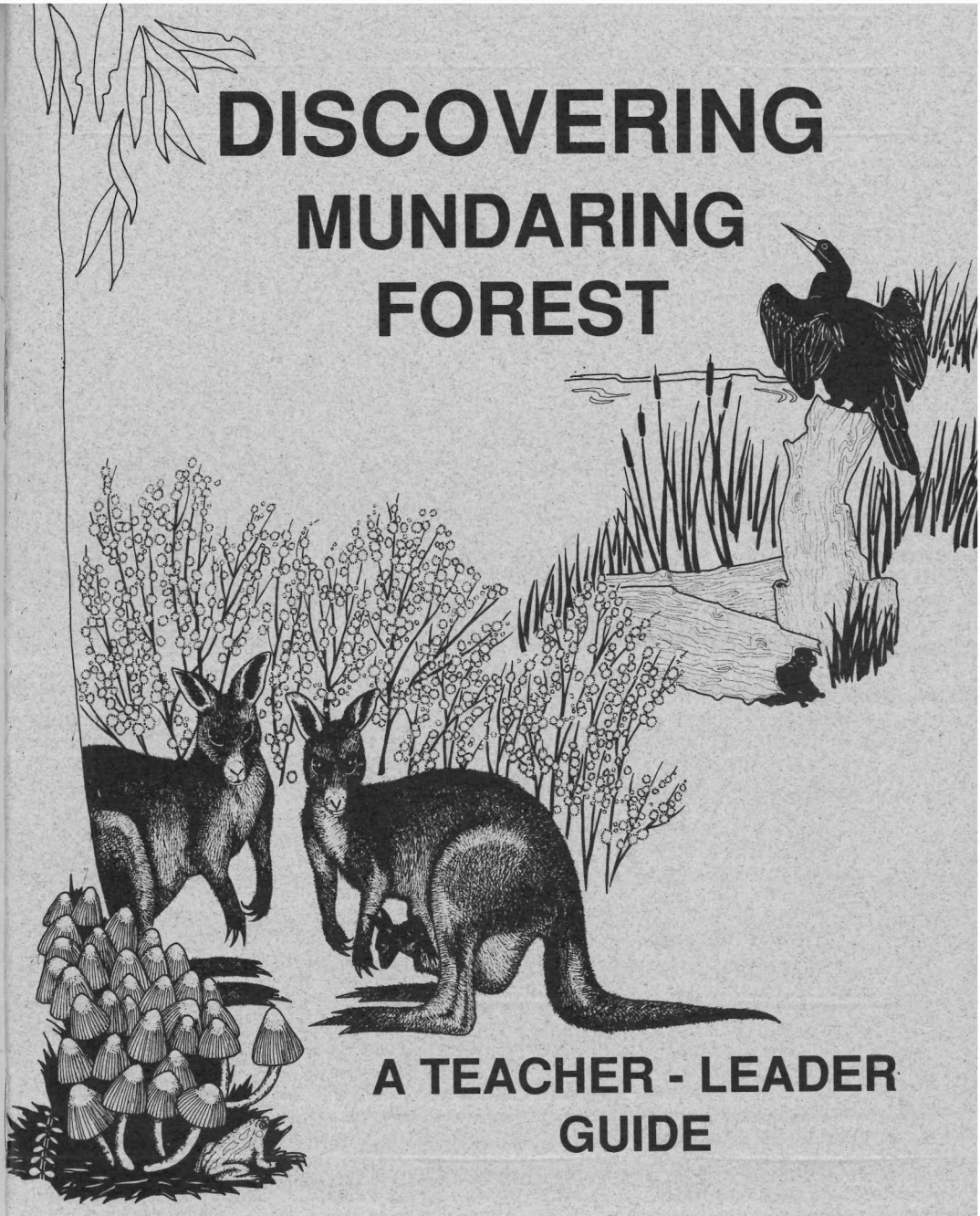
DISCOVERING MUNDARING FOREST



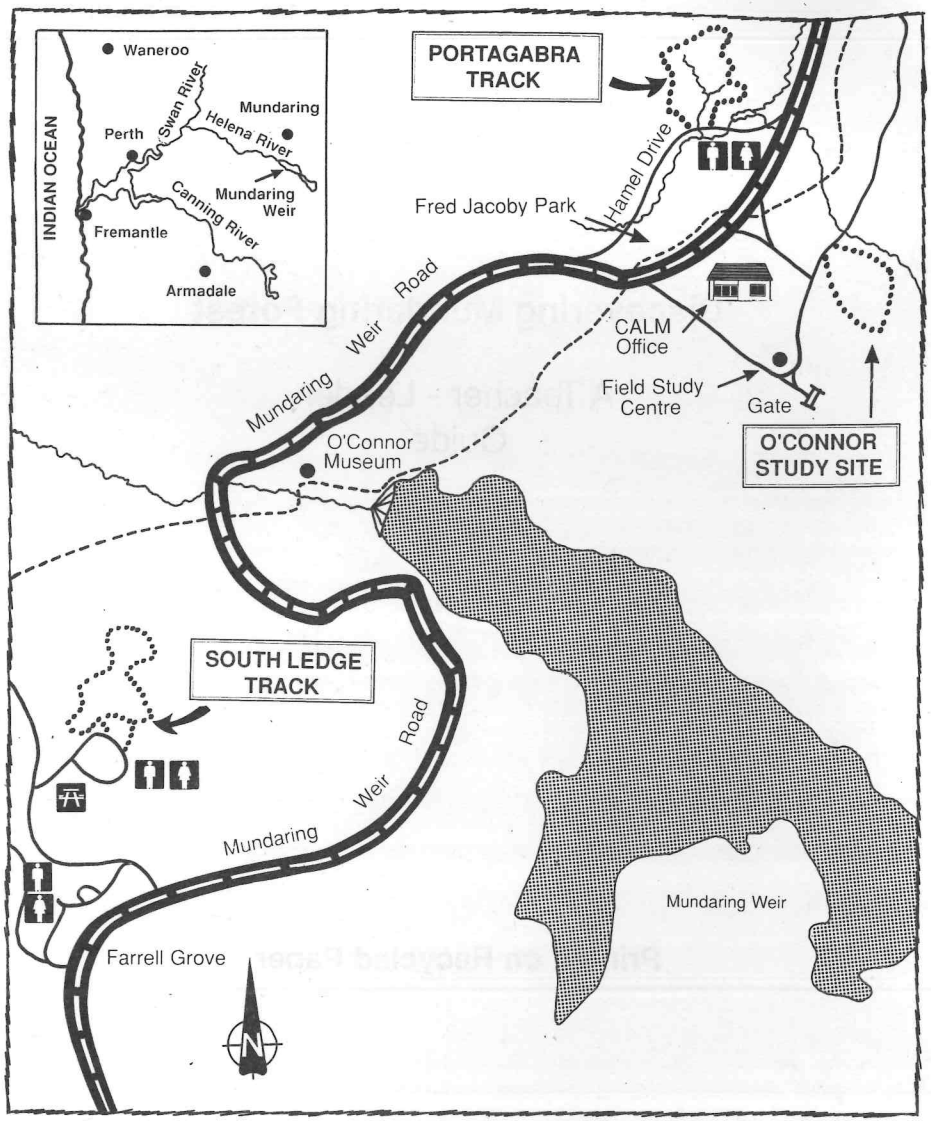
A TEACHER - LEADER GUIDE

Department of Conservation and Land Mananagement

Discovering Mundaring Forest

A Teacher - Leader
Guide

Printed on Recycled Paper



Roads

Kattamorda Heritage Trail

Rivers

The 3 Study Sites

Toilets

Picnic Site

ORIENTATION MAP

CONTENTS

Introduction to the Study Sites

This booklet identifies 3 study sites appropriate to the school syllabus.

