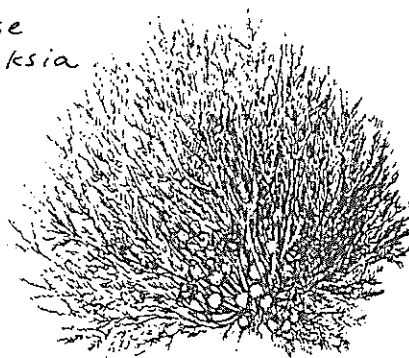


Firewood Banksia

Most new infections are caused by human activities which carry infected soils from place to place. By controlling these practices, the spread of the fungus can be reduced.

Phytophthora infected trees are sometimes recognised by dead branches amongst the higher foliage, or completely dead trees in an area of healthy looking trees, but there are also numerous other causes of these problems.

Blue boy

Rose
Banksia

■ Activity A.1 MAP READING *Resource Sheet 104 page 291*

MIDDLE
UPPER

SOCIAL
STUDIES
MATHS

Use Resource Sheet 104 on the overhead projector. Discuss the problem areas with the class. Explain that *Phytophthora cinnamomi* is only one species of *Phytophthora*, but it is the most prevalent of all the species. It is a tropical fungus enjoying hot, wet soils. It is known to affect at least 10% of our Western Australian native vegetation.

■ Activity A.2 FIENDISH FUNGUS *Resource Sheet 105 page 292*

○ MIDDLE
UPPER

SCIENCE
LANGUAGE

Use Resource Sheet 105 on the Life Cycle of *Phytophthora* to aid this activity. Discuss the life cycle prior to the activity.
Using the life cycle, the students write a story about themselves and life of a fiendish fungus and the trouble it can cause.

■ Activity A.3 JINGLE

MIDDLE
UPPER

○ LANGUAGE
MUSIC &
MOVEMENT

Students make up a jingle or song about the *Phytophthora* fungus. For example:

Freddy the Fungus (to the tune of "Louis the Fly")

*I'm Freddy the fungus, Freddy the fungus
Straight from water drop to tree.
I'm spreading disease with the greatest of ease
Straight from water drop to tree.
I travel in water and cling to roots
Afraid of no one except the kids with the Phosphoric Acid
Hate that rotten Acid.
One injection and Freddy the fungus
Champion of the Fungus Olympics, old Freddy
Poor dead Freddy
Freddy the fungus
A victim of Acid.
A-cid*

■ Activity A.4

TIME-LINE

*Resource Sheet 105 page 292*MIDDLE
UPPERSOCIAL
STUDIES
MATHS

Read out the life cycle of the *Phytophthora* fungus to the class and brainstorm a list of the danger signs with the students. Using this list, make a time-line of the events of dieback disease in a plant.

■ Activity A.5

LATIN WORDS

MIDDLE
UPPER

LANGUAGE

Students work out what the word *Phytophthora* stands for. You may need to do some work on Latin root words. Dictionaries may also help.

Note: The word *Phytophthora* comes from two Latin words:

phyton a plant

phthora destruction

■ Activity A.6

DICTIONARY MEANINGS

MIDDLE
UPPER

LANGUAGE

Students look up in the dictionary the following words that are related to *Phytophthora*:

quarantine	understorey	dieback
disease	dispersal	fungus
root	rot	infection
overstorey	pathogen	spore

Extension: *Play the game "Dictionaries".*

Each student has a closed dictionary. The teacher writes a word on the board and says "Go".

The students search for the word and when the first person finds it, they stand up with their finger on the word and read out the definition to the class.

Individual or group points can be scored.

■ Activity A.7

WORD SLEUTH

*Resource Sheet 106 page 293*MIDDLE
UPPER

LANGUAGE

Students complete the word sleuth on Resource Sheet 106. There is a message in the letters which are not used. This message is in word order even though the words have been split up.

The message is "ALWAYS KEEP OUT OF QUARANTINE AREAS".

■ Activity A.8

CROSSWORD

*Resource Sheet 107 page 294*MIDDLE
UPPERSCIENCE
LANGUAGE

Students complete the crossword on Resource Sheet 107.

Solutions

Across

3. root
5. inject
6. disperse
9. *Phytophthora*
11. infection

Down

1. fungus
2. soil
4. overstorey
7. rot
8. quarantine
9. parasite
10. native

■ Activity A.9

CRACK THE CODE

*Resource Sheet 108 page 295*MIDDLE
UPPERMATHS
LANGUAGE

Students break the code on Resource Sheet 108.

The answer is "ROOT-ROT FUNGUS IS DESTROYING OUR BUSHLAND".

■ Activity A.10

POSTER DESIGN

MIDDLE

UPPER

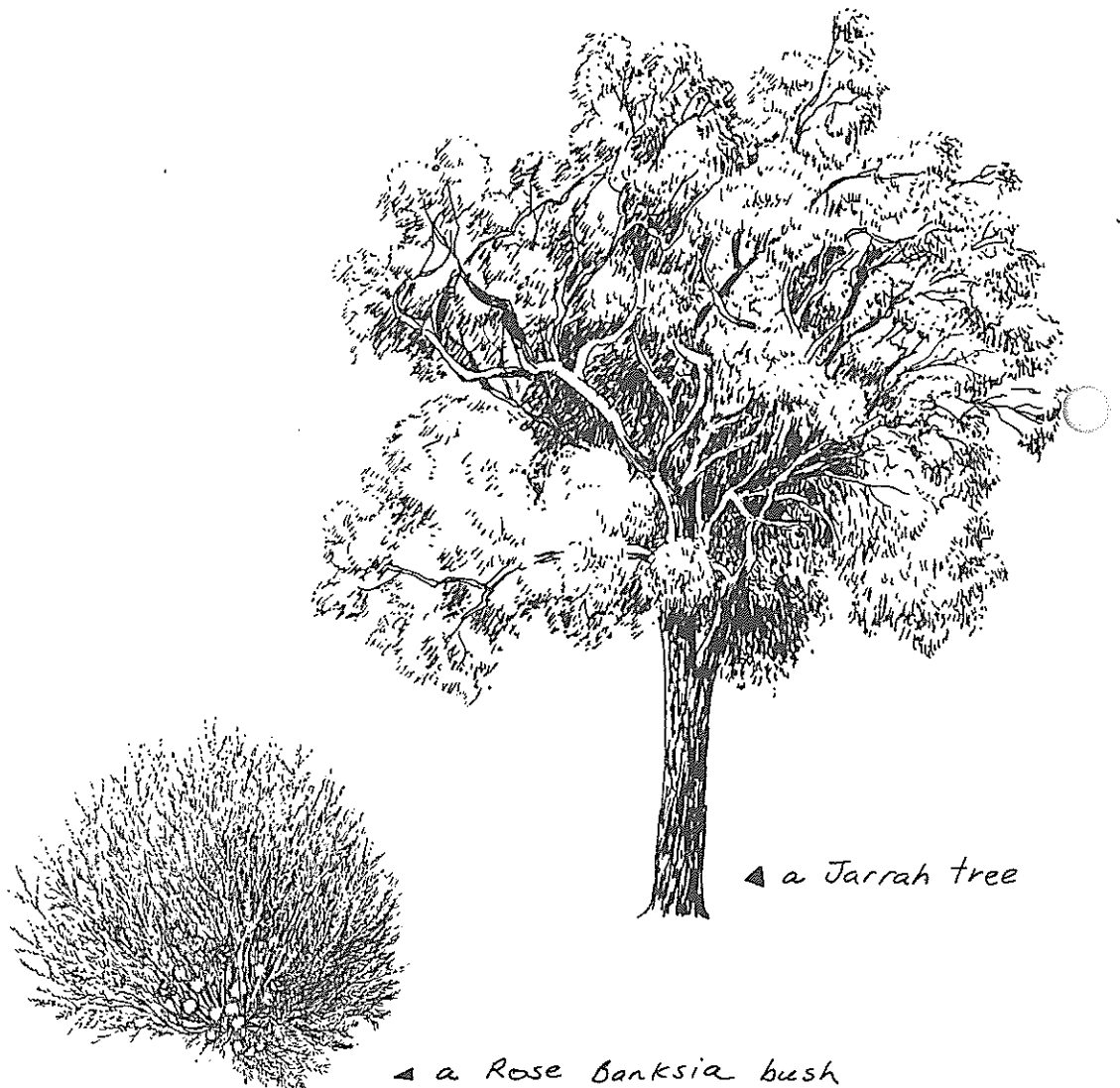
LANGUAGE

ART & CRAFT

Students design a poster of bushland which is susceptible to dieback disease. Include in the poster some of the following and add written captions to explain each thing.

- ◆ a vehicle at a hosing-down bay
- ◆ a quarantine sign
- ◆ a person injecting Phosphoric Acid into a tree at about waist height.
- ◆ a nurseryman sterilising soil to disinfect it
- ◆ a log blocking a road alongside a quarantine sign
- ◆ a concrete dip to drive a car through to rid the tyres of any fungus
- ◆ people following a footpath and walking through a cleansing solution to rid their feet/shoes of fungi
- ◆ people spraying the soles of their shoes with cleansing solution.

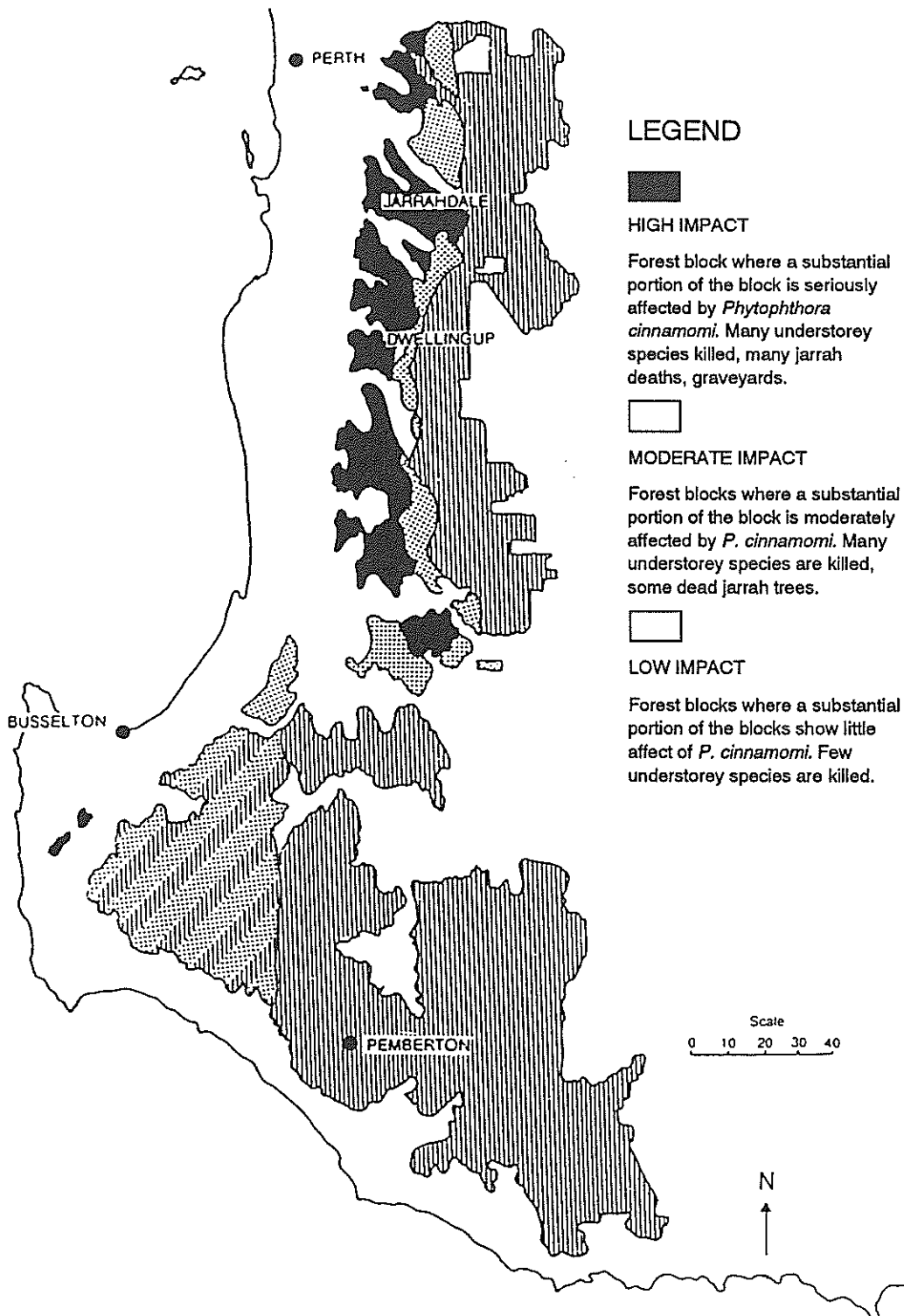
When completed, add a slogan to help prevent the spread of *Phytophthora* and place the posters around the school or community.



Resource Sheet 104

■ Activity A.1 MAP READING

page 287



Impact of *Phytophthora cinnamomi*
 in south-west Western Australia

(Department of CALM Mapping Section)

Resource Sheet 105

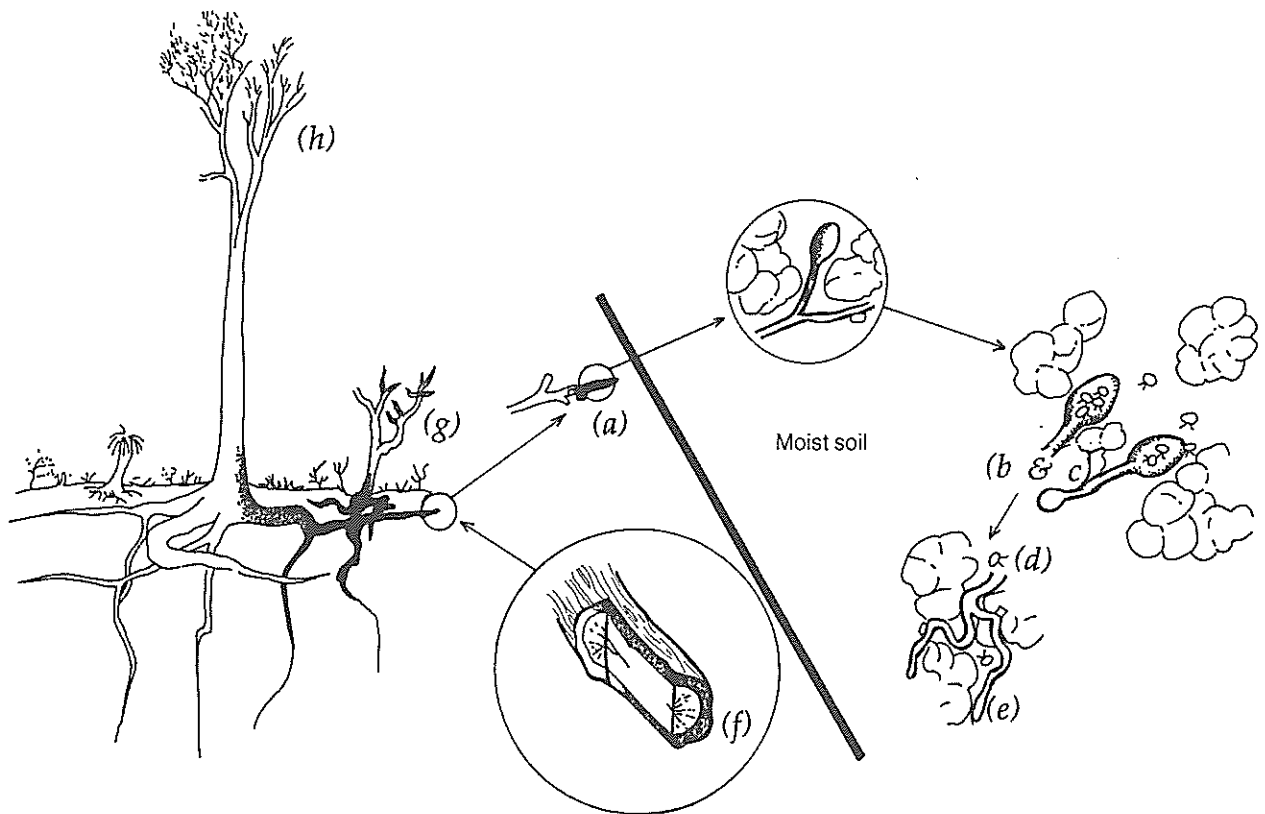
■ Activity A.2 FIENDISH FUNGUS

page 287

■ Activity A.4 TIMELINE

page 288

Life Cycle of *Phytophthora cinnamomi* in the Jarrah forest



Microscopic fungal threads in infected roots (a) form spore bodies (b & c) when the soil is warm and moist. Spore bodies release spores (d) into the water around the root which can actively swim or flow with the water through the soil to un-infected roots (e). Infection occurs when the spores develop into fungal threads which invade the root bark (f) to form lesions. Infections of roots results in death of the plant (g) or decrease in the foliage crown (h).

Resource Sheet 106

■ Activity A.7 WORD SLEUTH

page 289

Find the following words in the Word Sleuth below:

quarantine	understorey	dieback	diseases
fungus	root	rot	infection
dispersal	overstorey	pathogen	spores

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

The letters that remain form a message. Join them together in the same order as you would read a book.

