

Early Days

Aborigines were in our area for perhaps one thousand generations. We know that this area was significant because of the Moggill Bora Ring. The local tribe, the Jagera, or perhaps the Jinibara, camped at what we call Mt Elphinstone around the end of May, when there was a meeting with other tribes. According to a local source, marriages were arranged and aborigines with chest complaints were placed in the Mt Elphinstone caves, which were thought to be a place of healing. Some Aborigines then left for the Bunya Mountains around late October, or else dispersed. The folk of the tribes were organised into totems descending through the female line, each associated with some animal or plant, and each totem group kept a protective eye on its name species. They did not eat it and they ensured that it was not eaten by others.

Gaiarbau was said to be one of the last survivors of the Jinibara, who could tell of the life of his people before it was disrupted by contact with western civilisation. In 1957 Dr L.P. Winterbotham reported stories told by Gaiarbau when he was well over 80 years old. The Aborigines were necessarily close observers of nature and knew just when certain animals were at their best and fatty. A few signs related by Gaiarbau:
"kangaroos were fat when the fern leaf wattle was in bloom"

"the carpet snake was ready for eating when the wild passionfruit was ripe";
"the time for turtles was when the river chestnuts were blooming";
"when the silky oak was in bloom then the eels were fat and at their best".

The hairy caterpillars would be migrating in stringlike processions through the bush at mullet time, and when the bunya nuts were ripening in winter, bark on the gums and the Moreton Bay ash was peeling all along the trunks of the trees.

In this way, by noting the signs of the bush, the tribal folk would roam through the forests and woodlands, following their seasonal foods.

The first European settlers reached Brookfield, Moggill and Pullen Vale (yes, that is the way they spelt it at that time) in the late 1840s. Timber getters quickly moved along the creeks cutting the precious red cedar, white beech and rosewood. Not long after, Eliza Brimblecombe, whose father owned properties at Gold Creek, Pullenvale, Gap Creek and Moggill Creek, described this area:

"With moss hanging from the branches of the trees, wonderful elkorns, staghorns, mistletoe, vines and flowering trees and

plants of so many tropical varieties. The crystal clear water was a delight and there were ferns, water cress, wild violets, wild cherries, lillypillies, raspberries and wild strawberries to investigate along the banks." (cited by Clarkson and Langford 1985).

A description found in the back of John Harrop's diary, cited by Dart (1981), gives an idea of the vegetation at that time:

"The bush is that part of the country that is covered with large trees such as Ironbark, Blue and Red Gum (some of which grow to enormous size). The Scrubs are often found on the banks of the rivers and creeks and the inland water holes (or lagoons as they are called). The Scrubs are composed of trees so interwoven with vines that they form an almost impenetrable mass of vegetation, in the midst of which grow the tall and stately Pine, Cedar, Rosewood and other valuable woods."

The timber getters then turned to cutting the giant hoop pines. Bullock teams took the logs out of the hills to the Brookfield end of Rafting Ground Road, where the Show Grounds now are. Horse teams then took the logs to what is now Rafting Ground Park (see photograph on front cover, taken in 1899).

The logs were chained together into a raft in the bed of Moggill Creek, at low tide. With the high tide the rafts floated to the Brisbane River. The journey of the logs from Rafting Ground to the sawmills at Kangaroo Point was said to have taken a week, as the logs could only move downstream with the ebb tide. The photograph on the front cover of this book shows part of Rafting Ground Park

Probably the first list of species native to our district is the one published in 1889, following an excursion by the Field Naturalists Section of the Royal Society of Queensland in December 1888. They camped on Moggill Creek, about two miles south of Gold Creek Reservoir, then the main water supply for Brisbane. They list about 90 flowering plants and ferns, although many of the names are now unfamiliar, as they have been changed as a result of taxonomic revisions. Since those days, most of the forest those campers would have seen has disappeared.

In the last few years, communities in the Brookfield-Pullenvale-Moggill area have been seeking information which would help them to revegetate their land with local species. A group got together to assemble the information; it was decided to publish it as a book, and here it is!

as it is now, and one on the back cover, a family planting trees in the Park, an activity of our local Landcare group. After the logging, most of the area was cleared for farming or grazing. However, with the decline in farming since World War II, some of the cleared land in the hills has been allowed to return to woodland. Aerial photographs taken of Upper Brookfield in

The Need for Revegetation

People plant trees for various reasons, and all of them are valid. On smaller blocks of land, the intention might be to have an attractive garden, to attract birds, to provide shade or a screen. On larger blocks the intention might also be to grow trees as an eventual source of timber, to revegetate a rundown pasture, or for erosion control. For many of these purposes, exotic trees play a useful role, but if the intention is to encourage the native birds and animals, undoubtedly the local vegetation is best. Birds which feed on nectar and fruit are attracted to the local plants and the insects which feed on local plants are food for insect-eating birds.