For each site background notes are provided together with a sketch map and ideas for "further investigations". You will not find a prescribed activity approach in this booklet, rather the intent is that as teachers or leaders you will create your own activities to suit your group and purpose.

SCHOOL FIELD TRIPS TO MUNDARING FOREST

Summary of syllabus content appropriate to these study sites.

Primary
* plants and animals
* where and how they live
* how change affects their environment

Secondary Science
* investigations which clarify ecological concepts (habitat, adaptation, energy flow, cycles, population, interrelationships, succession, diversity)
* and lead to an understanding of ecosystems
* human role in modification of ecosystems.

Secondary Social Studies
* investigations about the components of ecosystems: landform, climate, vegetation, animals and their interrelationships

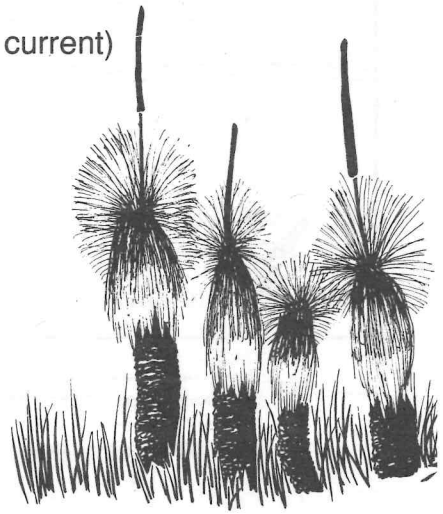
* which lead to an understanding of ecosystem
* resources from the natural environment (land uses)
* human impact on the natural environment
* human management of the natural environment

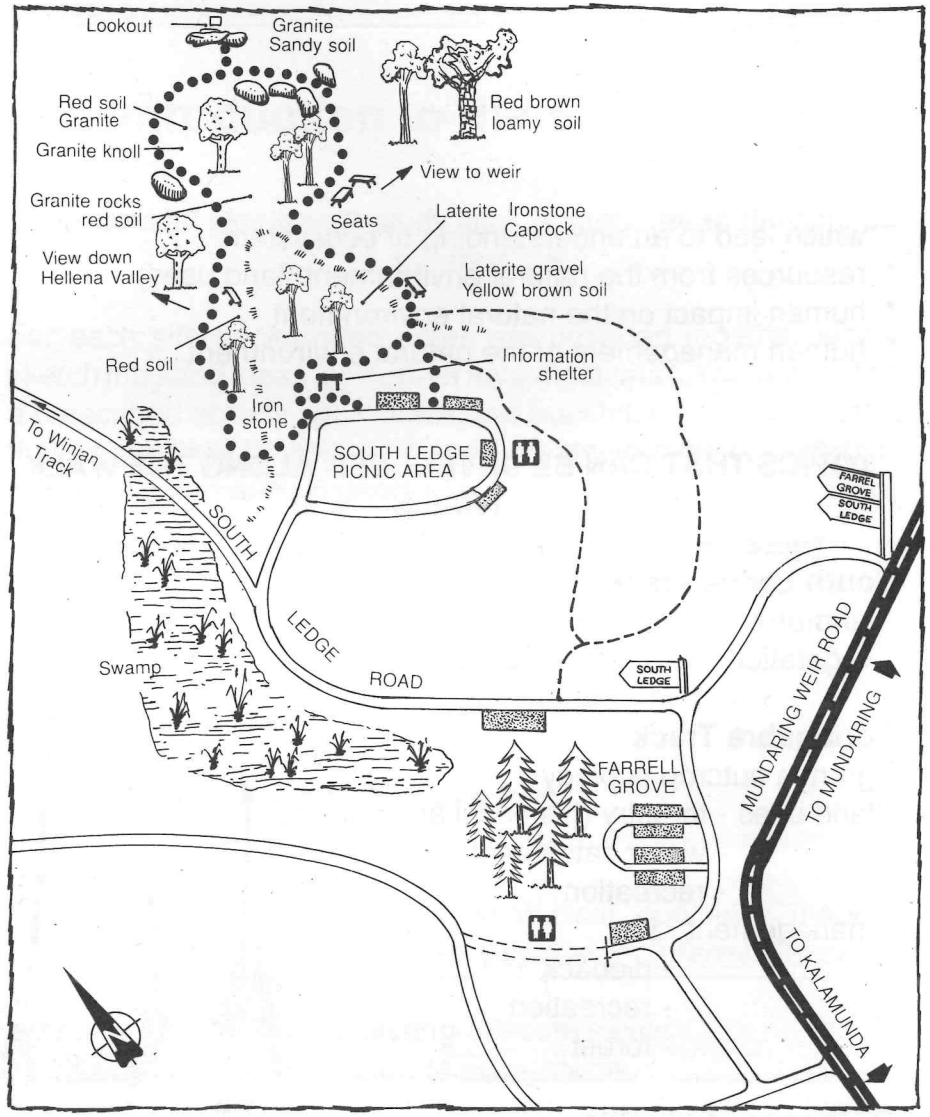
TOPICS THAT CAN BE DEVELOPED ALONG THE WALK TRAILS

South Ledge Track
* landform
* vegetation
* animals
* land uses

Portagabra Track
* granite outcrop ecology
* land uses - forestry (historical and current)
  - water catchment
  - recreation
* management - fire
  - dieback
  - recreation
  - forest

O'Connor Study Site
* soil vegetation associations





SOUTH LEDGE TRACK

SOUTH LEDGE TRACK

LANDFORM

From the 1km walk trail at South Ledge you can look across the valley of the Helena River and see how the original plateau has been dissected into "hills" by rivers and streams. The path starts on the gravelly lateritic soils at the top of the ridge and goes a little way down onto the valley slopes where the basement granite has been exposed.

From here you can contemplate the geological history of the Darling Scarp, the processes of weathering and erosion, and soil building.