The message is: _____

Resource Sheet 107

■ Activity A.8 CROSSWORD

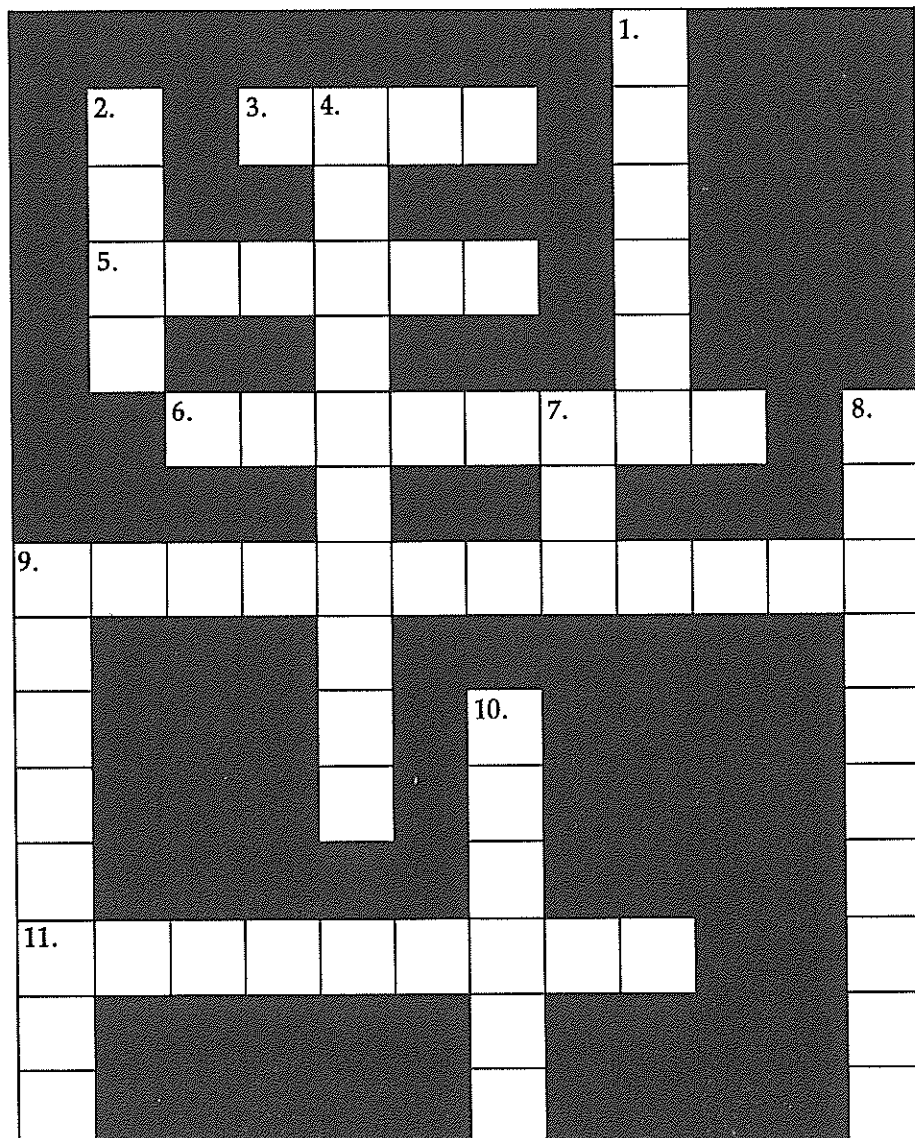
page 289

Across

3. Part of the tree which the fungus attaches itself to
5. Phosphorous Acid is used to _____ the trunk of trees
6. To spread
9. A fungus which causes root-rot
11. An organism causing disease establishes itself on its host

Down

1. A lower form of plant life which cannot make its own food and gets energy from dead or living plant or animal tissue
2. Plants need this to survive
4. Opposite to understorey
7. The process when organic material breaks down
8. Restriction of entry to vehicles into a particular area of forest
9. Something which lives off its host
10. Belonging to a given area



Resource Sheet 108

■ Activity A.9 CRACK THE CODE page 289

There is a hidden message on the document below.

All you have to do is crack the code.

□□□▼ □□▼ *◆■*◆▲ *▲

**▲▼□□|*■* □◆□ ○◆▲*●*■*

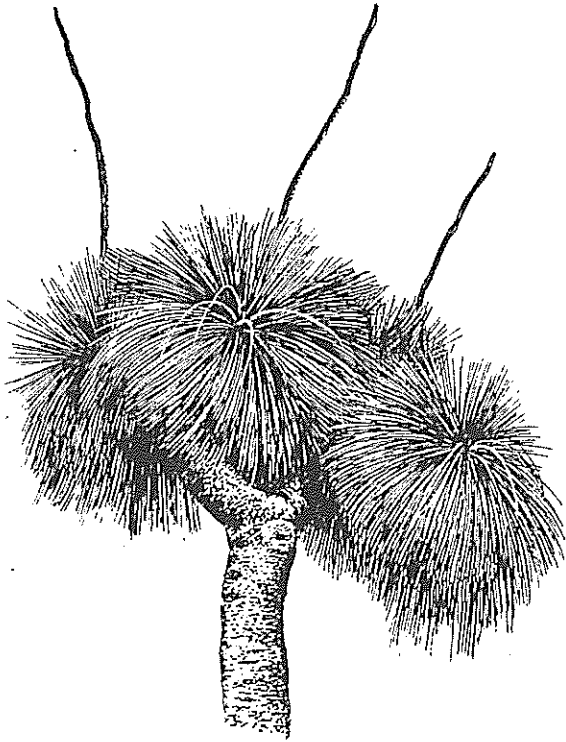
Hint:

a = *	b = ○	c = *	d = *
e = *	f = *	g = *	h = *
i = *	j = *	k = *	l = ●
m = ○	n = ■	o = □	p = □
q = □	r = □	s = ▲	t = ▼
u = ◆	v = ◆	w = ◐	x =
y =	z = ■		

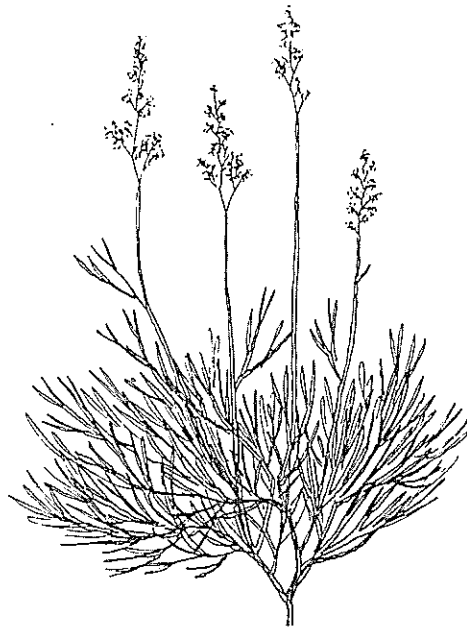
Now make up your own message using this code.

Try it out on your partner.

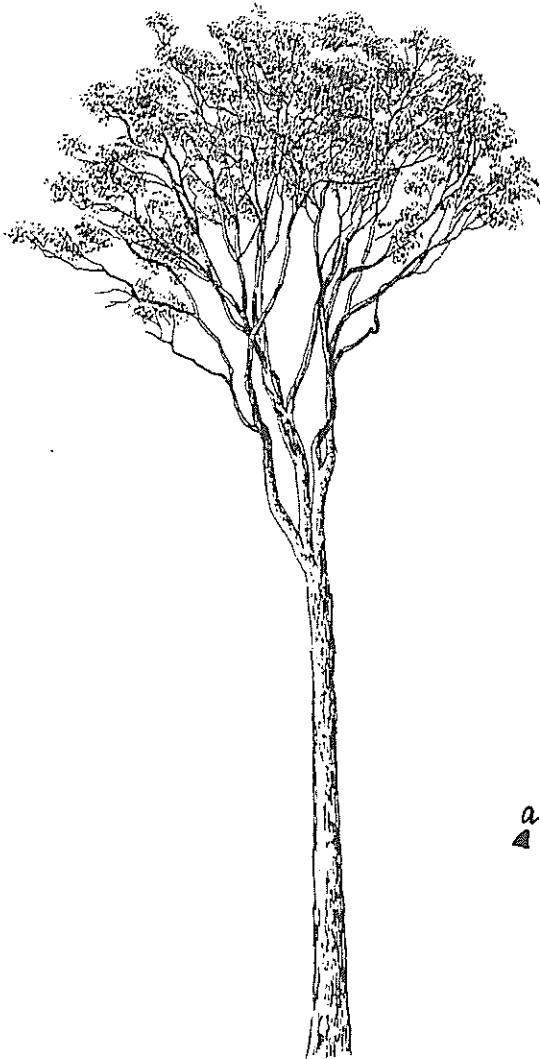
plants which are
susceptible to dieback



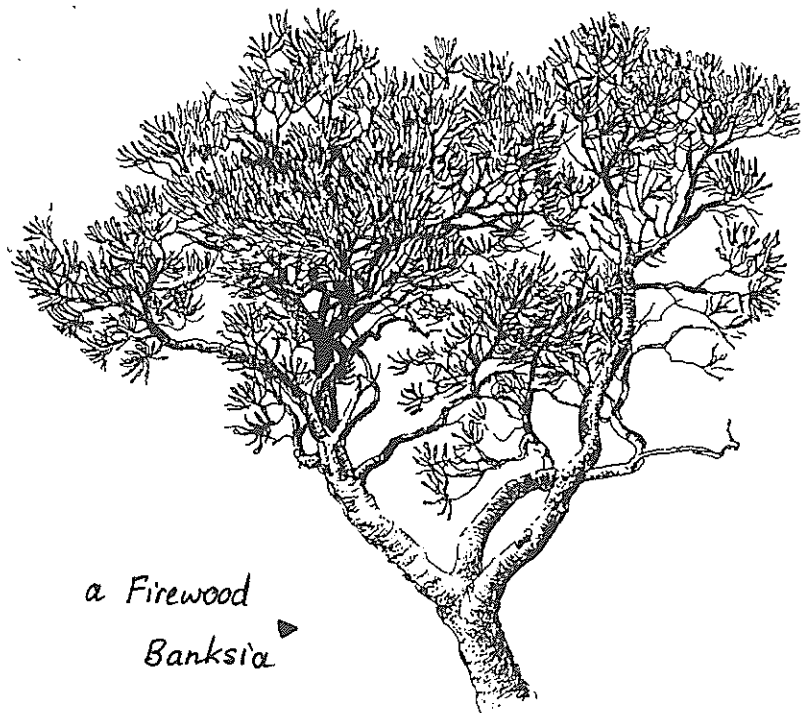
▲ a Grass Tree



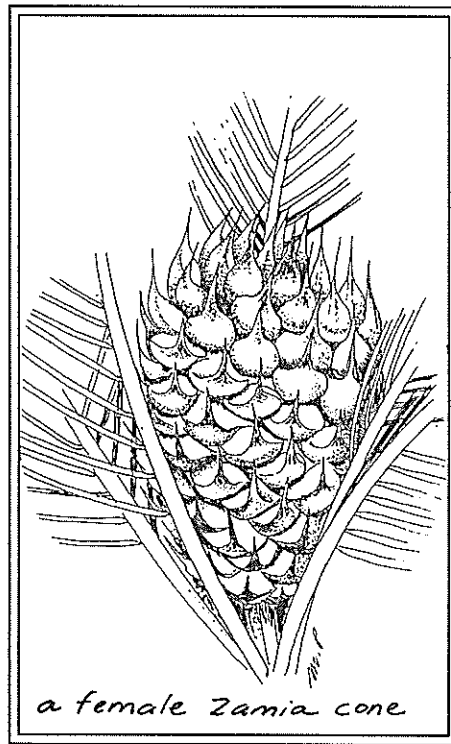
a Blueboy ►



▲ a forest
Jarrah



a Firewood
Banksia ►



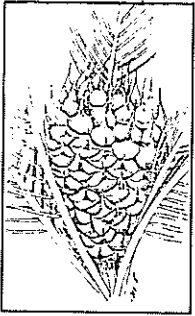
a female Zamia cone

APPENDIX 4 OBTAINING HELP



*Establish a native
garden in your school.*

Background



OBTAINING HELP

There are specialist groups throughout Western Australia that can help you with general and specific advice about native plants in the bush and in cultivation.

GREENING WESTERN AUSTRALIA

Greening Western Australia's purpose is to contribute to sustainable land-use in Western Australia by enhancing the State's tree and shrub cover. Its Schools Education Program develops students' understanding of, involvement in and long-term commitment to the conservation, restoration and expansion of local native vegetation to contribute to sustainable land-use throughout Western Australia.

Contact Greening Western Australia on (09) 481 2144 or write to
The Education Manager,
1118 Hay Street, West Perth, WA 6005
for further information.

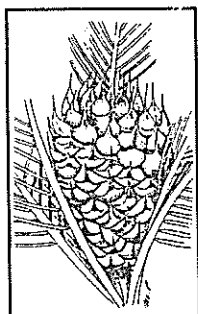
DEPARTMENT OF CONSERVATION
AND LAND MANAGEMENT (CALM)

CALM is responsible for managing all lands vested in the National Parks and Nature Reserve Authority and the Forests and Land Commission, that is all National Parks, Nature Reserves and State Forest. Botanists working for CALM are located at the Research Centres, Manjimup and Woodvale, and the Western Australian Herbarium. Local information is available from the Regional Offices and these have Rangers working in the field with knowledge of specific areas and Reserves. Some Regional Offices have Ecologists located with them.

CALM also has a Community Education Section dealing with environmental education. Interpretation Officers are attached to some Regional Offices. These are indicated by a *

The Central Office is located in
50 Hayman Road, COMO
PO Box 104, COMO WA 6152
Telephone (09) 334 0333

Background



The Regional Offices, most with attached District Offices are

***Central Forest**

Bunbury (097) 25 4300

District Offices Busselton, Collie, Grimwade, Harvey, Kirup,
Ludlow, Margaret River and Nannup

Gascoyne and Greenough

Geraldton (099) 21 5955

District Offices Carnarvon, Exmouth and Moora

Goldfields

Kalgoorlie (090) 21 2677

Kimberley

Kununurra (091) 68 0200

District Office Broome

***Metropolitan**

Mt Pleasant (09) 364 0777

***Northern Forest**

Kelmscott (09) 390 5977

District Offices Dwellingup, Jarrahdale, Mundaring, Wanneroo
and Yanchep

***Pilbara**

Karratha (091) 86 8258

District Office Dampier

South Coast

Albany (098) 41 7173

District Office Esperance

***Southern Forest**

Manjimup (097) 71 1988

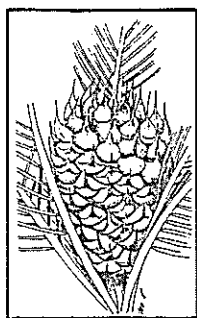
District Offices Northcliffe, Pemberton and Walpole

Wheatbelt

Narrogin (098) 81 1696

District Offices Katanning, Pingelly and Wongan Hills

Background



KINGS PARK AND BOTANIC GARDEN

Kings Park contains the State's Botanic Garden. Over 2000 Western Australian plants can be seen growing in the Gardens and the Display Glasshouses. The Garden is laid out on geographic lines and the Glasshouses contain plants that require drier or more humid conditions than prevail outside. A garden of rare and endangered plants is located beside the Glasshouses.

Kings Park and Botanic Garden was reserved as a public park in 1872 and is still predominantly bushland, similar to what it was at the time of settlement of Western Australia. Comprehensive books on the flora and fauna of the bushland and a management plan for the bushland has been developed.

Kings Park is a centre for horticultural and botanical research in the State. The Horticultural Advisory Officer and the Park's Botanists are available for advice to the public.

The Kings Park Voluntary Guides lead public walks through the Botanic Gardens and Bushland in Winter and Spring. The Guides also lead walks for primary school children through Kings Park and have developed activities to support those walks.

Kings Park can be contacted on (09) 321 4801, 321 5065 and 321 5228 and by writing to the

Director, Kings Park and Botanic Garden,
West Perth, WA 6005.

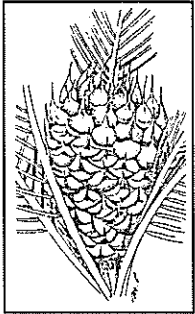
WILDFLOWER SOCIETY OF WESTERN AUSTRALIA

The Wildflower Society is a voluntary body, concerned with the conservation of wildflowers through the provision of an adequate reserve network and cultivation. With over 700 members in six Metropolitan Branches and six Country Branches there is probably a member near your school. The Branches have regular meetings addressed by various experts on plant groups and cultivation and hold excursions to areas of botanical interest.

The Society sells native plant seeds and publishes literature on Western Australian plants. Members of the Society receive a quarterly newsletter and copies of "The Australian Plants Journal".

Contact the central office on (09) 383 7979
or write to The Secretary,
PO Box 64, Nedlands, WA 6009.

Background



WESTERN AUSTRALIA NATURALIST'S CLUB

The Naturalist's Club is a voluntary conservation group that encourages the study of natural history in all its branches and endeavours to prevent the wanton destruction of native flora and fauna. The main body meets at their own Naturalists Hall in Nedlands to listen to talks on the flora and fauna of the State. Regular excursions to areas of interest to natural historians are organised. The Club has three Branches in the Metropolitan Area and Country Branches.