Before our area was settled by Europeans, there were essentially two major vegetation types, eucalypt forest and rainforest. Both of these showed variation depending on soil type and depth, slope and aspect. There is a lot of difference between slopes which face

each decade since the 1960s show the extent of this revegetation. The primary purpose of this book is to assist those who wish to participate in hastening this process to select suitable species native to our area. Unless an appropriate balance of these species is planted, the diverse wildlife of the area, which we all enjoy, will suffer.

northwest and those which face southeast. The northwesterly slopes are generally less favourable for plant growth, as they are exposed to the full strength of westerly winds in winter and of the sun during the hottest time of the day.

The eucalypt forest, dominated by a dozen or more species of *Eucalyptus*, was largely spotted gum and narrow-leaved ironbark on the ridges, where soils are thin and infertile, with silver-leaved ironbark occurring on the slopes and Queensland blue gum and broad-leaf apple on the lower flats.

Rainforests were widespread along the Upper Brookfield, Pullenvale and Gold Creek valleys and along Moggill Creek and other creeks in the district. Rainforests are extremely variable and differ greatly over different parts of their range. In the western Brisbane area there are essentially two types of rainforest, termed subtropical rainforest

and dry or depauperate rainforest. Dry rainforest is distinguished by a low tree canopy and ferns and palms are generally absent or rare. Vines are abundant. Smith's Scrub is a good example of dry rainforest, whereas the residual rainforest at Rafting Ground is subtropical rainforest.

In general, there is more interest in planting rainforest species than eucalypts, although the latter are better suited to the dry, infertile ridges, and they attract birds and mammals too. Rainforest species can be established in a wide range of conditions, but best results are likely to be on sites to which they are naturally adapted. This book includes information on the natural vegetation type to which each listed species is adapted.

Growth in the Rainforest

When creating your own area of rainforest, it helps to realise that most early growth of rainforest trees occurs in gaps. These gaps are created when a tree has died as a result of disease, being choked by vines, lightning strikes, or simply old age. Sooner or later, the dead tree falls to the ground, bringing nearby smaller trees with it. Sometimes live trees may also be brought down by strong winds. This allows light to penetrate to ground level, whereas in an undisturbed forest there is insufficient light for young

Where possible, it is desirable to plant trees to provide corridors or links between larger blocks of forest. It is also of benefit to maintain a continuity of vegetation type, unless there is a good reason for doing otherwise, such as a change in situation from hill slope to valley floor. Wildlife benefits from these corridors, which provide security as well as access to food sources. Creeks are particularly important as a focus for re-forestation, as they provide a habitat for a wider variety of wildlife than the hills and are a source of drinking water. In addition, well-vegetated creek banks minimise erosion and help to reduce downstream flooding.

There are several general books which include information on planting and

Regenerating a Rainforest

trees to grow. Important features of a gap, besides increased light levels, are that it is a relatively protected environment with little wind or frost at ground level, humidity is higher than in the open and the ground is usually littered with debris such as branches, rotting wood and leaf litter. This keeps the earth relatively cool and moist and encourages earthworms and decomposing organisms which release nutrients back into the soil.