The Plateau

The hills of the Darling Range were once part of a huge plateau which covered most of the south west of Western Australia. The western edge of the plateau has been uplifted along the Darling Fault Line, forming the Darling Scarp (which has since been eroded back 3-4 km east of the fault line).

The Valleys

Over time, rivers have carved deep valleys into the western edge of the plateau. The Helena River, a tributary of the Swan is one of the major water courses in the northern part of the Darling Range.

Weathering

The original plateau is ancient, and mostly formed of granite parent rock. Because it is so old it has been subject to vast

weathering, and because it is so flat, the products of weathering have mostly not been eroded, but retained over the basement granite.

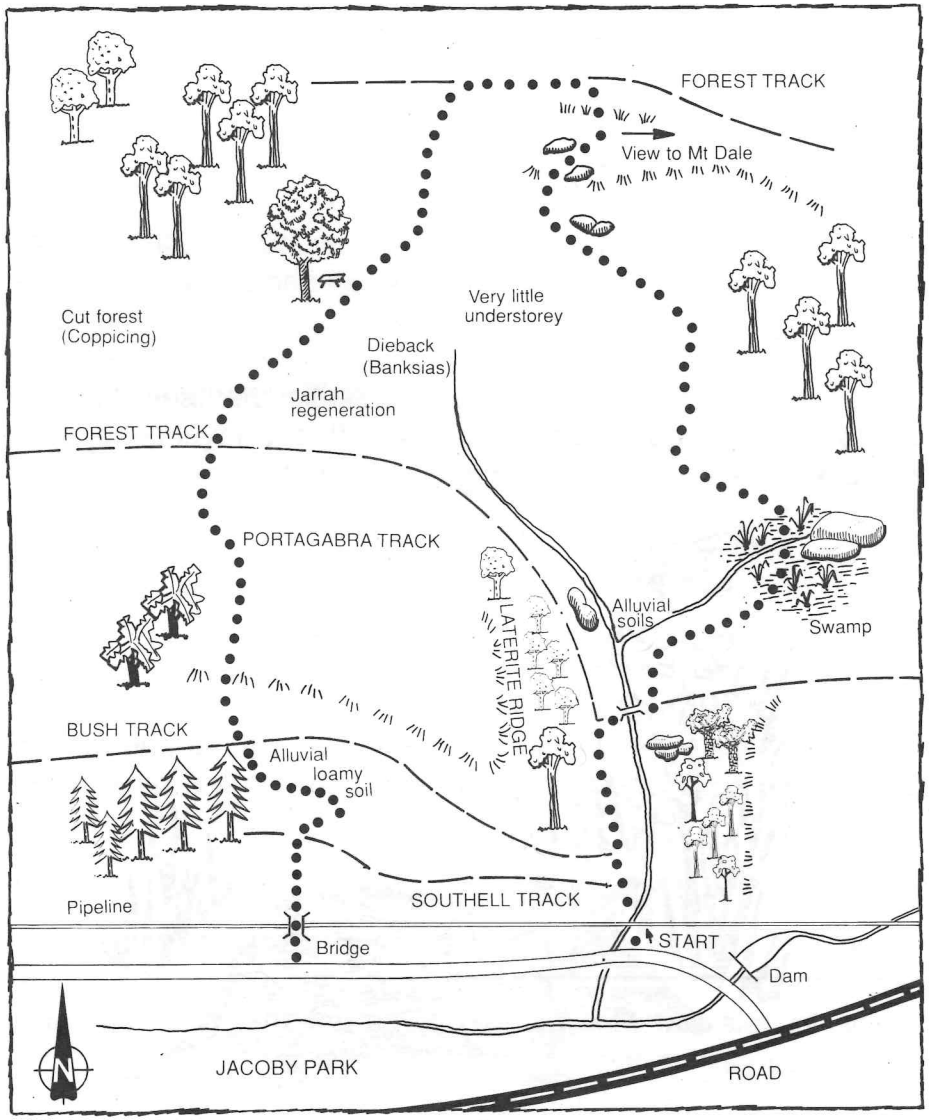
Granite weathers initially to form a clay, which forms a roughly 20m deep layer over the parent rock. The upper surface of the clay undergoes further weathering. Silica is slowly leached out of the soil, and the insoluble oxides of iron and alumina remain as a layer of gravelly laterite. Further weathering cements the surface into a hard layer of cap-rock, commonly called ironstone.

Where rivers and streams have carved into the plateau, the different layers of the profile have been exposed. However, here below the weir, the Helena Valley is very steep, and much of the weathered mantle has been eroded, exposing bare or thinly covered rock.

VEGETATION

On some slopes granite heaths are obvious where shallow rooted plants grow on thin soils over granite. On deeper soils around the exposed rock marri takes advantage of the natural water catchment area. Pockets of wandoo occur, especially on clay soil - often near granite. Jarrah dominates on the laterite soil at the top of the ledge, and there is a diverse range of understorey vegetation.

For more information see Resource Note 18 "Geology of the Jarrah Forest".



PORTAGABRA TRACK

PORTAGABRA TRACK

This track forms a circuit that begins and ends at Jacoby Park. It is approximately three kilometres in length and, walking at a leisurely pace, will take about an hour to complete. The first kilometre is a steady up-hill walk terminating in a fairly steep grade over the last 200 metres, but from there on it is all down-hill. The track is well signposted and easy to follow.

TREES

At the beginning of this walk, there is a narrow strip of alluvial loamy soil. The main trees growing here are mostly eucalypts; marri (*E.calophylla*) and blackbutt (*E.patens*). The undergrowth consists mainly of zamia palm, blackboy and several species of hakea, hibbertia, and acacia.

The smooth barked, whitish coloured trees growing along the creek are wandoo (*E.wandoo*). In this part of the forest this species is usually small and confined to narrow belts along some gullies. (It is seen at its best further east). Higher up the slopes on the gravelly lateritic soils, jarrah (*E. marginata*) predominates, with a few marri. There are no wandoo or blackbutt towards the top of the slopes. (For more information see Resource Note 17 "Some Trees of the Jarrah Forest").

GRANITE

The granite outcrops found throughout the forest support very interesting plant communities that have adapted to an environment that changes drastically from one season to another. In summer the rock surface reaches temperatures of 50 °C and the plants are

exposed to the hot summer winds. In winter the shallow soil becomes water logged and with no trees to protect it the rock is exposed to cold winds and frosts. The moss swards and small fissures and depressions on the rock collect soil blown by the wind or washed down by rain from the weathering rock surface. In these deposits many small flowering herbs and shrubs grow. In the moss mats grow miniature plants that have adapted to this habitat by reducing their size and life cycle. In winter they put forth beautifully coloured, delicate little flowers. Among them you will find trigger plants, orchids, sundews and others. Where the soil is deeper, flowering shrubs (most of which bloom in spring) obtain a precarious foothold. Most noticeable of them are hakea, bottlebrush, verticordia and darwinia.