The Club produces a monthly newsletter and publishes a quarterly journal, "The Western Australian Naturalist" and handbooks.

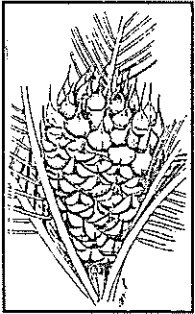
Contact the Club on (09) 389 8085
or write to PO Box 156, Nedlands, WA 6009.

WESTERN AUSTRALIAN HERBARIUM

The Herbarium is part of CALM. Although predominantly a research institution there are more botanists working here than at any other location in the State. The Herbarium is a plant museum and houses a Research Collection of 400,000 specimens of pressed plants that act as references for all work done on native plants in Western Australian. The Herbarium also has a Community Reference Herbarium for public access and a collection of books on identifying Western Australian plants. A native plant garden surrounds the Herbarium and incorporates a self-guided nature trail.

Contact the Herbarium on (09) 334 0500
or write to them via the Central Office of CALM.

Background



LOCAL PLANTS GROUP

This is a group formed to encourage the cultivation and study of the wild plants naturally occurring in an area. The group encourages and supports the growing of gardens containing the appropriate locally occurring native plants. At times the group organises, with the appropriate permission, the transplanting of plants from bushland that is to be cleared.

Contact the Local Plants Group through the Secretary,
Margaret Hansen
31 Auborough St, Doubleview WA 6018
Telephone (09) 446 4719

OTHER GROUPS

Universities The University of Western Australia has a Botany Department and there are Biology and Environmental Science Departments at Murdoch, Curtin and Edith Cowan Universities, all of which employ botanists.

Local Landcare Group

Men of the Trees

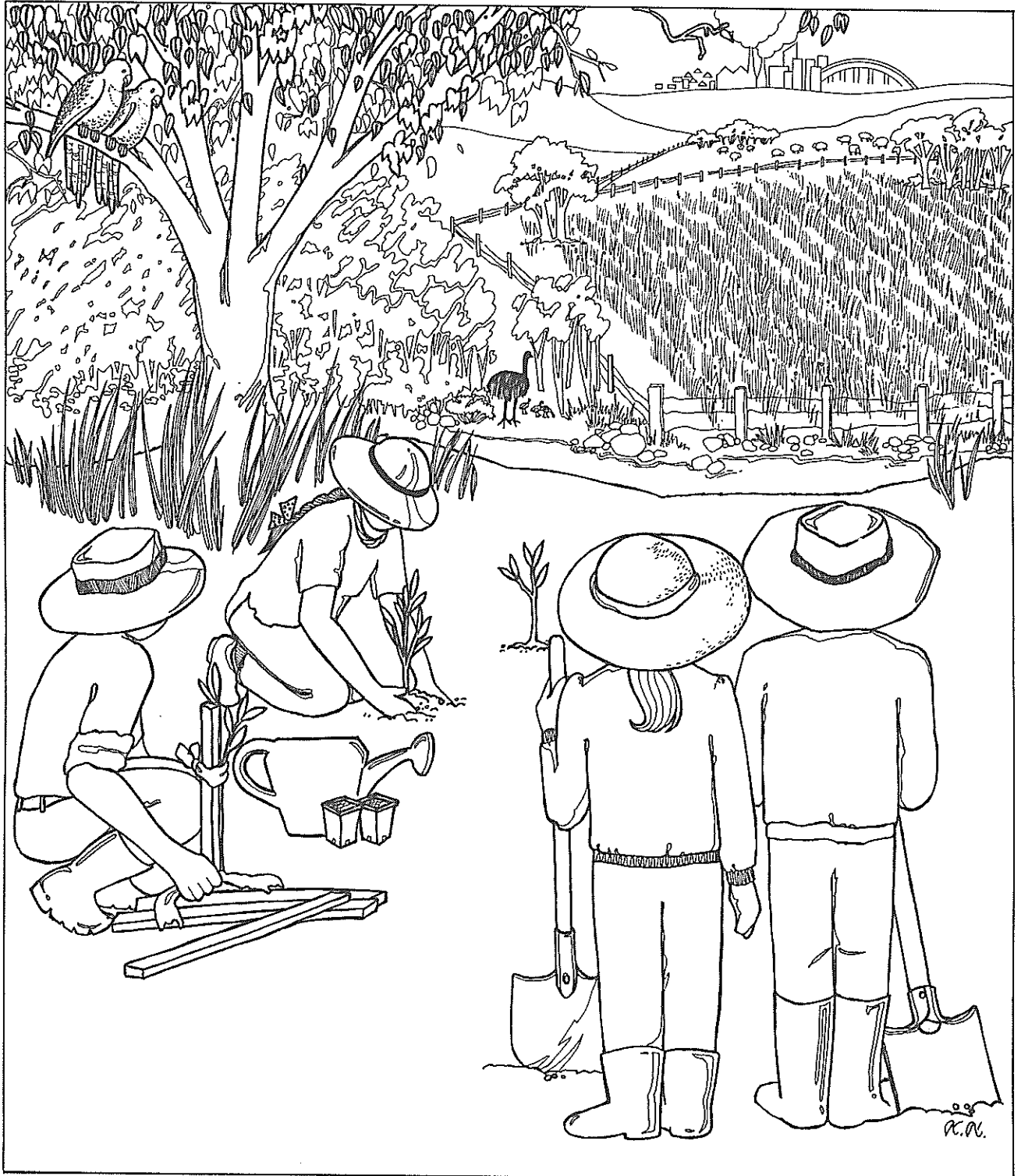
Tree Society

Australian Association of Bush Regenerators

GETTING STARTED

Many students have very little experience with plants, let alone the concept of native plants. Before embarking on the "Our Wild Plants" Package try involving students in the magic of our wildflowers:

- ◆ with a talk from a person from one of the above groups.
- ◆ have a mini 'Wildflower Show' of cultivated wildflowers
- ◆ use plant materials as the subject of colour and/or shape exercises in Art.
- ◆ design a T-Shirt with the patterns developed from native plants.
- ◆ go on a spring excursion to the bushland
- ◆ read literature with an Australian Bush flavour

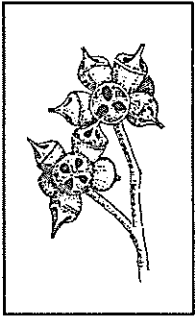


*Getting involved in planting
'Our Wild Plants'*



REFERENCES

References



GENERAL WESTERN AUSTRALIAN PLANTS

Blackall, W.E. and Grieve, B. J. (1954-88). *How to Know Western Australian Wildflowers; A Key to the Extratropical Regions of Western Australia*. University of Western Australia Press, Nedlands. Part 1 (1988), Part 111 (1980-81) and Part IV (1975) revised by B.J. Grieve.

Erickson, R.E., George, A.S., Marchant, N.G. and Morcombe, M.K. (1973). *Flowers and Plants of Western Australia*. Reed, Sydney.

Gardener, C.A. (1968). *Wildflowers of Western Australia*. W.A. Newspapers Ltd, Perth.

Hopper, S.D., Van Leeuwen, S., Brown, A.P. and Patrick, S.J. (1990). *Western Australian Endangered Flora*. Dept. of CALM, Perth.

Morcombe, M.K. (1969). *Australia's Western Wildflowers*. Landfall Press, Perth.

Pate, J.S. and McComb, A.J. (1981). *The Biology of Australian Plants*. University of Western Australia Press, Nedlands.

Pate, J.S. and Dixon, K.W. (1982). *Tuberous, Cormous and Bulbous Plants*. University of Western Australia Press, Nedlands.

Pate, J.S. and Beard, J.S. (1984). *Kwongan Plant Life of the Sandplain Biology of a South-West Shrubland Community*. University of Western Australia Press, Nedlands.

Satrawaha, R. and Bull, C.M. (1981). The Area Occupied by an Omnivorous Lizard, *Trachydosaurus rugosus*. *Aust. Wildl. Res.* 8, 435-42

Seddon, G. (1972) *Sense of Place - A response to an Environment: The Swan Coastal Plain*, Western Australia.

Sharr, F.A. (1988). *Western Australian Plant Names and their Meanings*. University of Western Australia Press, Nedlands.

Taylor, J. (1990). *Australia's Southwest and Our Future*. Kangaroo Press, New South Wales.

PLANT COMMUNITIES

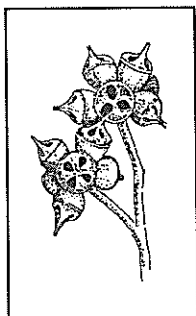
Beard, J.S. (1990). *Plant Life of Western Australia*. Kangaroo Press, Australia.

Erickson, R.E., George, A.S., Marchant, N.G. and Morcombe, M.K. (1973). *Flowers and Plants of Western Australia*. Reed, Sydney.

Hussey, B.M.J. et al. (1989) *Guidelines for Bush Corridors*. Western Australia.

Seabrook, J. (1994) *Growing Understorey Seed*. Greening Western Australia. Western Australia.

References

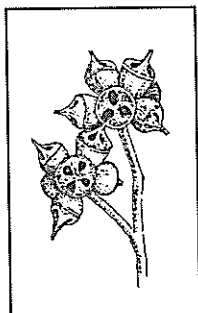
**BUSHLAND VALUES, MAINTENANCE AND REGENERATION**

- Beadle, B. (1990). 'How Many Trees' *Aust. Nat. Hist.*, Vol 23 (4), 274.
- Bradley, J. (1988). *Bringing Back The Bush*. Landsdowne Press, Sydney.
- Beckwold, R. (1986). *The Last Stand*. Australian Government Publishing Service, Canberra.
- Buchanan, R.A. (1989). *Bush Regeneration - Recovering Australian Landscapes*. TAFE, NSW.
- Hobbs, R. and Wallace, K. (1991). Remnant Vegetation of Farms is a Valuable Resource. *WA Journal of Agriculture* 2
- Keighery, B.J. (1994). *Bushland Plant Survey*. Wildflower Society of Western Australia.
- Powell, R. & Lake, C. (1994). *Growing Local Plants for Education*. Department of Conservation and Land Management, Perth.
- The Department of Planning and Urban Development (1994) *Draft Urban Bushland Strategy*. D.P.U.D. Western Australia.
- The National Trust of Australia. (W.A.) (1994) *Urban Bushland Policy*. The National Trust of Australia . Western Australia.

LOCAL GUIDES TO WILD PLANTS AND ASSOCIATED FAUNA

- Bennett, M.E. and Dundas, P.J. (1988). *The Bushland Plants of Kings Park, Western Australia*. Kings Park Board, Perth.
- Dell, B. and Bennett, I.J. (1986). *The Flora of the Murdoch University: A Guide to the Native Plants on Campus*. Murdoch University, Perth.
- Department of Conservation and Environment. (1980). *Atlas of Natural Resources*, Darling System, Western Australia.
- Hussey, B.M.J. et al. (1987). *A Naturalist's Guide to Perth*. Handbook No. 13. W.A. Naturalist's Club Inc., Perth.
- Keighery, B.J. (1994). *Bushland Plant Survey*. Wildflower Society of Western Australia.
- Keneally, K.F. (Co-ordinator) (1977). *The Natural History of Wongan Hills*. W.A. Naturalist Club, Perth.
- Marchant, N.G. et al. (1987). *Flora of the Perth Region: Parts One and Two*. WA Herbarium, Perth.

References

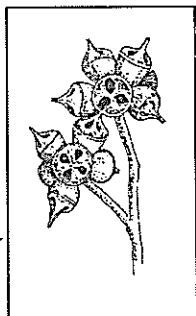


- Motherwell, A. et al. (1988). *A Guide to the Flora and Fauna of the Rockingham Offshore Islands and Cape Peron*. Kwinana Rockingham Mandurah Branch of the WA Naturalist's Club, Perth.
- Powell, R. and Emberson, J. (1981). *Woodman Point: A Relic of Perth's Coastal Vegetation*. Artlook Press, Perth.
- Powell, R. (1990). *Leaf and Branch*. Dept. of Conservation and Land Management, Perth.
- WA Museum. (1992). *City Bushlands*. Western Australian Museum, Perth.

DETAILED WORKS ON INDIVIDUAL GROUPS OF WESTERN AUSTRALIAN PLANTS

- Brooker, M.I.H. and Kleinig, D.A. (1990). *Field Guide to Eucalypts: Volume 2. South-western and Southern Australia*. Inkata Press Pty Ltd, Melbourne.
- Erickson, R.E. (1965). *Orchids of the West*. 2nd Ed. Paterson Brokensha Pty Ltd, Perth.
- Erickson, R.E. (1968). *Plants of Prey*. University of Western Australia Press, Nedlands.
- Erickson, R.E. (1981). *Triggerplants*. University of Western Australia Press, Nedlands.
- George, A.S. (1985). *The Banksia Book*. Kangaroo Press, Kenthurst, New South Wales.
- George, A.S. (1984). *An Introduction to the Proteaceae of Western Australia*. Kangaroo Press, Kenthurst. New South Wales.
- Hoffman, N. and Brown, A. (1992). *Orchids of South-West Australia*. 2nd Ed. University of Western Australia Press, Nedlands.
- Hopper, S. (1993). *Kangaroo Paws and Cats Paws*. Department of Conservation and Land Management, Perth.
- Holiday, I. and Watton, G. (1990). *A Field Guide to Banksias*. Hamlyn, Australia.
- Holiday, I. and Watton, G. (1990). *A Field Guide to Melaleuca*. Hamlyn, Australia.
- Keighery B.J. & Pieroni, M. (1989). *Gum Tree Pack*. Wildflower Society of W.A., Nedlands.

References



Lawrie, A. (1987). *Carnivorous Plants of Australia*. Vol. 1. University of Western Australia Press, Nedlands.

Muir, B.C. (1977) *Biological Survey of the Western Australian Wheatbelt*. Part II. Records of the Western Australian Museum, Supplement 3.

Lawrie, A. (1989). *Carnivorous Plants of Australia*. Vol. 2. University of Western Australia Press, Nedlands.

Nikulinski, P. (1991). *The Banksia Book*. Fremantle Arts Centre Press. Fremantle.

Powell, R. (1990). *Leaf and Branch*. Dept. Conservation and Land Management, Perth.

Sainsbury, R.M. (1985). *A Field Guide to Dryandras*. University of Western Australia Press, Nedlands.

Sainsbury, R.M. (1987). *A Field Guide to Isopogons and Petrophiles*. University of Western Australia Press, Nedlands.

Taylor, S. and Hopper, S.D. (1988). *The Banksia Atlas*. Australian Flora and Fauna Series No 8. Aust. Gov. Pub. Service, Canberra.

JOURNALS WITH SECTIONS ON WESTERN AUSTRALIAN PLANTS AND ANIMALS

Journal of the Society for Growing Australian Plants. (1963 - continuing).

Landscape. (1985 - continuing) Dept. of CALM.

Journal of the Royal Society of Western Australia

W.A. Naturalist. Journal of the W.A. Naturalist Club

HISTORICAL TREATMENTS

Basset, M. (1981). Augusta and Mrs Molloy in *People and Plants in Australia*, p357-383; Eds Carr, D.J. and Carr, S.G.M., (1981). Academic Press, Sydney.

Carr, D.J. and Carr, S.G.M. (1981). *People and Plants in Australia*. Academic Press, Australia.

Finney, C.M. (1984). *To Sail Beyond the Sunset Natural History in Australia 1699-1829*. Rigby, Australia.

References

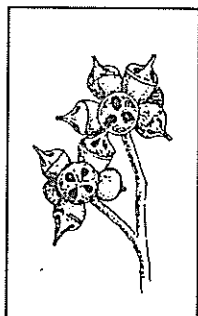


- Hamley, G. and Watterson, B. Eds. (1986). *In and Around Augusta*. 6th Edition. Augusta Historical Society, R. Griffiths, Busselton.
- Hasluck, A. (1990). *Portrait with Background*. Fremantle Arts Centre Press, Fremantle.
- Jacob, T.K. and Vellios (1988). *Southland - The Maritime Exploration of Australia*. W.A. Ministry of Education.
- Jarvis, N. Ed. (1986). *Western Australia: An Atlas of Human Endeavour*. 2nd ed. W.A. Gov Print, Wembley.
- Marchant, L.R. (1982). *France Australe*. Artlook Books, Perth.
- Popham, D. (Ed.). (1978). *Reflections*. Carroll's Pty. Ltd., Perth.

ABORIGINAL LIFE

- Bennett, E., Bindon, P. and McKay, P. (1990). *Plants Used by the South Western Aborigines* Pamphlet from the Western Australian Museum.
- Bindon, P. (1982). *National Botanic Garden Aboriginal Trail*. Pamphlet. National Botanic Garden, Canberra.
- Carr, D.J. and Carr, S.G.M. (1981). 'The Botany of the first Australians'. in Carr, D.J. and Carr, S.G.M. (1981). *People and Plants in Australia*. Academic Press, Australia, p.3-46.
- Cribb, A.B. and J.W. (1988). *Wild Food in Australia*. 2nd Ed. Collins Publishers, Australia.
- Green, N. (1984). *Broken Spears*. Focus Education Services, Perth.
- Hallam, S.J. (1975). *Fire and Hearth: a study of the usage and European usurpation in south-western Australia*. Aust. Inst. Aboriginal Studies, Canberra.
- Hamley, G. and Watterson, B. (Eds). (1986). *In and Around Augusta*. 6th Edition Augusta Historical Society, R. Griffiths, Busselton.
- Hammond, J.E. (1933). *Winjan's People. The Story of the South West Australian Aborigines* Facsimile Ed. (1980). Hesperian Press, Victoria Park.
- Isaacs, J. (1987). *Bush Food: Aboriginal Food and Herbal Medicine*. Weldons, Sydney.
- Low, T. (1988). *Wild Food Plants of Australia*. Angus and Robertson, Eden Park.