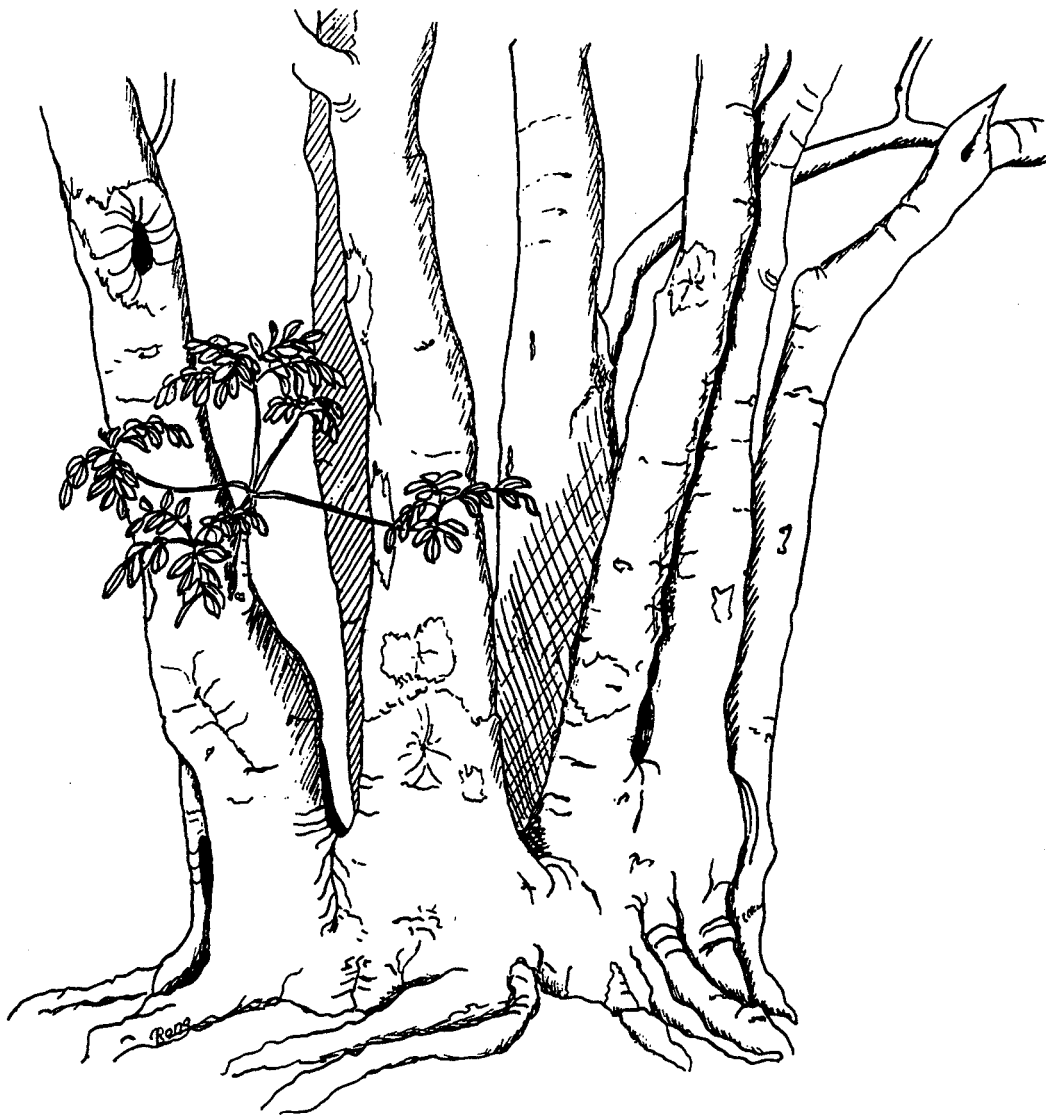
These are the conditions which many young

management of rainforest trees and there are some enthusiasts in our district who have accumulated a wealth of local experience. This information is brought together in this book. For the most part, we only cover species which currently occur in the area, and it is probable that many species which still occur in the general region are now extinct in the Brookfield-Pullenvale-Moggill district. Much of the information on distribution comes from species lists generously made available by Mr Lloyd Bird, of Bundamba. Locations of sites where species have been positively identified are shown in the map on page 5. Information on a broader range of species native to southeast Queensland may be obtained from the references listed at the end of the book.

rainforest trees are adapted to, for optimum growth, and these are the conditions, therefore, which you should try to create. There are some pioneer species which are adapted to rainforest margins and to larger exposed areas caused by severe disturbance. These hardier, wind-resistant species may be planted round the edges of your rainforest area, again simulating natural conditions.

Creating a gap

The first step, regardless of vegetation type, is to select an area of a size you feel you can