On nearly every outcrop the remarkable pin cushion plant is found. This little herb has green spiky leaves and white pungent flowers in winter but turns orange or rust brown in summer when it becomes dormant. In summer all the other small plants wither away, the moss swards appear to be dead and dehydrated and even the shrubs appear to have wilted and died. The small rock pools dry up by early summer and the algae and microscopic animals dependent on them have by then completed their life cycle and left eggs, seed and spores in the dried mud.

Soon after the first rains a transformation occurs, and the whole cycle begins again.

These rock outcrops also provide habitat for many lizards, and some snakes. Most common are the ornate dragon lizards.

As granite outcrops form an important link in the chain of forest environments it is essential they be protected from damage. The moss mats in particular are very fragile. Motor cycles or even people can dislodge them from the rock and so destroy the habitat of so many small plants; removing or disturbing the loose rocks upsets the habitat of the small dragon lizards and geckoes. (For more information see "Exploring Granite Outcrops").

EARLY TIMBER FELLING

The forest structure around Mundaring has been significantly altered from its original form. Most of the large jarrah which comprised the original forest were felled in the latter part of the 1800s and earlier this century to provide timber for the rapidly expanding community of Perth and for a thriving export market. In addition, extensive areas of forest in the Upper Helena catchment were ring-barked in an effort to increase runoff into Mundaring Weir for the Goldfields Water supply.

Numerous small "spot mills" were established in the Ranges to harvest this bountiful supply of jarrah, or Swan River Mahogany as it was then known. Fed by an extensive bush railway network, these mills and the sleeper hewers, who either preceeded or followed, rapidly cut out the best trees. In their wake, large quantities of branches and leaves were left on the ground and this provided fuel for fierce bushfires which did enormous damage to the remaining trees. In the Mundaring District, woodcutters and charcoal burners followed the millers and sleeper hewers and cut up much of the waste wood left on the ground. About 20 000 tonnes of firewood per year was required to fire the steam boilers

at the pumping station at Mundaring Weir and O'Connor (3 km up from the Weir).

However, jarrah forest is tough and resilient. In place of the old trees, a new regrowth forest has developed. The new trees spring from seedlings or from coppice shoots that formed on the stumps of the trees removed in harvesting operations. These shoots grow from dormant buds situated near the base of the stump. Over the ensuing decades, they have developed into the larger trees which now dominate this area. In many instances, the original stumps have rotted away, leaving a ring or cluster of offspring showing where the parent trees once stood.

A number of larger trees along the Portagabra Track were not harvested because they were deemed unsuitable for timber. Over the centuries, some have been badly damaged by bush fires and most contain decayed wood in the lower trunk and have a sparsely foliaged crown with dead limbs. Ironically, many of the same characteristics which make these trees unsuitable for commercial use make them ideally suited as habitat trees. These forest veterans in effect serve as nature's boarding houses, providing food and shelter for a myriad of insects, reptiles, birds and small mammals. Under the present forest management practices, these habitat trees are retained for their wildlife value where as in years past, they were ring-barked or felled.

LANDFORM

From here you can see the outline of Mt Dale, 23 km away to the south. You will also notice just how flat the Darling Range is. The Range is really an uplifted plateau that has been dissected by

streams to form 'hills'. The plateau is primarily of granite parent rock which has weathered to form lateritic (gravelly) soils as seen on this ridge. Where rivers and streams have carved valleys into the plateau, the original granite is often exposed. Mt Dale is probably an 'erosion residual', its composition (or possibly its size) has allowed it to resist erosion a little more than the surrounding land. (For more information see Resource Note 18 'The Geology of the Jarrah Forest').

JARRAH ECOLOGY

Jarrah faces a number of environmental difficulties: infertile soil, lack of water during long dry summers, a fire-prone environment, and susceptibility to dieback and insect attack.

Jarrah mostly occurs on the lateritic ridges of the Darling Range. The gravelly soil has been heavily weathered and leached of nutrients, and is often underlain by a layer of dense cap rock. However, it is low rainfall rather than infertile soil that seems to be the main factor limiting the range of jarrah.

Jarrah solves the summer drought problem by using its deep root system to reach ground water supplies (roots penetrate the cap rock through channels - probably formed by long-dead trees). This enables the tree to continue transpiration through the summer, while many plants with shallow roots cease to transpire when the surface soil dries. The extensive root system is established while jarrah is still a seedling, when it also builds up a lignotuber - a swollen rootstock containing a supply of buds ready to grow should the above-ground shoot be damaged. Many shoots can come from one lignotuber, and though usually only one strong

one grows, you will sometimes notice several trunks growing from one base.

The ability to resprout from a lignotuber also aids survival if the tree is damaged by fire. Thick bark protects the tree from mild fires (note the charred trunks). If the foliage is burned the dormant buds under the bark are stimulated to form shoots - allowing photosynthesis to continue while the canopy regrows.

Jarrah (and other eucalypts) shed bark, leaves and twigs which build up and dry out on the forest floor, forming a natural fuel for fire. In such deficient soil, fire is probably very important in recycling nutrients.

EFFECTS OF FIRE

Here you will find a hollow butt, typical of damage caused by fierce bushfires. Because bushfires also threaten lives and damage property and forest values, we now try to minimise the risk by burning off accumulated forest debris before it becomes a fire hazard. Plants of the jarrah forest are well adapted to survive fire. Some resprout from underground tubers and corms, while others germinate from seed which is stored on the plant and is dispersed after fire. Adaptations which aid plants' survival include: thick bark, lignotubers, epicormic shoots, hard woody fruits (which protect seeds), seed follicles which open (releasing seed) after a fire, hard seed coats, prolific production of seed which builds up in the soil.

The effect of fire on animals depends on how the plants respond, and also on the size of the fire, its intensity and the interval between fires.

The challenge for forest managers is to balance the need for protection of life, property and the economic value of the forest with the ecological needs of the forest (For more information see Resource Note No 16 'Fighting Fire with Fire').

PINE PLANTATION

This small plantation occurs on land which was originally cleared by early settlers. Generally, settlers took up and cleared only the valleys and left the laterite ridges timbered.

This species, *Pinus radiata* , is grown most successfully on fertile loamy soils. There are only very limited areas of such soils in State forest and it is for this reason that some farmlands have been purchased in the Blackwood Valley and similar areas for the establishment of pine plantations, and why the Government is encouraging farmers in suitable areas to grow pines on their properties. On sites such as this the average rates of growth of *P. radiata* are 2 cm in diameter per tree per year and 11 cubic metres of timber per hectare per year. As a result of this rapid growth, pine forest matures and can be harvested in as little as 30 years. In comparison, the growth rate for good quality jarrah forest is much slower, averaging 0.2 cm diameter and 0.2 cubic metres of timber per year and requires 100-120 years to produce a millable product. This faster growing pine will help reduce the demand for timber from our native forest.