References



- Low, T. (1989). *Bush Tucker*. Arthur Collins, Sydney.
- Low, T. (1990). *Bush Medicine*. Arthur Collins, Sydney.
- Meagher, S. J. (1974). 'The Food Resources of the Aborigines of the South-West of Western Australia' Records of the WA Museum, 3, part 1, p.14-65.
- Reid, E. (1977). 'The Records of Western Australian Plants used by Aborigines as Medicinal Agents'. WA Institute of Technology, now Curtin University, Bentley.

PLANT AND ANIMAL INTERACTIONS

- Burrows, R. (1986). *Forest Explorer* Dept. Conservation and Land Management, Western Australia.
- Dubas, G. and Bull, C.M. (1991). Diet Choice and Food Availability in the Omnivorous Lizard, *Trachydosaurus rugosus*. *Wildl. Res.*, 18, 147-55
- Lamont, B. (1989). 'Biotic and abiotic interactions in *Banksia* Woodland.' *Journ. Royal Soc. of WA*, 71 (4), p 99-100.
- Keighery, G.J. (1985). 'Natural History Notes on the Flora of Kings Park'. *WA Naturalist*, Vol 16 (1),
- Mc Millan, P. and Baldwyn, J. (1990). *Exploring Granite Outcrops*. Dept. Conservation and Land Management, Western Australia.
- Saunders, D.A. (1980). 'Food and Movements of the Short-Billed Form of the White-Tailed Black Cockatoo'. *Aust. Wildl. Res.*, 7, p.257-69.

ANIMAL GROUPS

- Blakers, M., Davies, S.J. and Reilly, P.N. (1984). *The Atlas of Australian Birds*. Melb. University. Press, Melbourne.
- Common, I.F.B. and Waterhouse, D.F. (1975). *Butterflies of Australia*. Angus and Robertson, Sydney.
- Frith, H.J. (Ed) (1976). *1977 Reader's Digest Complete Book of Australian Birds*. Reader's Digest Services Ltd, Sydney.
- Holm, E. (1988). *On Pollination and Pollinators in Western Australia*. Eigil Holm, Denmark.

References



Porter, B.D. (Ed.). (1985). *Birdlife of Murdoch. A Guide to Local Species.* Murdoch University, Perth.

Storr, G.M. and Johnstone, R.E. (1979). *Field Guide to The Birds of Western Australia.* Western Australian Museum, Perth.

Tingay, A. & S. (1982). *Common Animals in Kings Park and Perth Gardens.* Kings Park Board, Perth.

CHILDREN'S STORY BOOKS

Baker, J. (1991). *Window.* Julia MacRae Books, London.

Ets, M. H. (1976). *Play with Me.* Puffin, New York.

Liddelow, L. (1984). *Talk with Me.* Longman Cheshire, Sydney.

Roughsey, D. (1975). *The Rainbow Serpent.* Collins, Sydney.

EDUCATION

Department of Conservation and Land Management. (1992). *Discovering the Hills Forest.* Department of Conservation and Land Management, Perth.

Department of Conservation and Land Management (1994). *Exploring Wheatbelt Woodlands.* Department of Conservation and Land Management.

Powell, R. and Lake, C. (1994). *Growing Local Plants for Education.* Department of Conservation and Land Management, Perth.

Van Matre, S. (1972) *Acclimatisation.* American Camping Assoc. Inc., Indiana, USA.



GLOSSARY



*Banksia Woodland
scenery*

Glossary



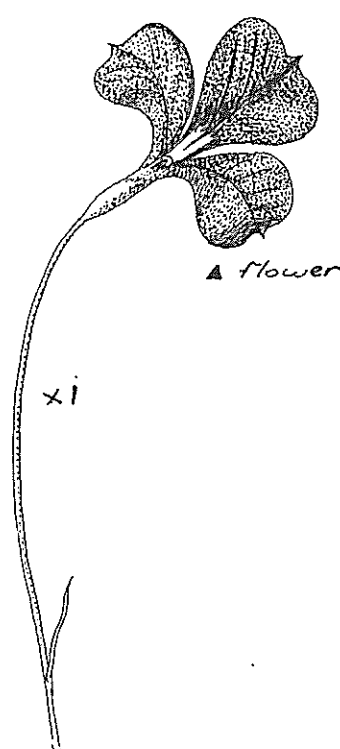
Aboriginal person: a native inhabitant of Australia or a descendant of a native inhabitant.

aestivate: to pass the summer in a dormant condition.

adapted: an organism suited to its habitat and way of life.

adaptation: a feature which suits an organism to its environment.

annual: a plant that completes its life cycle in one year.



Baio (Nyungar): the seeds of Zamia Palm, *Macrozamia riedlei*.

Zamia Palm

female cone

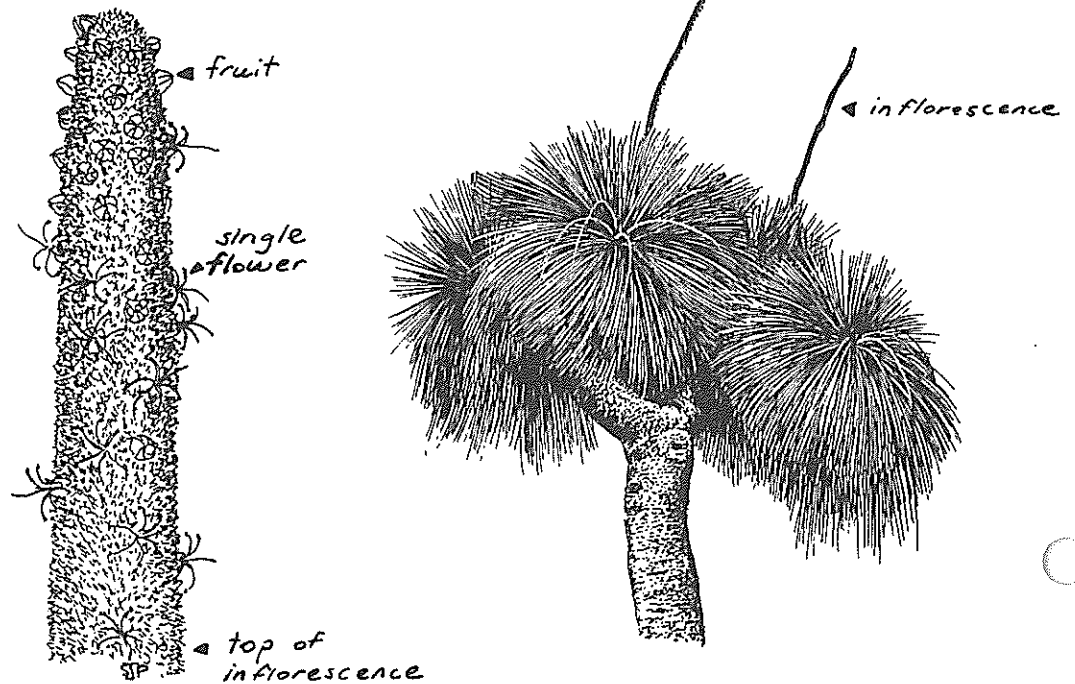
plant

male cones

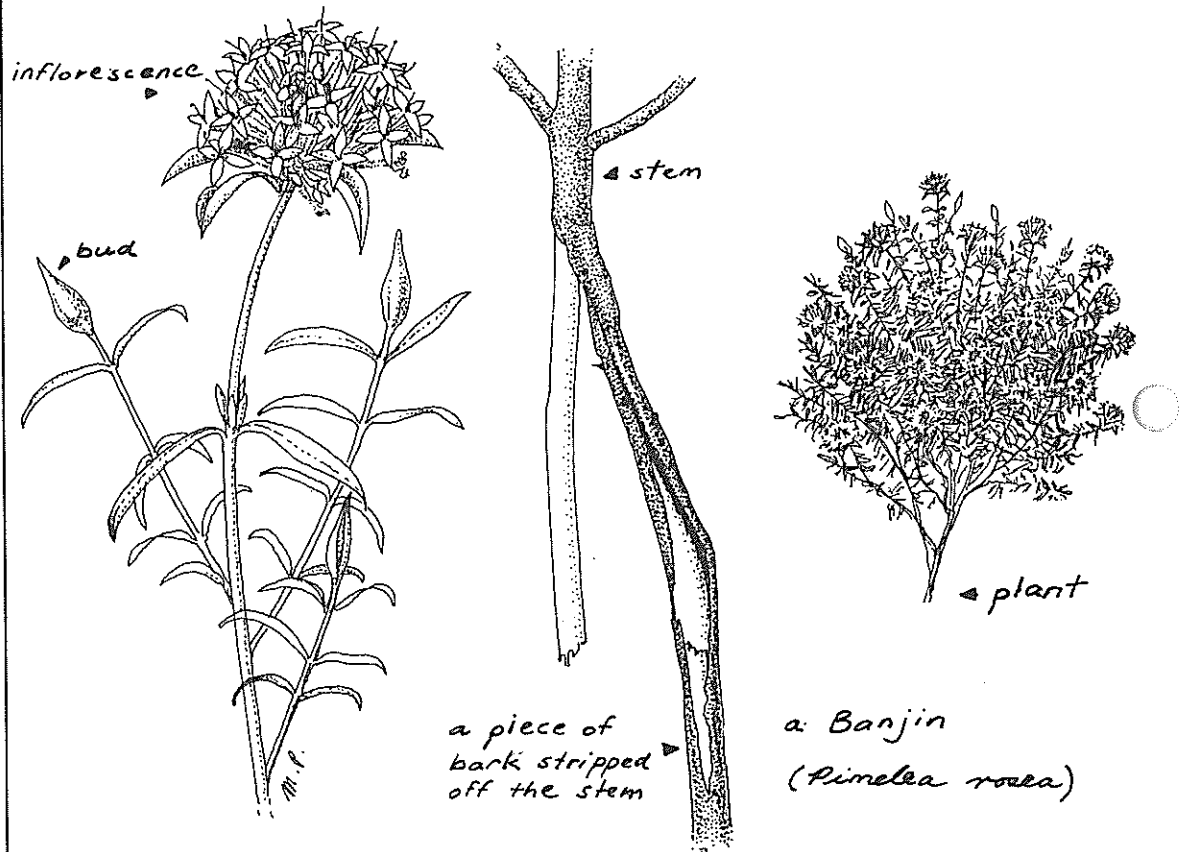
Glossary



Balga (Nyungar): the Grass Tree, *Xanthorrhoea preissii*.



Banjin (Nyungar): the bark of *Pimelea* species, a low shrub.



Bard-ya (Nyungar): a white quartz used for knife or spear heads.

biennial: a plant that grows for two years, reproducing and dying in its second year.

Bigo or Piring: the resin of the Grass Tree *Xanthorrhoea preissii*. See Balga above.

Glossary



biodiversity (biological diversity): the variety of organisms, the species themselves and their genetic diversity and the assemblages they form, the communities and ecosystems.

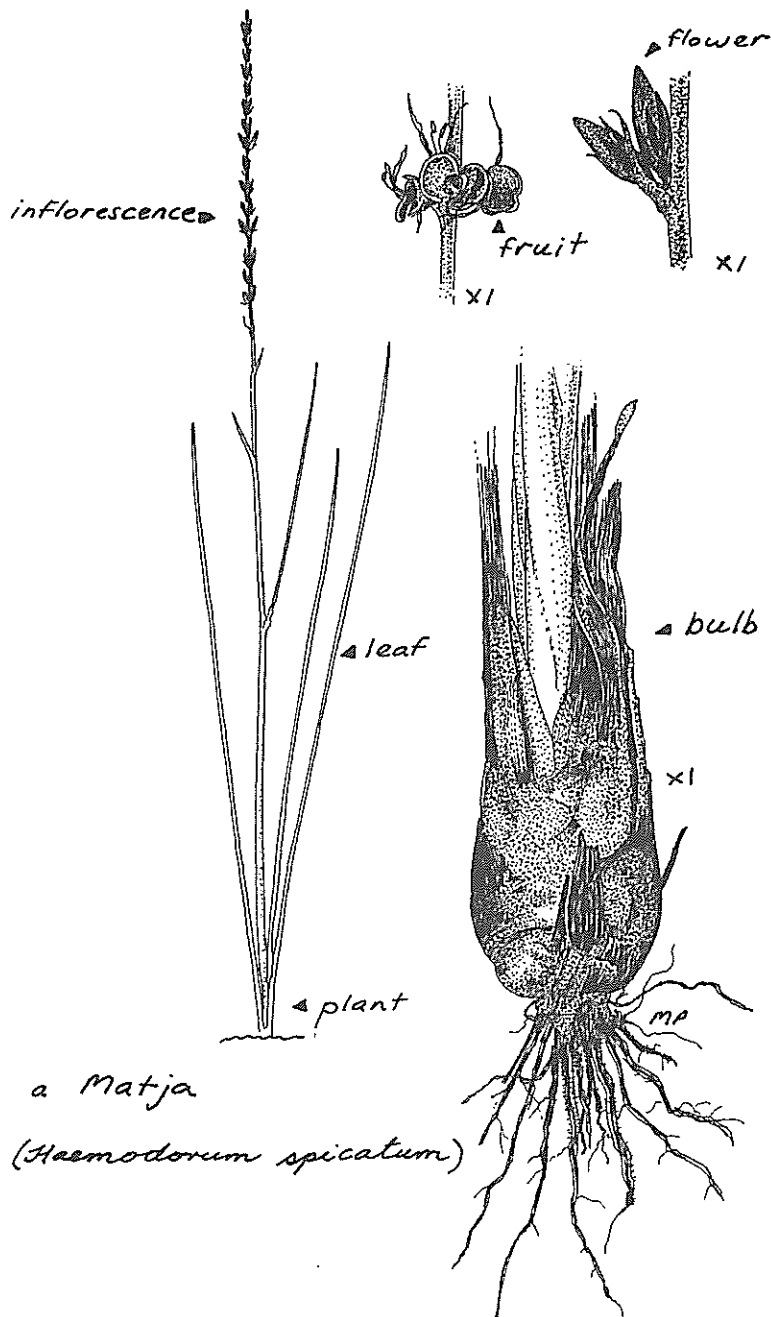
biology: the study of living organisms.

Borail (Nyungar): spear.

botanic garden: a place in which plants are grown, studied and exhibited.

botanist: a person who studies plants.

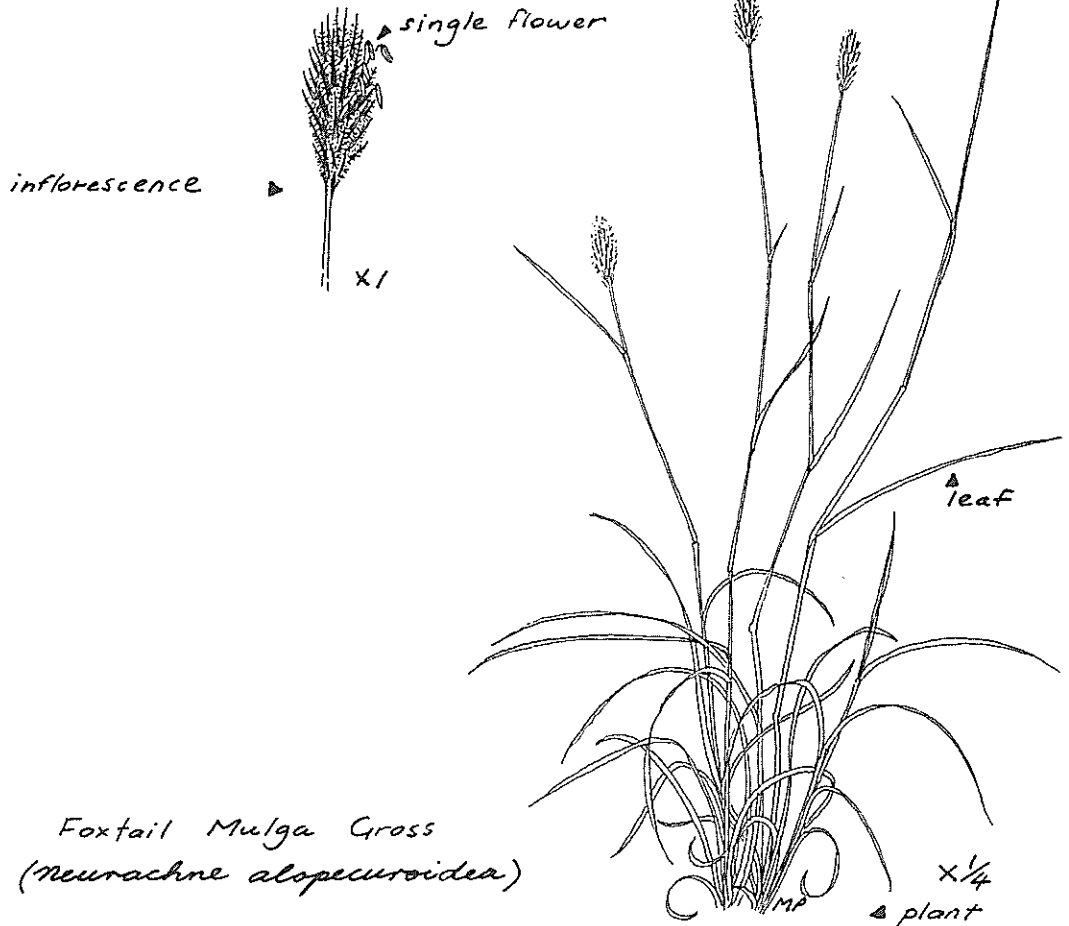
bulb: a short underground stem, surrounded by fleshy leaf bases that stores food and encloses one or more buds for the next season's growth.