New technology is now allowing the use of young jarrah from thinnings taken to encourage the healthy growth of remaining selected trees. Planks from these thinnings, previously considered to be too small for economic use by furniture makers, are jointed

and glued to size. These VALWOOD panels make excellent use of thinning logs and benefit sawmillers and furniture makers, while protecting W A's supplies of mature jarrah.

PIPELINE

The pipeline between Devenish Plantation and Jacoby Park is the main line of the historic Eastern Goldfields Water Supply Scheme which carries water 700 kilometres to Norseman. (For more information visit the O'Connor Museum in the Old Pumping Station below the wall of the Mundaring Weir.)

POSSIBLE INVESTIGATIONS

The following investigations could be used to help students build up an understanding of the ecology of the jarrah forest. Interspersed with the investigations are some suggested ways to get students absorbed in the forest by using their senses more acutely.

(I) TREES

What conditions do the different trees require?

The four trees you will see growing along this walk are marri, jarrah, blackbutt, and wandoo. They do not all grow in the same conditions. By examining the soil and their position in the landscape, try to work out the preferred environmental requirements of each of the species.

One way to compare the soil type is to feel it to see if it is gravelly, silty, clayey etc. Introduce students to this technique of distinction by touch by asking them to search for touches. You could give

each person a card with a touch word (like prickly, sticky, soft, smooth) written on it, ask them to find one or more examples of that touch, and then to share it with another person and see if they can work out the touch word.

(II) GRANITE

What lives where and why?

Explore the "bare" rock to see what lives there. Map the distribution of one organism e.g. lichen or moss. Consider the factors which might affect its distribution; test an hypothesis.

Students should understand and respect the fragility of granite outcrops before attempting this exercise.

The plants and animals living on granite are minute. Students could get a closer look at them if they adopt an "ants eye-view"; pretend to be the size of an ant while exploring the granite. This will be even more rewarding if you can use magnifying glasses.

(III) FOREST HISTORY

How has the forest changed?

Look out for big, old stumps, signs of timber-cutting activities in the 1800s and early 1900s. Compare their size and spacing with that of the present trees.

Students can let their eyes become movie cameras to see the forest from different perspectives. Try some of these: filter out the present forest, look only at the old stumps and imagine how the forest used to look, use a wide-angled lens to focus on the whole forest-scope, use a telephoto lens to zero in on a small fragment of the scene, squint to put the camera out of focus to find new patterns etc.

Now filter out the old stumps and focus on the young trees which have replaced the veteran jarrah. Visualise what the new forest will look like in 50-100 years time.

(IV) EFFECTS OF FIRE
How do the plants here respond to fire?

Search for plants showing the various adaptations which help them to cope with events like fire, (see teacher's notes), and use this information to assess how the various plants would respond to a fire e.g.

. how would the plant cope with a low intensity fire?
. how would the plant survive a high intensity fire?
. would the seeds survive a fire? how?
. would the plant reshoot if damaged by fire, or die and regrow from seed?

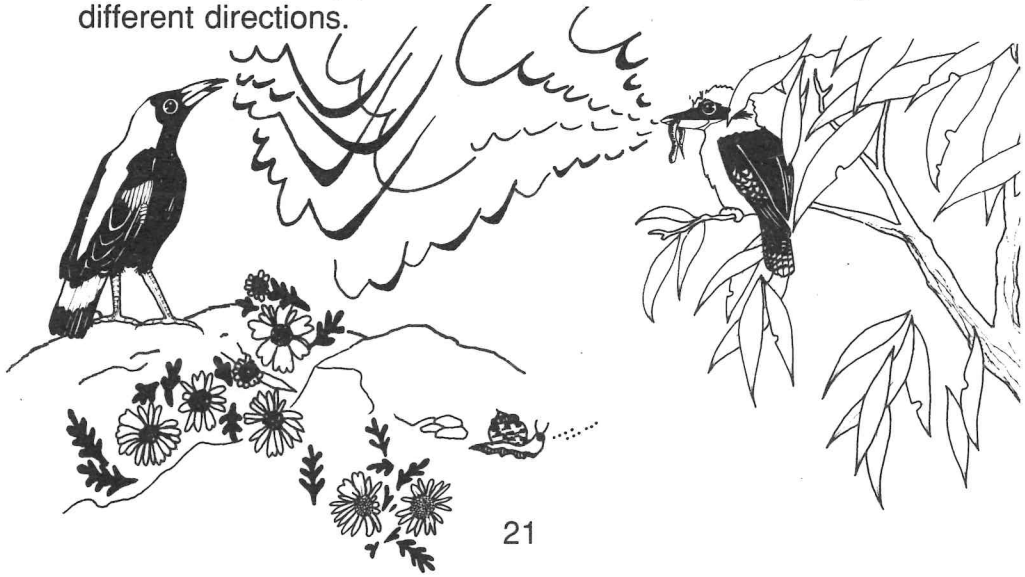
Finding adaptations can require attention to small details. To tune in for this, students can search for specks of colour. Give each student two squares of colour that you've cut from a paint chart and ask them to match them with natural colours they find in the bush - its not as hard as it sounds. Remind students not to pick living things, and get them to verify their colour matches with someone else.

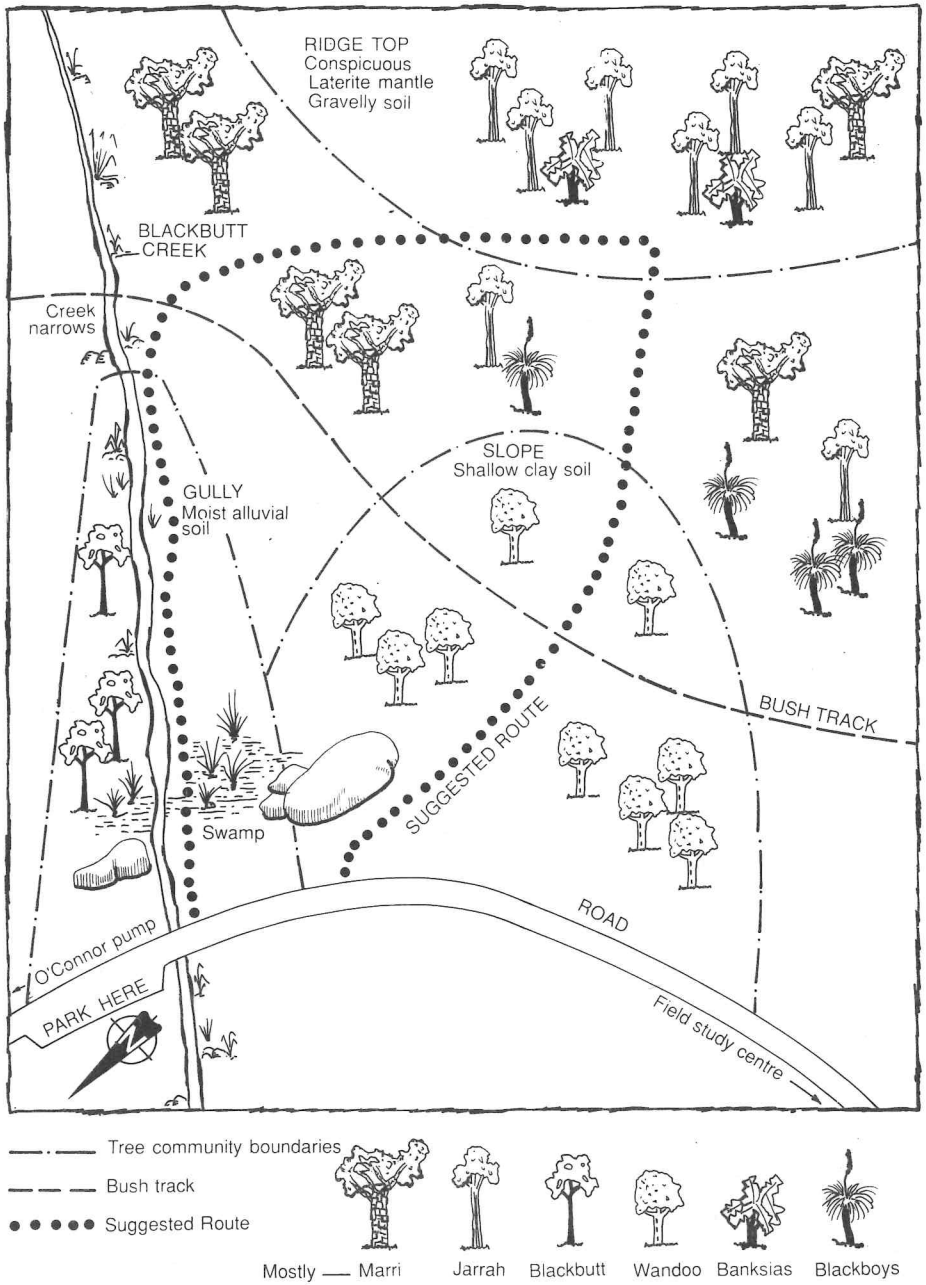
(V) JARRAH FOREST COMMUNITY
How do organisms meet their needs for food and shelter?

A forest can be divided into layers, or storeys. Identify these layers (e.g. leaf litter .... tree canopies). On a profile sketch of the forest, map the distribution of organisms, and work out their habitat requirements. Propose a possible food web for each level of the forest.

(for more information about jarrah forest inhabitants,
see Resource Notes 1-4)

A listening activity helps students to be more aware of all the activity going on around them in the forest. Ask each person to find a special "listening" tree. By putting their ear up to the tree, they can focus on all the sounds of the forest. Record sounds by writing down not words but letters describing each of the sounds. No names, just letters strung together. Their record sheet should show their listening post with these sound waves coming in from different directions.





O'CONNOR STUDY SITE

O'CONNOR STUDY SITE

VEGETATION AND SOIL TYPE

A range of conditions are represented in this area which can be used to demonstrate the relationship between soil conditions and vegetation, the concept of competition, and the idea of vegetation communities.

There are four species of eucalypt here, each with its specific requirements for soil type and moisture - some are quite precise in their needs, while others will tolerate a range of conditions. Consequently the boundaries between these vegetation communities are indistinct - there is a slow change in dominance from one species to another.

The Clay Slopes - Wandoo

Wandoo is easily distinguished; it is the only tree here with white bark, or with smooth bark. The bark is deciduous, and is shed in summer. The new autumn bark is a creamy colour but changes to white as it ages. Bark is shed unevenly, leaving grey patches of outer bark which gives the trunk a mottled look.

This small patch of wandoo is growing on heavy, clay soil. Wandoo is characteristically found on slopes where clay soil has been exposed. It is more common in the drier areas to the east of the Darling Range. In the patch of wandoo at the bottom of the slope (near the road), granite boulders are exposed. This is one indication that the surrounding soil is very shallow.

The Slopes - Marri

Marri has rough, dark bark (as do jarrah and blackbutt). The shape of the tree can be quite distinctive; the branches start about two thirds of the way up the trunk and are spreading and often wiggly - one branch can turn in several directions. The fruits (honkey nuts) are very large. Sometimes the tree has red gum (kino) seeping from the trunk. The bark is tesselated - broken into rough squares.

Marri can grow on practically any site but predominates on the slopes where conditions do not suit other species. Near the top it gives way to jarrah which does better on the drier sites, and near the bottom it gives way to trees like blackbutt which out-compete it on the moist, fertile soil. Marri does like moisture-gaining sites and is often found around granite outcrops which act as small water catchments.

The Ridge Top - Jarrah

Jarrah has stringy, dark bark, with distinctive vertical fissures making the bark look like it is in long strips. Jarrah tends to grow straight and tall. Its branches usually start about three quarters of the way up the trunk (in dense forest).

Near the top of the ridge the soil changes markedly. Gravel abounds, and the hard laterite cap rock commonly called ironstone is obvious. Conditions for growth are harsh. As well as the cap rock, the soil is dry and infertile. In these conditions jarrah competes most successfully and dominates the forest. Some banksia occurs here; it grows quickly and if it has the opportunity competes with the slower growing jarrah.

The Gully - Blackbutt

Blackbutt is the third of the trees in this area with rough, dark bark. It is similar to jarrah in form, but the fruit is smaller, the leaves have a bluish tinge (jarrah is a relatively bright green), and the bark is not in such thin strips.

The bottom of this little gully has rich, moist alluvial soil - ideal for blackbutt which dominates the site. Higher up, the gully narrows sharply - there is no alluvial soil and no blackbutt (marri takes over)

For more information see Resource Note 17 "Some trees of the Jarrah Forest".

POSSIBLE INVESTIGATIONS

What are the environment requirements of the four species of trees in this area?

This could involve some of the following activities and observations:

(I) Draw a sketch map of the area and mark in the land forms (gully, slope, granite boulders, ridge top).

(II) Wander about the area to meet the trees; try to distinguish the four species by their physical features (bark, shape, leaf colour and venation, fruit, flowers etc)

(III) Following a roughly triangular route (granite-ridge top-gully) map out the distribution of the tree species.

(IV) Try to work out community boundaries.