Glossary



bunch grasses: an annual or perennial grass that spreads in clumps.

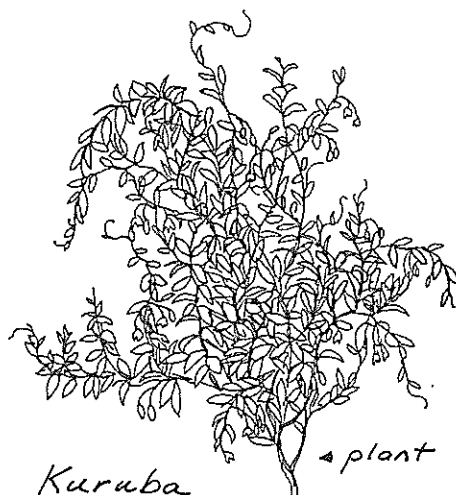


Foxtail Mulga Grass
(*Neurachne alopecuroides*)

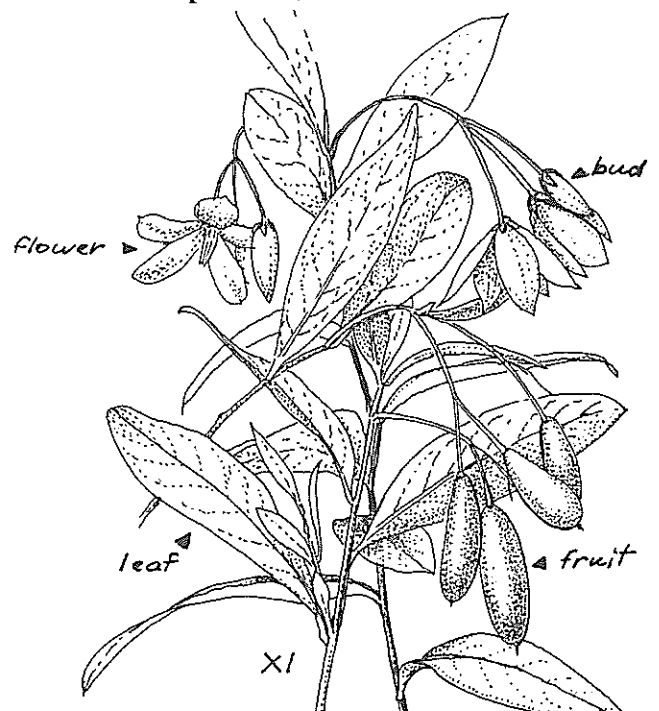
bushland: a native plant and animal community; land on which there is vegetation which is either a remainder of the natural vegetation of the land, or, if altered, is still representative of the structure and floristics of the natural vegetation. See Activity Cards 1 - 16

canopy: the green leaves of a plant forming a roof like structure.

climbers: plants that support themselves on other plants by stems or tendrils.



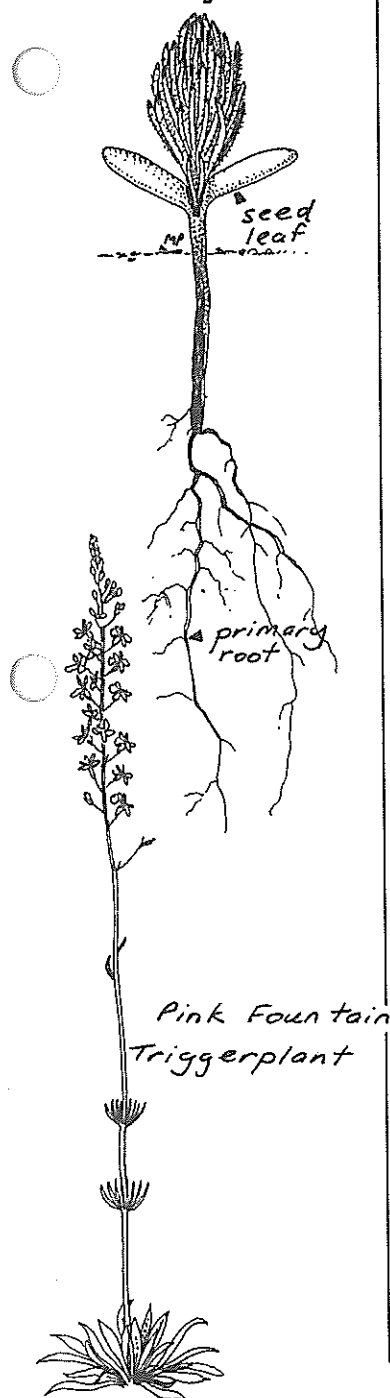
Kuruba
(*Sollya heterophylla*)



Glossary



a dicotyledon
seedling



collecting dish: a shallow dish hollowed from wood, called a coolaman in central Australia.

conservation: process by which humans support the living processes to maintain a living planet.

Coojong: (Nyungar) the wattle, *Acacia saligna*.

common name: the colloquial name given to a plant species (the same name may be used for several species). Alternatively one plant may have several different common names.

corm: a solid reduced underground stem that stores food and lasts for one year, being replaced by a new corm formed above the old one the following year.

cuticle: a protective waxy layer covering the leaf surface of flowering plants.

Dedin (Nyungar): spear.

dicotyledons: one of the two groups of flowering plants; having two seed leaves (cotyledons), may be woody or non-woody, forming a primary root with smaller secondary roots, leaf veins forming a network and floral parts usually in 4's or 5's.

digging sticks: shaped wooden pole with sharpened ends used for digging and as a club.

ecosystem: a living system through which matter and energy flow.

endemic: having a natural distribution confined to a geographical region, grows nowhere else.

European person: a native inhabitant of Europe or a descendant of a European inhabitant of Europe.

exotic: an introduced plant, not local to the area.

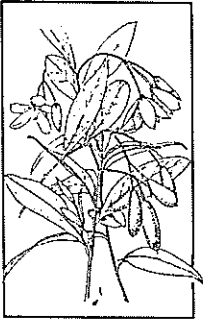
family: the major groupings of flowering plants, members of each group sharing a set of common floral characteristics. Families are divided into genera, genera sharing a larger number of floral characteristics. Genera are divided into species which share the same floral and other characteristics. All family names are made up of the first named genus in the family and the ending -aceae. For example the trigger plant Family, Stylidiaceae after the first named genus, *Stylidium* with the ending -aceae.

fauna: the total animal life of an area; usually the total number of animal species and their variants in a specified period, geological stratum, geographic region, ecosystem community or habitat.

fern: a non-flowering vascular plant reproducing by spores.

flora: the total plant life of an area; usually the total number of plant species and their variants in a specified period, geological stratum, geographic region, ecosystem community or habitat.

Glossary



flower: the portion of the plant containing the male and female parts necessary for reproduction. These are:

- (i) male parts (stamens) each having a stalk (filament) and a pollen sack (anther) holding the pollen:
- (ii) female parts (ovules), which on fertilisation become the seeds, enclosed in the ovary; the stigma which receives the pollen and the style that connects the stigma to the ovary.

When acceptable pollen lands on the stigma the pollen grows a long pollen tube down the style into the ovary to an ovule.

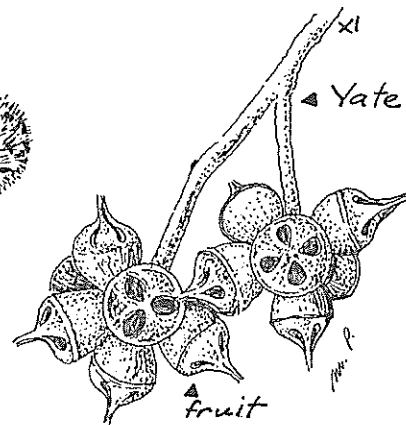
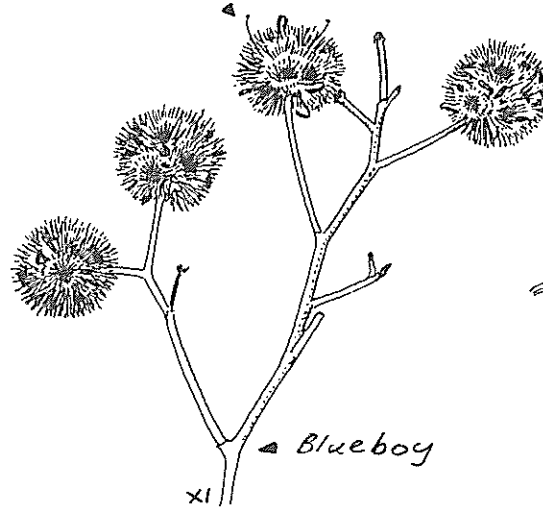
Fertilisation occurs when a nucleus from the pollen grain fuses with a nucleus from the ovule to form one nucleus. This grows to become an embryo plant within a seed. The ovary and the structures surrounding it grow to become the fruit to protect the seeds.

The other parts of flowers, the sepals and petals, are to protect the flower before it opens. If the sepals and petals are brightly coloured they will attract animals to the open flowers. Flowers are designed to attract animals so that the animals will carry pollen from one flower to another (cross-pollination) to enable the plant to make the best possible seed. See page 334 for illustrations.

flowering plants: plants bearing flowers (angiosperms).

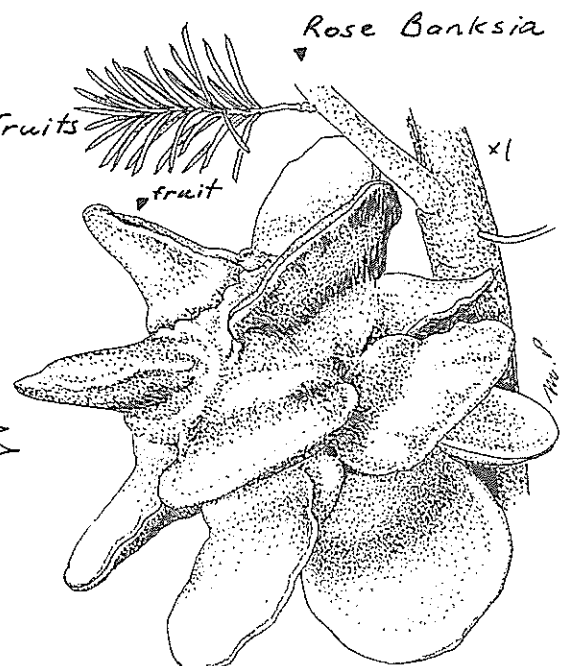
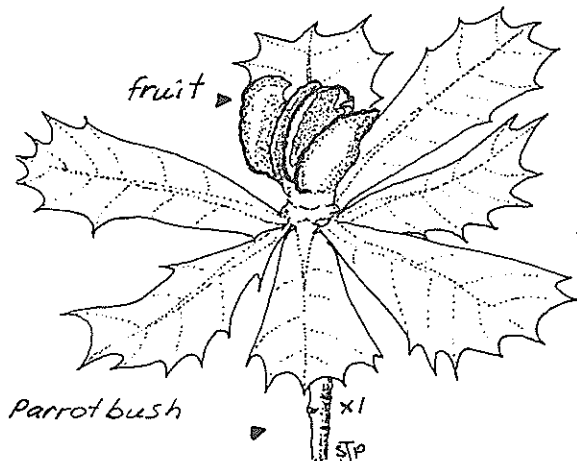
fruit: the ripe ovary containing the seeds.

a head of fruit



Morning Iris

• a collection of wild plant fruits



Glossary



fuel: flammable material used for obtaining energy by burning.

genus: see family.

germination: when the seed begins to grow.

grass: a monocotyledonous plant of the family *Poaceae*, having jointed stems sheaved by long narrow leaves having a ligule at the top of the sheaf and bearing inconspicuous flowers that are pollinated by wind.

habitat: the place or type of place where a plant normally grows and an animal naturally occurs.

heath: a dense to mid-dense low shrubland, one metre or less in height, with small leaves.

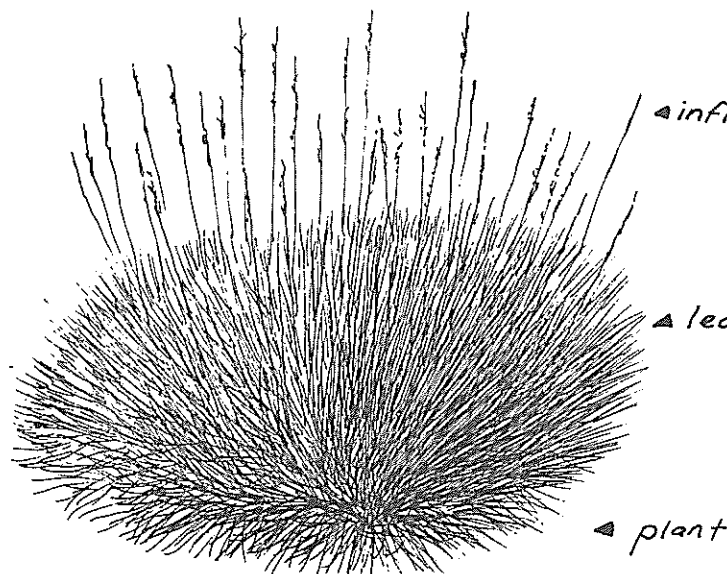
herbarium: a collection of preserved, dried plant material. Also refers to the building in which they are stored.

herbs: an annual or perennial plant with non-woody stems.

heritage: those places, being components of the natural environment or the cultural environment, that have aesthetic, historic, scientific or social significance or other special value for future generations as well as for the present community.

hummock grasses: perennial grasses forming dome-shaped hummocks.

a *Spinifex* (*Triodia*)



inflorescence

single flower

inflorescences

leaves

plant

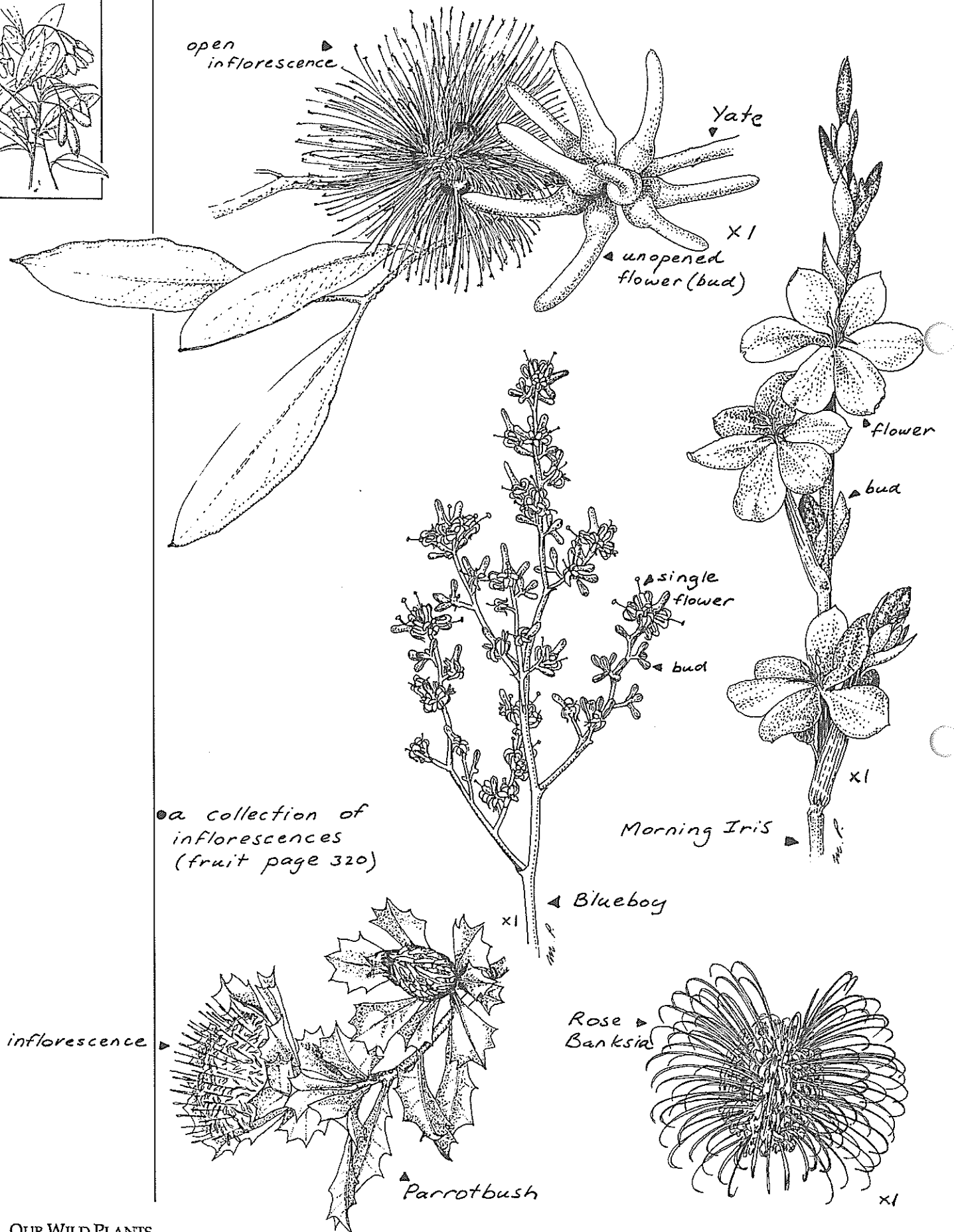


Glossary



indigenous: native to an area.

inflorescence: a flowering shoot, generally of more than one flower.