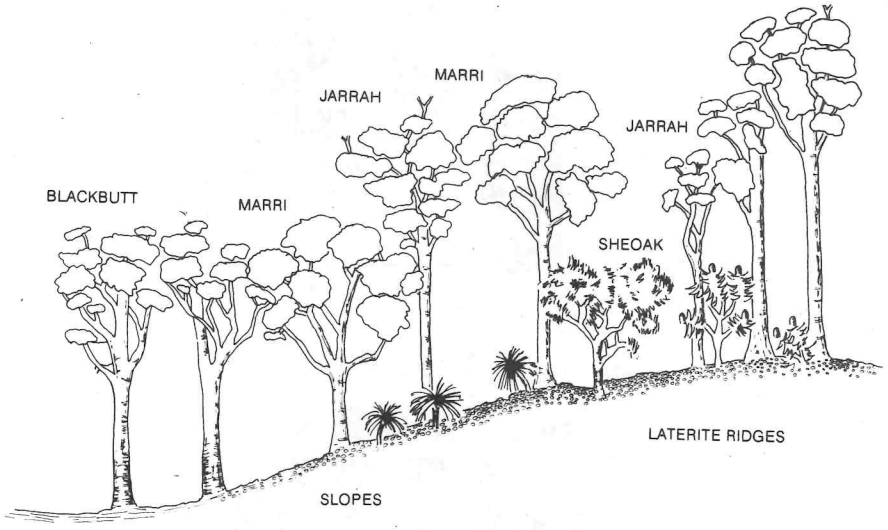
(V) Compare the soil at each site (this can be done easily by trying to pick up a handful of soil - can you get a handful? is it rich in humus? is it gravelly?)

(VI) Work out if the different sites are likely to get much moisture (Again, this can be done by observation and deduction, or by more sophisticated measuring techniques).

(VII) In which environmental conditions are each of the trees favoured.

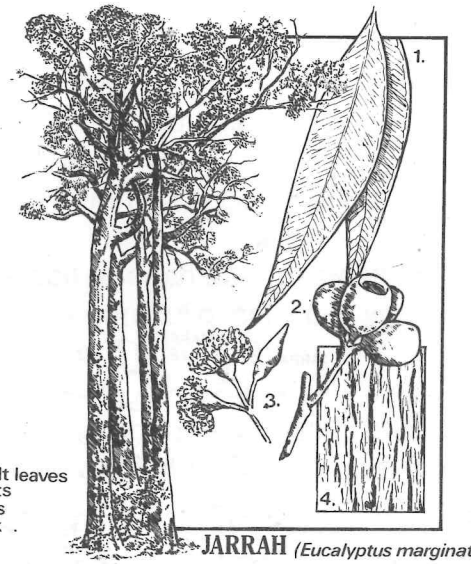
OTHER INVESTIGATIONS

- Do changes in site conditions correspond to changes in the dominant tree species?
- Do all trees compete equally well at each site?
- Which trees are the most successful competitors in each area?



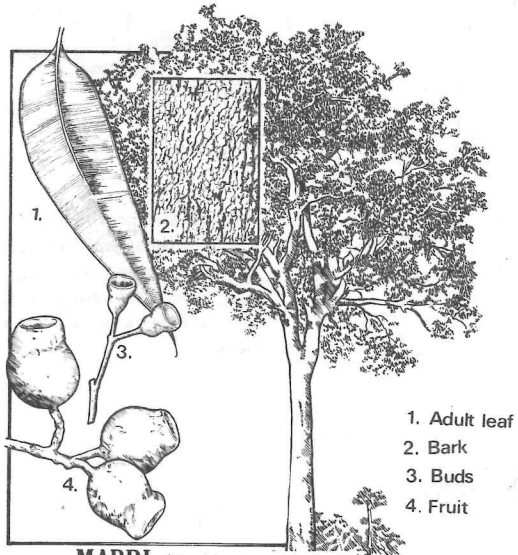
Diagramatic profile of jarrah forest.
Most of the jarrah forest area consists of the remains of the old laterite-capped plateau, steeply dissected in places by young rivers. The change in soil and drainage down the slopes provides a range of conditions, suitable for different species.

Trees of Mundaring Forest



1. Adult leaves
2. Fruits
3. Buds
4. Bark

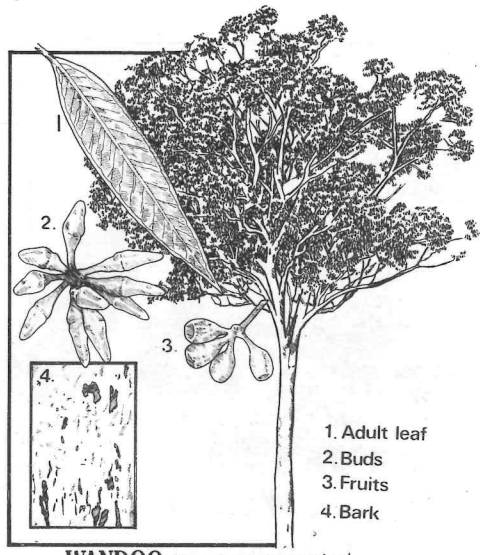
JARRAH *(Eucalyptus marginata)*



1. Adult leaf
2. Bark
3. Buds
4. Fruit

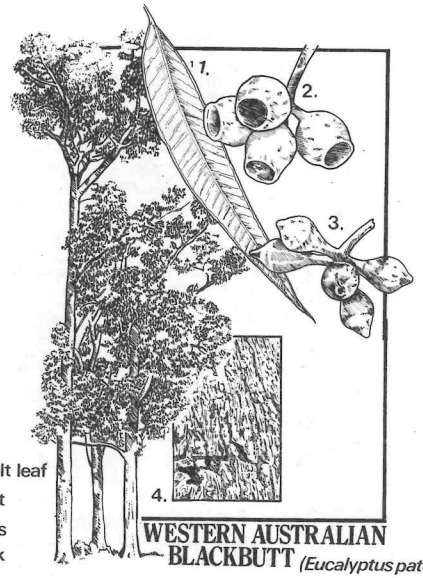
MARRI *(Eucalyptus calophylla)*

Trees of Mundaring Forest



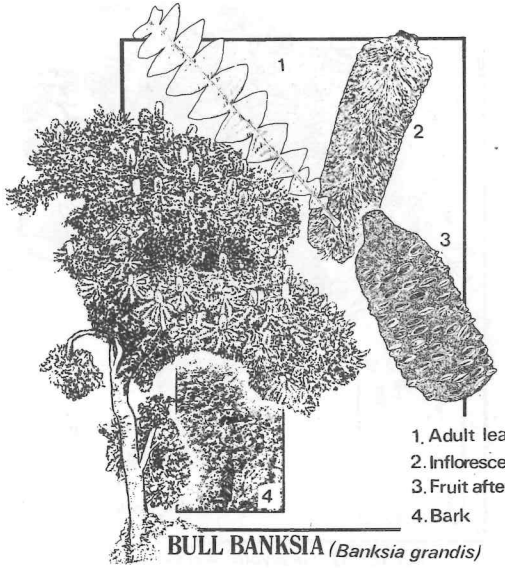
1. Adult leaf
2. Buds
3. Fruits
4. Bark

WANDOO *(Eucalyptus wandoo)*



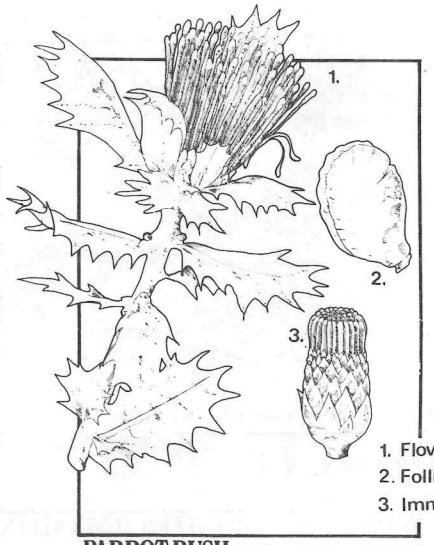
1. Adult leaf
2. Fruit
3. Buds
4. Bark

WESTERN AUSTRALIAN BLACKBUTT *(Eucalyptus patens)*



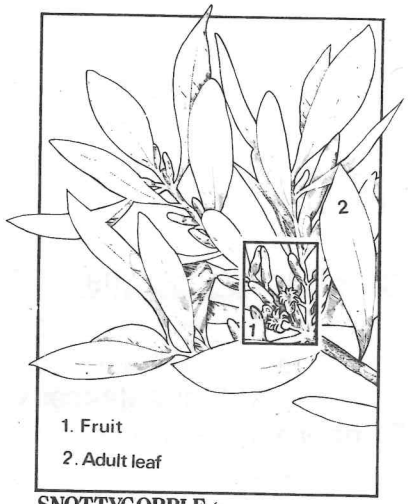
1. Adult leaf
2. Inflorescence at bud stage
3. Fruit after dehiscence
4. Bark

BULL BANKSIA *(Banksia grandis)*



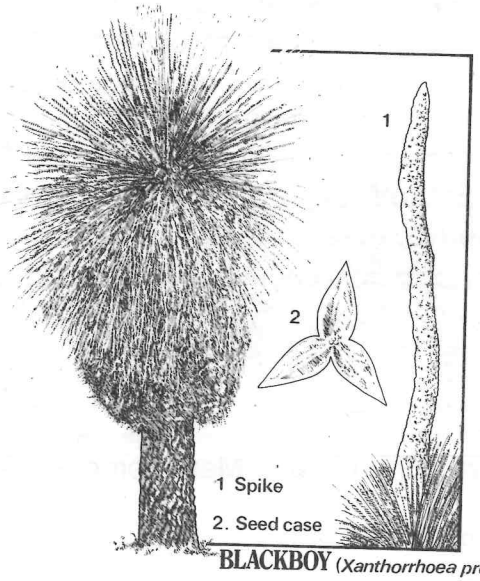
1. Flowering branch
2. Follicle
3. Immature flower head

PARROT BUSH *(Dryandra sessilis)*



1. Fruit
2. Adult leaf

SNOTTYGOBBLE *(Persoonia elliptica)*



1 Spike
2. Seed case

BLACKBOY *(Xanthorrhoea preissii)*

REQUESTING CALM ASSISTANCE

* **CALL PERSONALLY** to collect resources (Front Counter): 50 Hayman Road, Como or CALM Mundaring

* **PHONE** Front Counter enquiries to request a mail-out: (09) 367 0481/(09) 367 0437

* For **VIDEOS AND FILMS** phone (09) 367 0333 after 2.30 p.m.

* For further enquiries and assistance with **PROGRAMME DEVELOPMENT** phone Environmental Education Officer (09) 367 0333

* **FIELD EXCURSIONS OR TALKS** : Given plenty of lead time and a clear statement of learning objectives, CALM may be able to assist. This may be in the form of advice on best study sites, provision of maps and background information, suggestions on suitable study topics, and possibly input into your field excursion. Remember: our field officers have many competing duties, some of which may override even the best plans e.g. fire emergencies. We ask you to establish contact with the Mundaring District Manager, then send in the completed form titled: "Schools and Group Excursions" to:

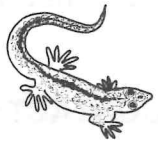
District Manager
Dept of Conservation and Land Management
Mundaring Weir Rd
Mundaring 6073
(09) 295 1955

* **MUNDARING FIELD STUDY CENTRE** : Administered by Belmont Senior High School YEO and AUS programmes

CONTACT (For bookings) CALM Mundaring (09) 295 1955

CALM encourages groups to seek field experiences to enrich the learning programme. Our message is : GET BUSHED for your best educational experiences.

"School Talks and Excursions" Request Form



Thank you for your enquiry about:

* an excursion to this area
* a school talk

We want to help your group gain the maximum benefit from the experience. To do this, we need to know your plans and objectives well in advance. So, could you please complete this form and return it to us soon? **WE NEED 4 WEEKS NOTICE.**

Name of group/school .....
Contact person .....
Address .....
Post Code ..... Telephone No. .....
Date(s) of proposed visit(s) .....
Times .....
Age/level .....
No. of participants .....
Subject area(s) .....
.....
.....

Where applicable please answer the following:
Aims of visit (e.g. environmental awareness, recreation, etc)
.....
.....
.....

What do you hope your group will gain from the visit?
.....
.....
.....

What pre-visit activities have you planned?
.....
.....
.....

What follow-up activities have you planned?
.....
.....
.....

How would you like us to help?
.....
.....
.....

After this form has been returned we will confirm further details by phone or letter. Thanks for your help - we hope your excursion will be enjoyable and educational.

Please return to:

District Manager
Dept of Conservation and Land Management
Mundaring Weir Road
Mundaring 6073
(09) 295 1955

FURTHER EDUCATIONAL RESOURCES AVAILABLE FROM THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT THAT ARE RELEVANT TO THIS AREA:

* Getting BushEd With CALM

* Exploring Granite Outcrops

* Explorer Series : Goldie and the Riddles of Life (forest habitat of the frog)

* Resource Notes (currently 20 of them)

Jarrah Ecosystem Concepts
#17 Trees
#18 Geology, Hydrology
1 Marsupials
2 Birds
3 Frogs
4 Snakes and Lizards

Jarrah Management
#11 Dieback
#12 Managing Dieback
#10 Reasons for Rarity
#16 Fire

Ecology
5 Parrot adaptations
#15 Macrozamia - inter relationships
#19 Possums, habitat and fire
#20 Genetic diversity and conservation of the grass wattle

* **Landscope magazine** - various articles on conservation, wildlife and forests

* **Posters** - Granite outcrops : Living Rocks
- Bush corridors
- Wildlife (various)
- Minimal Impact Bushwalking

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