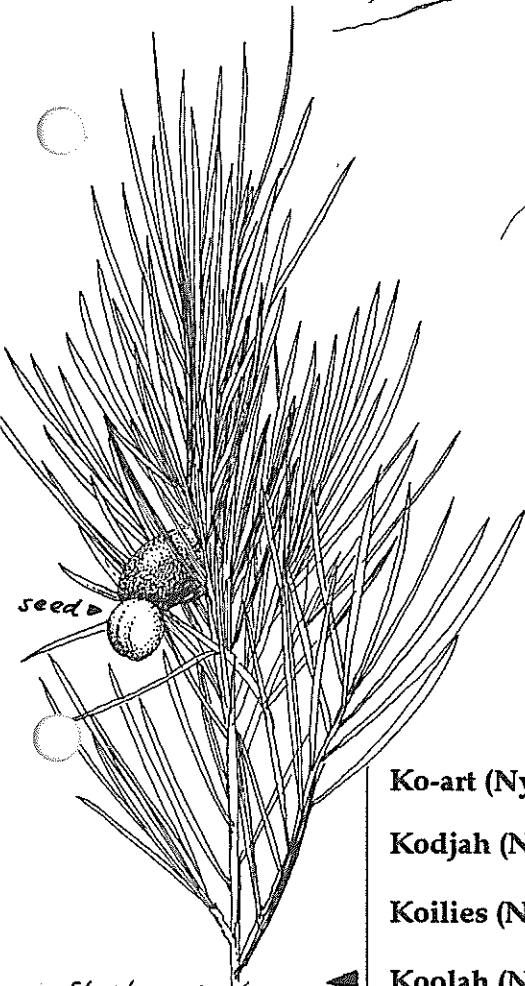
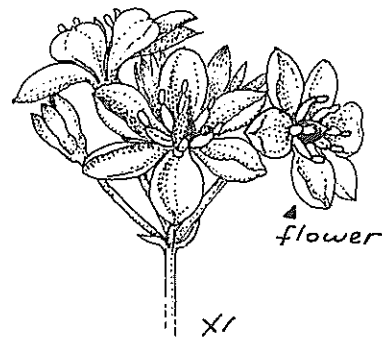
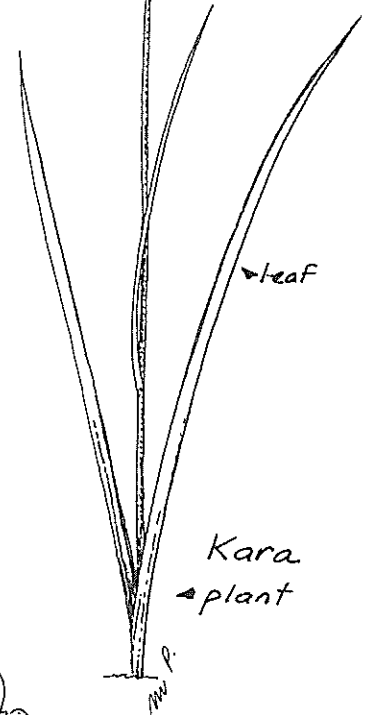
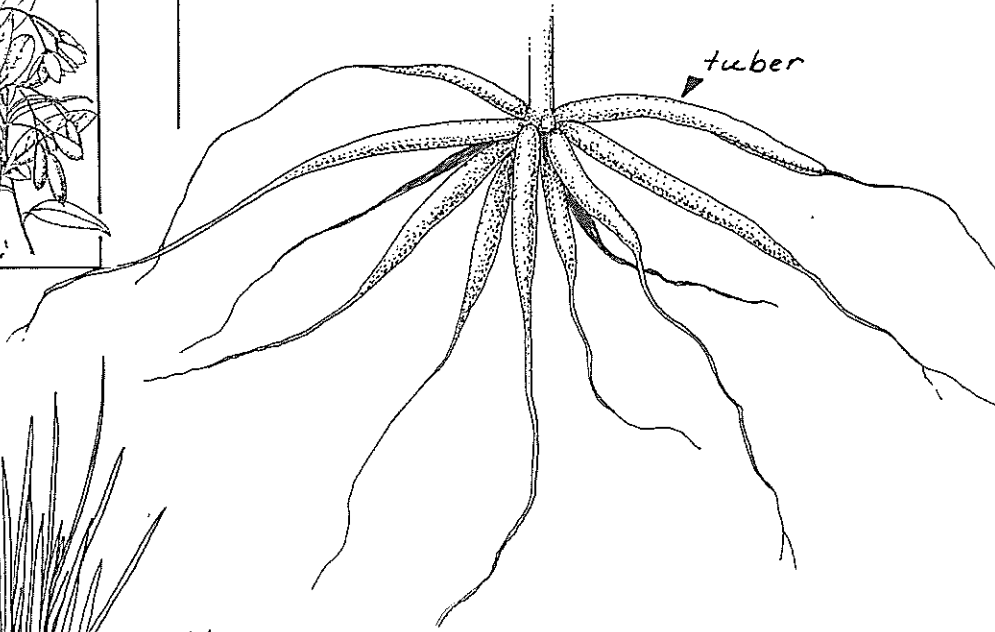


Glossary



Jarrah (Nyungar): *Eucalyptus marginata*.

Kara (Nyungar): the Milkmaids (*Burchardia umbellata* and other species).



a fleshy dark blue 'plum' forms below the seed

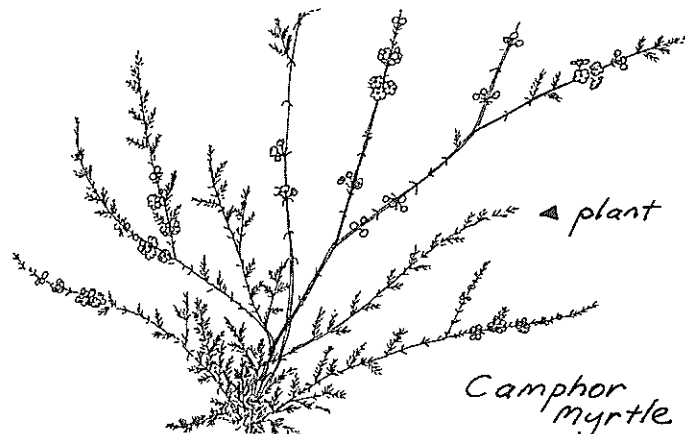
Ko-art (Nyungar): spear.

Kodjah (Nyungar): stone axes.

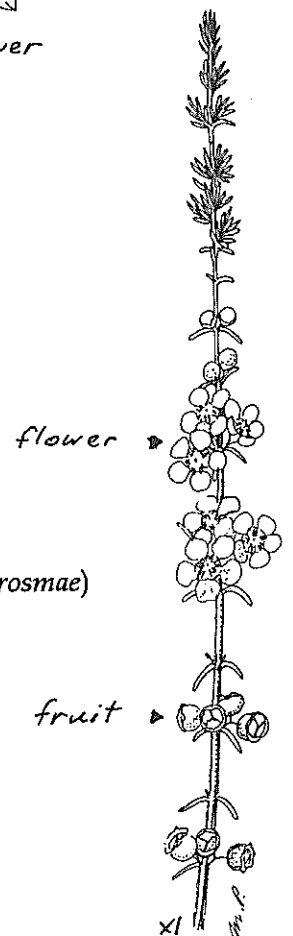
Koilies (Nyungar): throwing sticks.

Koolah (Nyungar): the Emu Plum (*Podocarpus drouynianus*).

Kurren (Nyungar): probably Camphor Myrtle (*Baeckea camphorosmae*)



Camphor myrtle



Glossary



Kuruba (Nyungar): probably native Bluebell (*Sollya heterophylla*). See Climber.

kwongan (Nyungar): an Aboriginal term for the Western Australian sand plain and its vegetation which consists typically of a layer of shrubs of less than a metre in height and hard, brittle leaves. See Activity Card 13.

leaching: the loss of soluble substances (mineral and nutrients) from soil by the action of water moving through the soil.

leaf: a generally flattened outgrowth of a stem and the principal site of food manufacture in the plant (photosynthesis).

lichens: encrusting leaf-like or branching masses formed by a fungus associating with a green or blue-green algae.

lignotuber: a swollen woody stem formed at ground level from which many stems may arise. See Mallee.

loams: a rich soil being a mixture of sand, clay and decaying organic matter.

local plant community: the plant community growing naturally in an area, an indigenous community.

local plant species: a native plant growing naturally in an area, an indigenous species.

mallee: a multi-stemmed small eucalypt, the stems arising separately from from one lignotuber. See Activity Card 12.

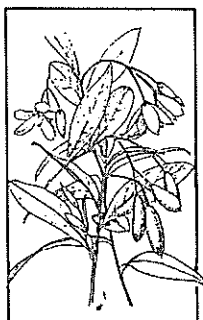


▲ Yate
(*Eucalyptus cornuta*)



Fremantle Mallee ►
(*Eucalyptus foecunda*)

Glossary



Mangar (Nyungar): spear.

Mangite (Nyungar): *Banksia grandis*.

Marri (Nyungar): *Eucalyptus calophylla*.

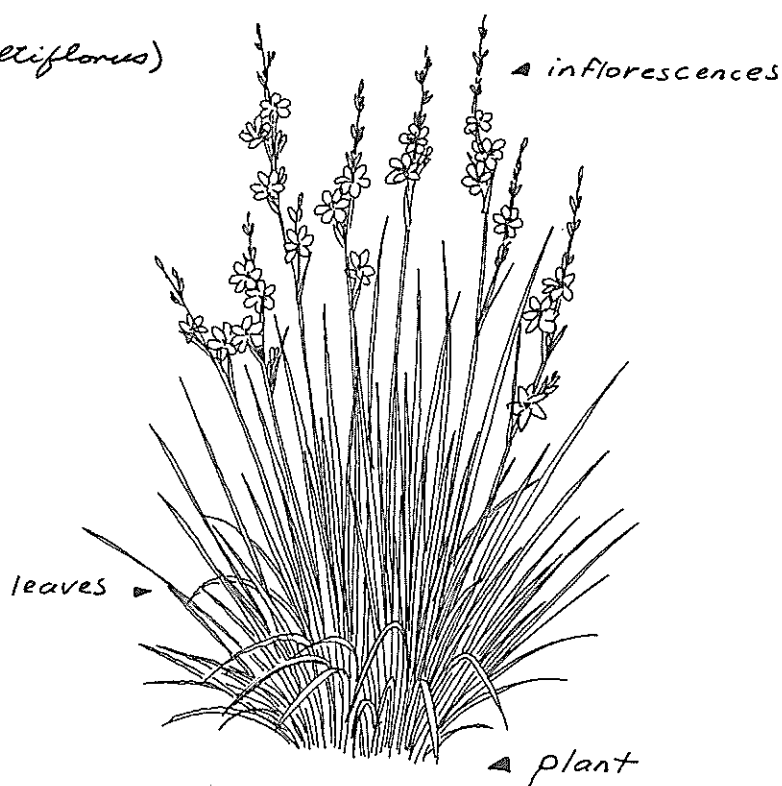
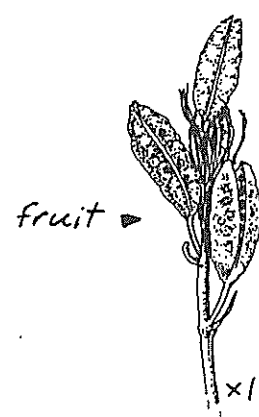
Matja (Nyungar): bulb of the Bloodroot (*Haemodorum* species).

Meeros (Nyungar): spear throwers.

mia (Nyungar): a temporary shelter constructed by south-western aboriginal people at their camping places.

monocotyledons: one of two groups of flowering plants; having one seed leaf (cotyledon), all non-woody, forming many equal roots (fibrous root system), leaf veins parallel and floral parts usually in threes.

Morning Iris
(*Orthroanthus multiflorus*)
a monocotyledon



moss: a green, non-vascular plant reproducing from spores.

mulga: a wattle, *Acacia aneura* or vegetation dominated by this species.

mycorrhizal fungi: fungi living in association with the roots of plants for the mutual benefit of the plant and the fungi to obtain nutrients from the soil.

nature conservation: conservation of all life forms and natural systems necessary for their sustained existence.

nature reserve: a natural area set aside and protected by legislation to protect flora and fauna.

Glossary

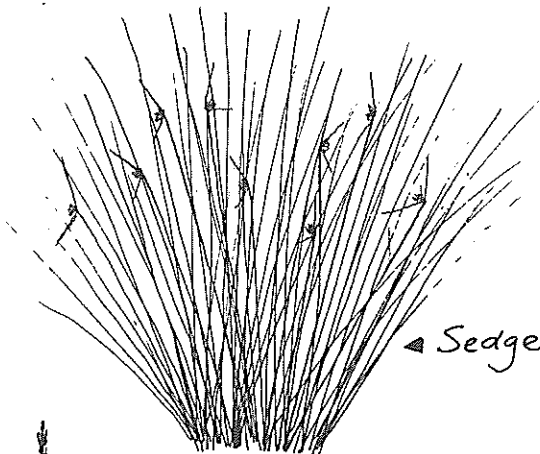


National Park: an area, generally natural, set aside and protected by legislation to protect flora and fauna and recreation values.

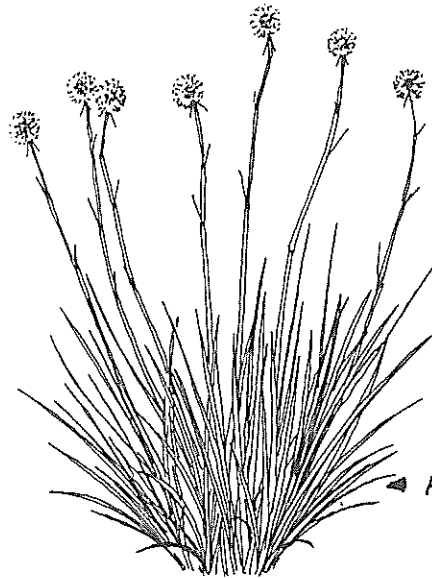
natural vegetation: the original vegetation of the area.

nectar: a sugary fluid produced by flowers, and to a lesser extent an excess of pollen produced by the flowers is eaten by animals and encourages them to move from flower to flower and to return at other times.

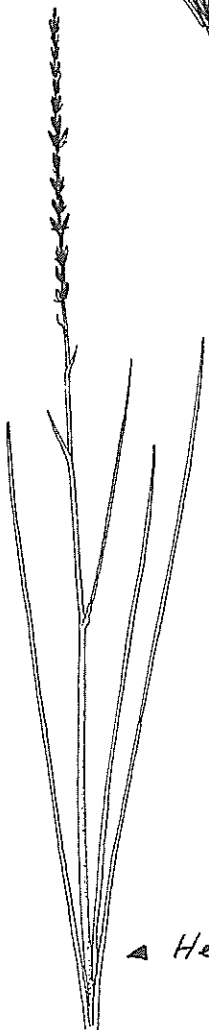
Non-woody plants: plants without special thickening in the walls of the cells of the stem.



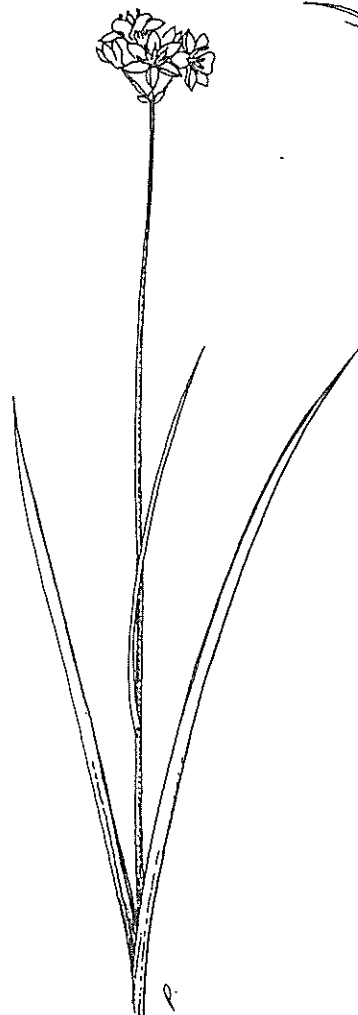
◀ Sedge



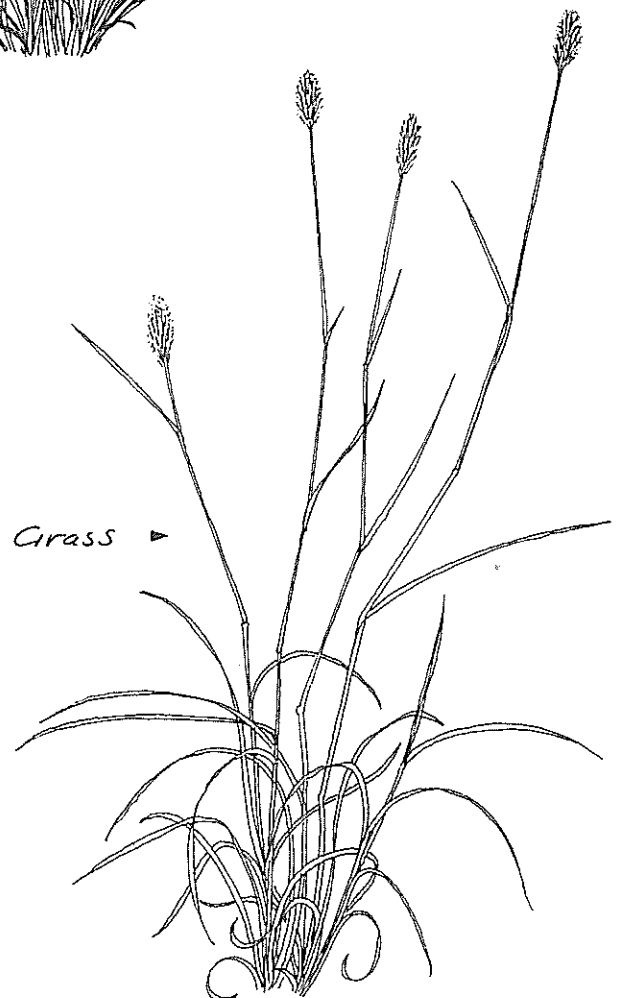
◀ Herbs ▶



◀ Herbs ▶

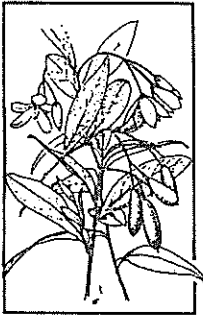


M. P.



Grass ▶

Glossary



ovary: the portion of the flower containing the ovules.

overstorey: the tallest layer of plants in a plant community, generally referring to trees.

perennial: a plant with a normal lifespan of more than two years.

plant community: an assemblage of plants characterised by a group of dominant species, synonymous with vegetation association.

plant life form: how the plant grows, divided into trees, shrubs, herbs, grasses and sedges.

pollination: the transfer of pollen from one flower to another.

pollinators: an animal which affects pollination.

Pondil (Nyungar): the Spearwood, *Kunzea ericifolia*.

proteoid roots: special bunches of small rootlets formed to enhance absorption of nutrients into the plant by increasing surface area. A characteristic of the Proteaceae family.

Quandong (Nyungar): *Santalum acuminatum*.

rhizome: a horizontal underground stem, often a site for food storage.

restoration: to aid the natural regeneration processes in bushland by reducing disturbance. For example, the removal of weeds.

revegetate: to replant an area with vegetation.

roots: specialised plant structures found in the soil that absorb water and nutrients.

sand: a loose material consisting of rock or mineral particles.

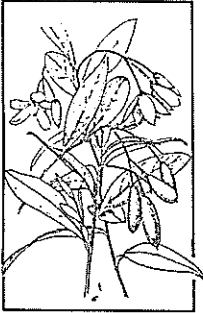
savanna: tropical grassland with or without scattered trees.

scientific names: confined to one species and has two parts, the genus and the specific name, for example Marri is called *Eucalyptus* (genus) *calophylla* (species).

Scientific names are always in italics or underlined, the genus name begins with a capital letter and the species name with a lower case letter. When botanists find a new plant, they determine which group it belongs to for its genus and then give it a specific name that refers to some feature of the plant that distinguishes it from other plants in that genus. These names are derived from Greek and Latin. The botanist who names the plant also describes it with words and drawings. This description is published in a journal (scientific magazine). When a plant's scientific name is used in a journal, the name is followed by this botanist's name and an abbreviation of it. For example Marri is written as *Eucalyptus calophylla* R.Br., the R.Br. referring to Robert Brown, a 19th century botanist.

sclerophyll: the character of hard, brittle leaves.

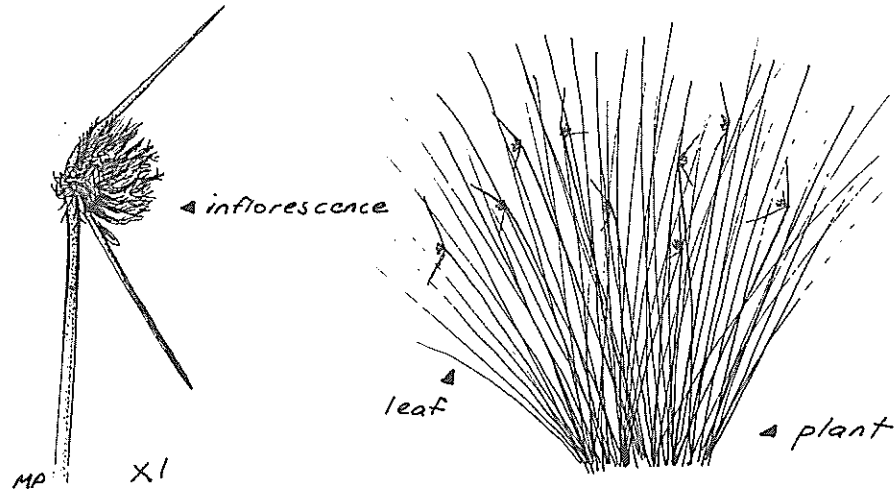
Glossary



scrub: an open, tall shrubland, greater than two metres in height.

sedges: grass-like plants that are tufted or spreading plants from the groups Sedges (families *Cyperaceae* and *Restionaceae*) and Rushes (family *Juncaceae*), Bullrushes (family *Typhaceae*) and *Syridaceae*. Most have inconspicuous flowers that are pollinated by wind.

a Semaphore Sedge
(*Mesomelaena pseudostygia*)

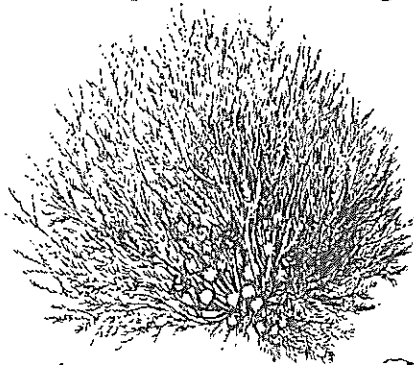


seed: formed by the growth of a fertilised ovule consisting of an embryo plant enclosed in a seed coat.

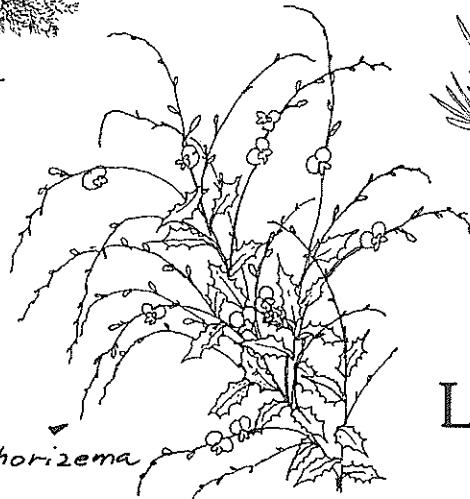
seed coat: a protective layer around the embryo plant formed from parts of the ovary.

sepals: green protective petals.

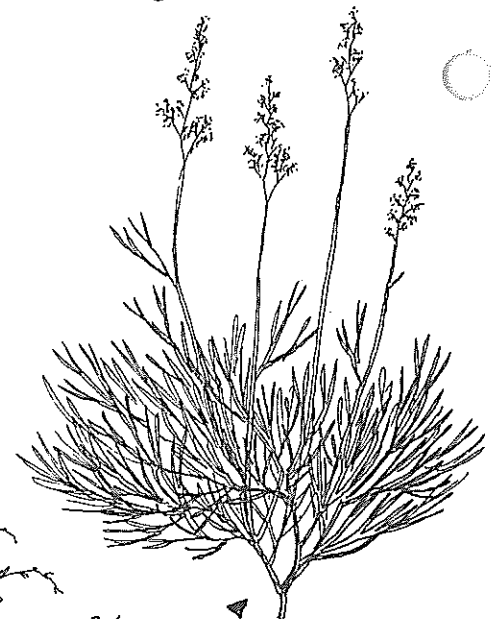
shrub: a woody plant with one or many woody stems, the foliage being all or part of the total height of the plant.



↑ Rose Banksia



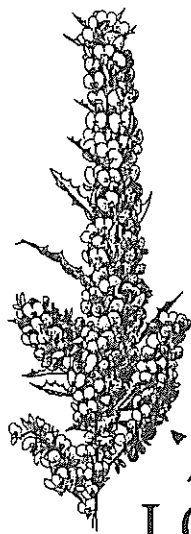
a Holly Leaved Chorizema



Blueboy ↑

LOW SHRUBS

Glossary



▶ Holly leaved Hovea



▶ Swan Berry

LOW SHRUBS

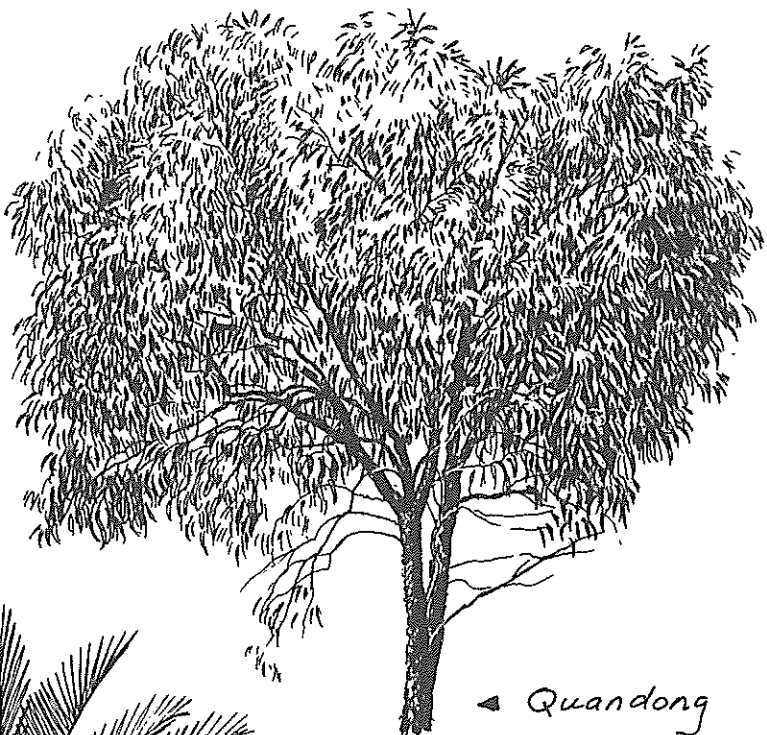


▶ Camphor Myrtle

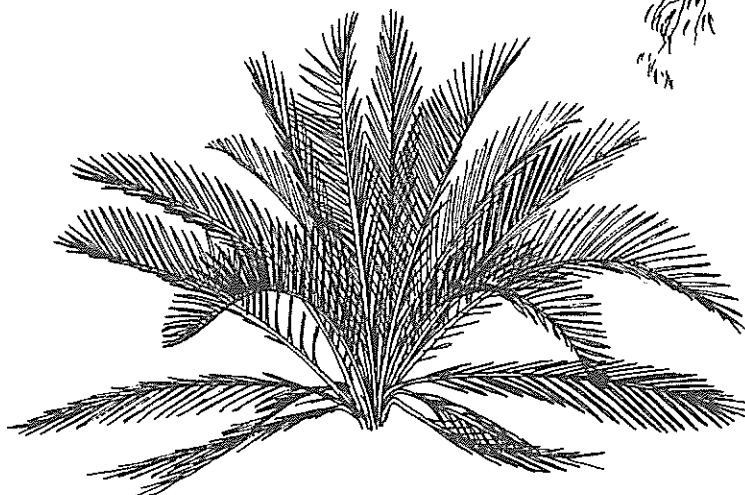


▶ Woolly Bush

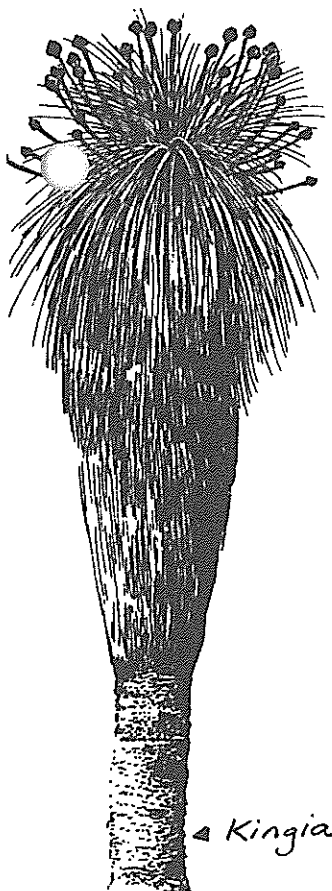
TALL SHRUBS



◀ Quandong

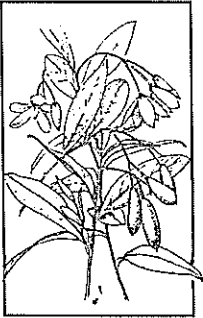


◀ Zamia



◀ Kingia

Glossary



species: those plants which are able to interbreed to produce fertile seed.

stamen: a male plant of the flower having a stalk (filament) and pollen sac (anther) holding the pollen.

strata: the layers of plants in a community.

subspecies (subsp.): a distinct form of the species.

sustainable: able to maintain the ecosystem.

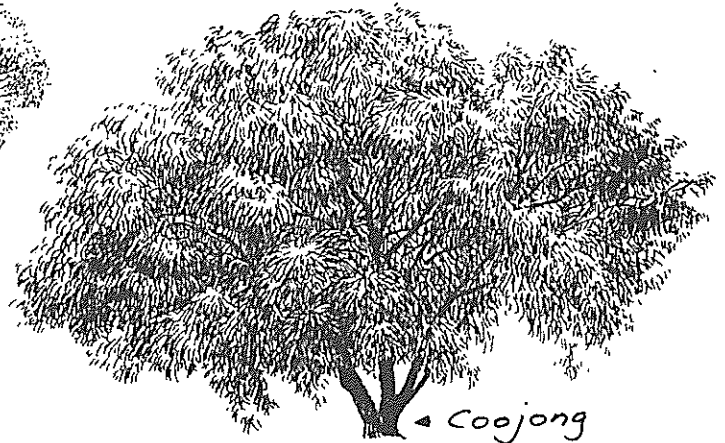
thicket: a closed, tall shrubland greater than two metres in height.

topsoil: the surface layer of the soils containing the majority of minerals, organic matter and living organisms.

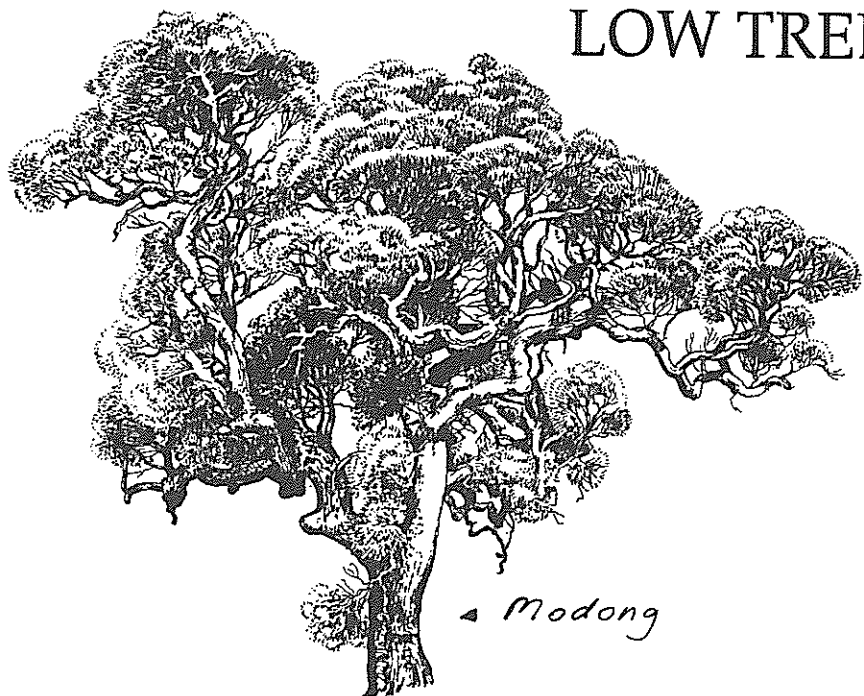
tree: a woody plant with a trunk and canopy, the canopy being less than or equal to 2/3 of the height of the trunk.



Yate ▴



▴ Coojong



▴ Modong

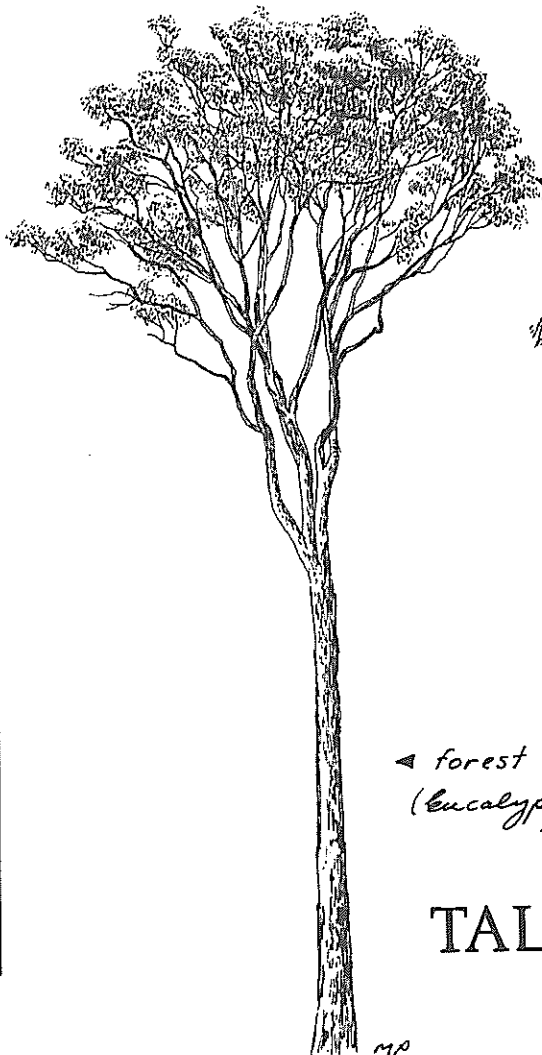
LOW TREES

Glossary



◀ Tuart
(*Eucalyptus gomphocephala*)

Salmon Gum
(*Eucalyptus salmonophloia*)



◀ forest Jarrah
(*Eucalyptus marginata*)



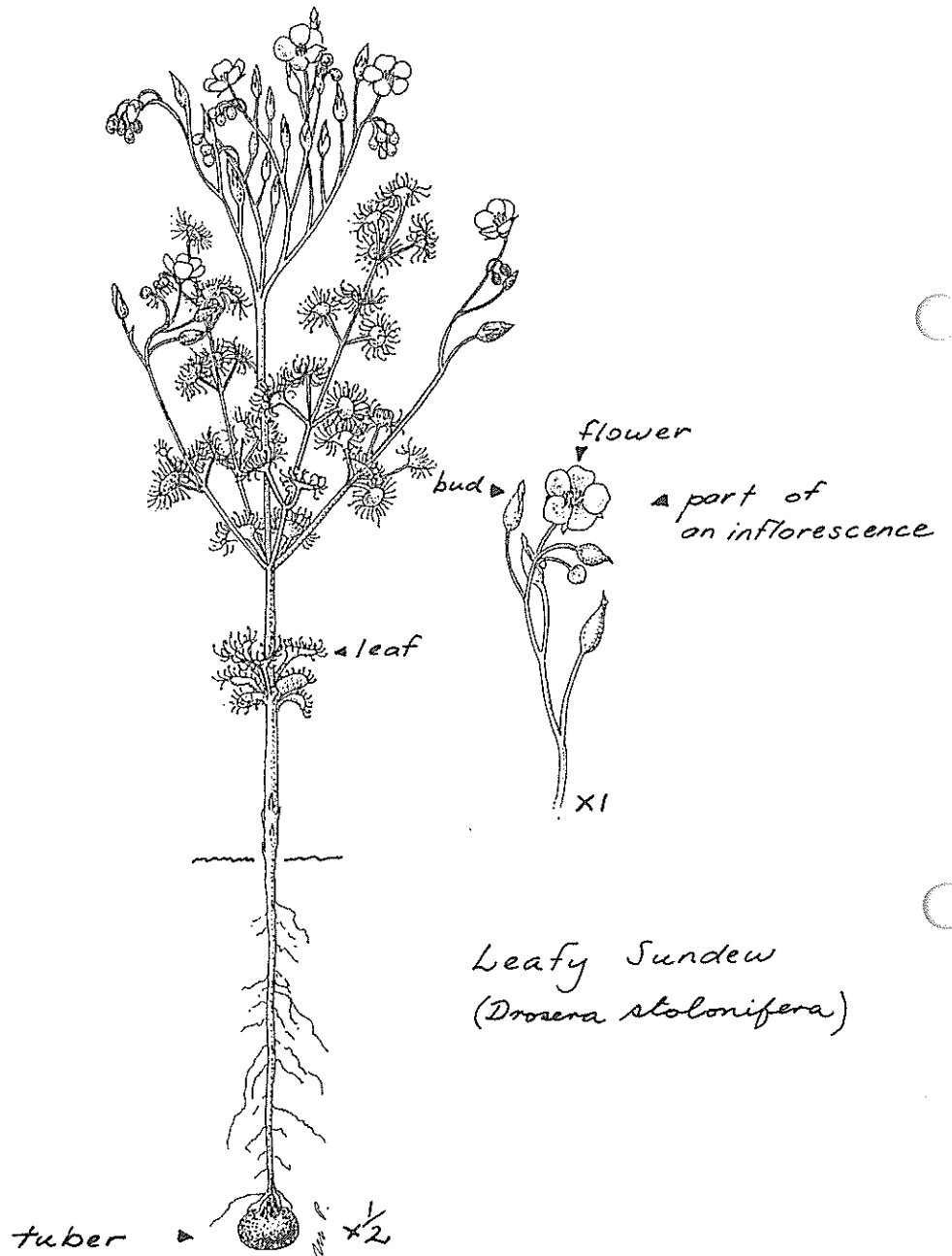
TALL TREES

Glossary



trunk: a thick, principal, usually upright, stem

tuber: a swollen underground stem or root containing stored food.



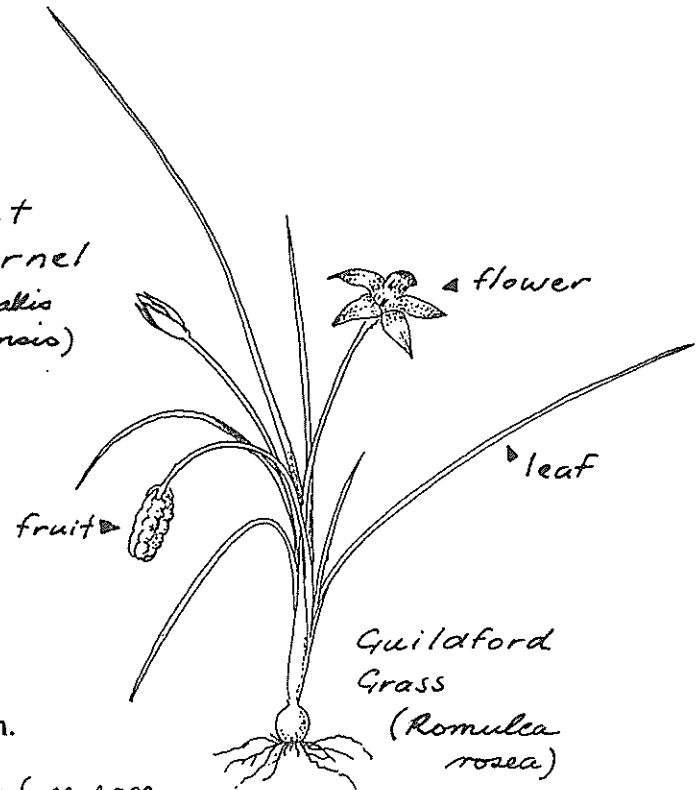
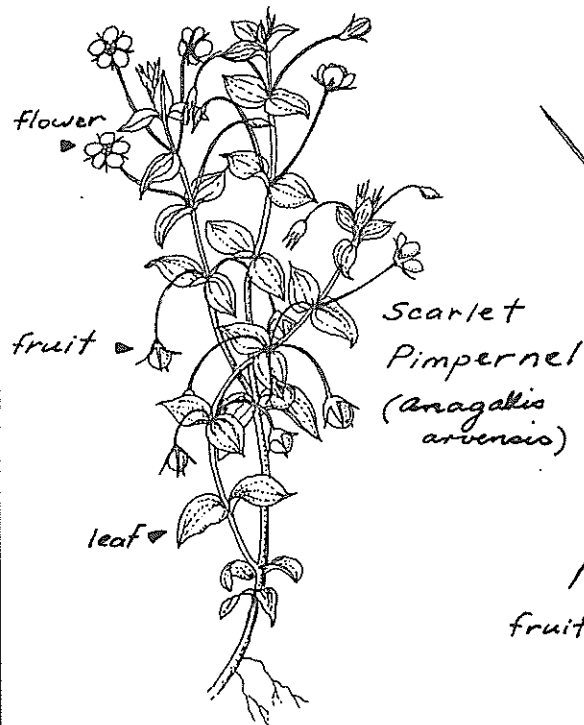
understorey: plants growing under the canopy of the tallest plants in a plant community. Usually means flowering shrubs.

vesting: the purpose for which crown land is managed, eg vested in WAWA to protect an area of water catchment

Glossary



weed: a plant growing where it is not wanted and reproducing without aid from humans.



wild: a naturally occurring organism.

wildflowers: native flowering plants. (see page 334)

wild plant: a local native plant that has grown from seed not planted by humans.

Woonda (Nyungar): shield.

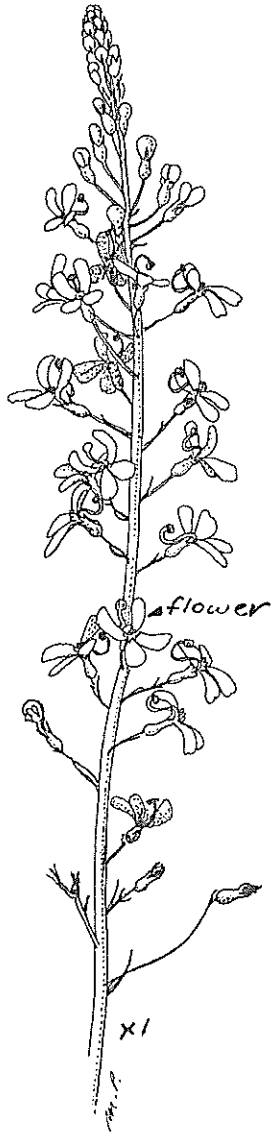
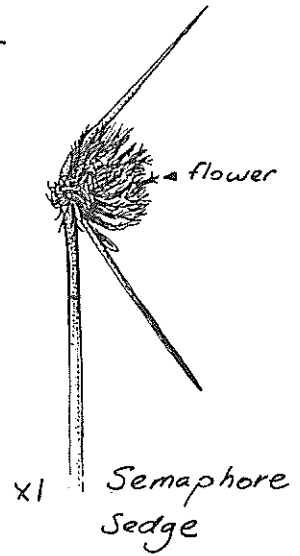
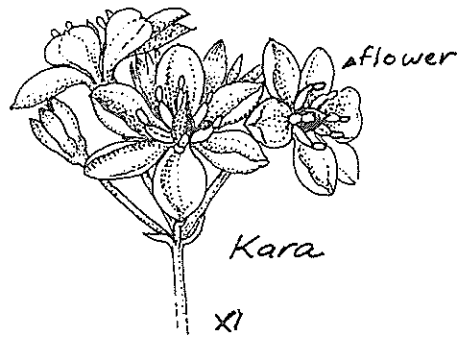
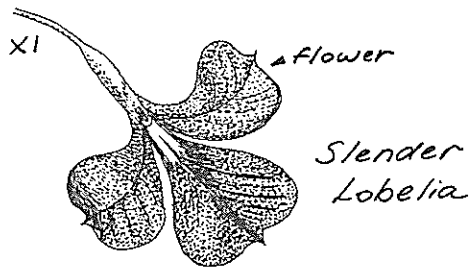
wood: the hard fibrous material formed from the cells in the stem with special thickening called xylem.

woody plants: plants with special thickening called lignin in the walls of the cells in the stems forming an internal 'skeleton'.

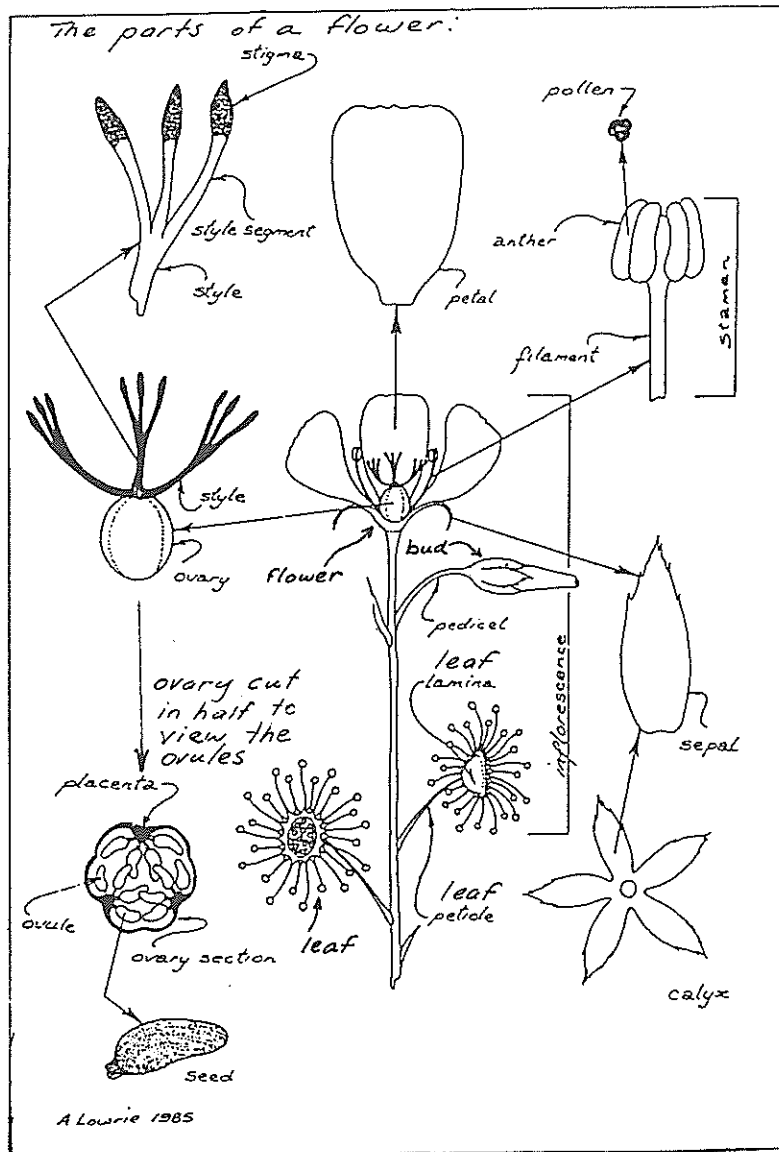
Wuanga (Nyungar): *Acacia saligna* seeds.

xylem: water conducting tissue in plants.

Yanjidi (Nyungar): the Bullrush, *Typha domingensis*.

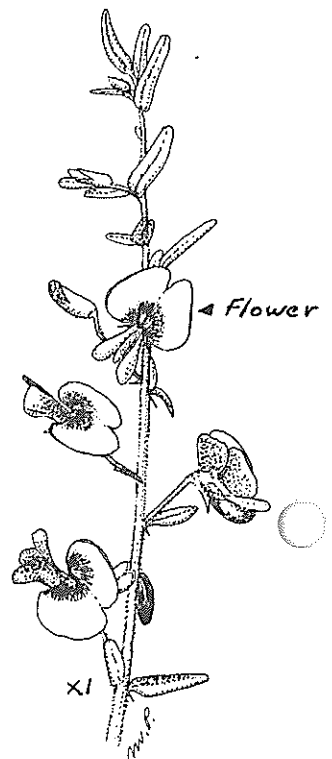


Pink Fountain Triggerplant



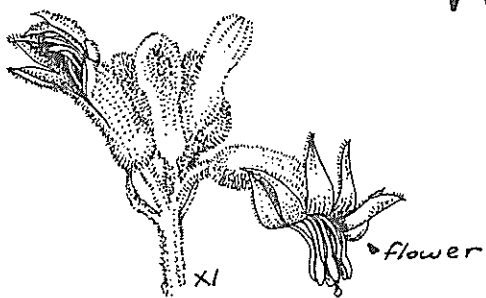
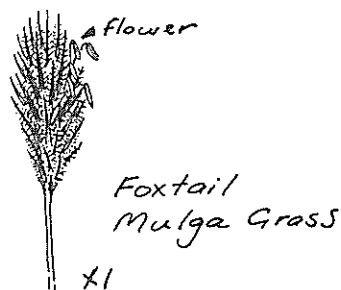
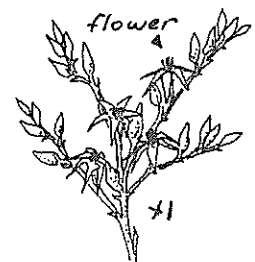
(Modified from Lowrie 1987)

WILDFLOWERS



Beranup Bossiaea

Phlebocarya ciliata



Red Flowered Kangaroo Paw