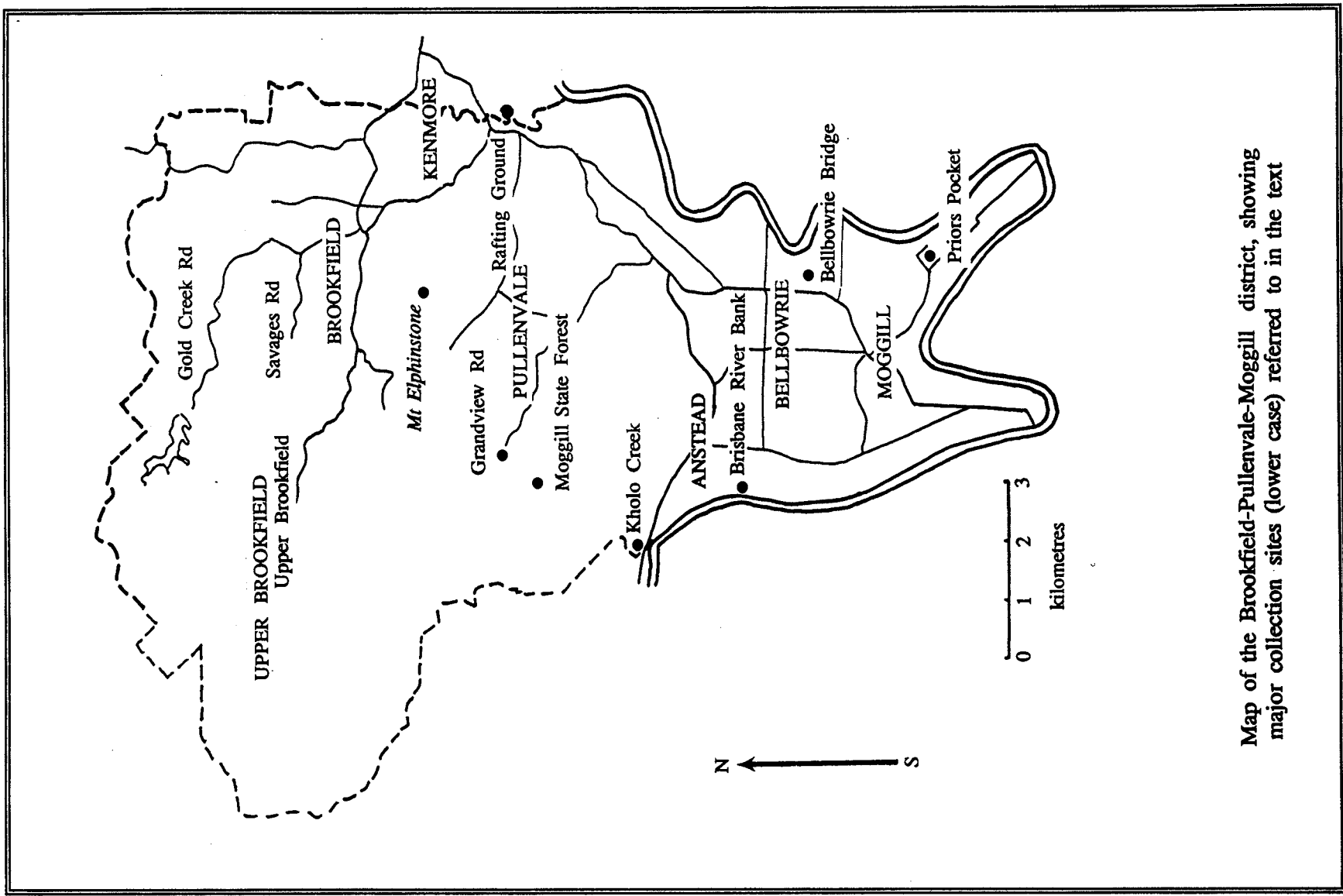
handle, remembering that establishing a forest area includes not only the initial planting, but also weeding during the first year or two, mulching, and watering if necessary in a drought. This area becomes your gap. Gap size may be anything from 7 m diameter to 50 m or even more - it all depends on the space, time and energy available. After planting one gap, and managing the after-care, you may then want to go on to another. Thus, several gaps may eventually be created within the total area available for planting. If your total area is large, it is a good idea to create successive gaps some distance from each other, so that natural regeneration can occur in between. As the trees grow, they will start to shade out the weeds in the in-between areas and lessen the need for weed control.

Treatment of the gap differs according to the initial vegetation. This will most commonly be one of these two types:

- areas infested with lantana, or other weeds, often with wattles;
- areas now under grass.

Lantana or other weed infested areas

You should go inside the area to create your gap, leaving wattle and weeds, including lantana, around the outside. These provide some protection against wind and frost and help keep the humidity higher than outside



Map of the Brookfield-Pullenvale-Moggill district, showing major collection sites (lower case) referred to in the text

the gap. The diagram on page 7 shows suggested staged treatment of a large, weed-infested area. Leaving the weeds in place until you are ready to plant helps to maintain the soil condition, allows some natural regeneration of seedlings to occur, and provides a refuge for small mammals and birds. Within your gap area, cut any weeds, wattles and lantana to ground level, then cut up woody branches and stems and strew the debris on the ground. Exceptions are those weeds which can resprout from small sections, such as Madeira vine (*Anredera cordifolia*), which need to be removed. Tobacco bush (*Solanum mauritianum*), if present, should be retained. Although not native, it attracts fruit-eating birds, which may drop seeds, encouraging natural regeneration. Take care to retain any seedlings regenerating under the weeds, unless they are exotic weed species such as Chinese elm (*Celtis sinensis*) and camphor laurel (*Cinnamomum camphora*). If you are not sure whether you should retain any particular plant, take a sample to your local nurseryman or to the Moggill National Parks and Wildlife Office for identification.

Some of the more widespread and troublesome weeds in our district are illustrated on pages 15 and 16.

Do not burn anything. If you do not wish to use chemicals, there are three physical methods to discourage regrowth:

- Grub out the roots with minimal disturbance;
- wrap opaque materials (such as black plastic) over and around the cut stumps to ground level to prevent new shoots receiving light;
- strip surviving stumps of green shoots at regular 2-3 week intervals until the plant gives up and dies.

If you wish to use chemicals, apply a concentrated solution of Roundup to freshly cut exposed stumps. Where there are robust vines, such as glycine (*Neonotonia wightii*) and *Ipomoea* spp., these are best controlled by treating freshly cut stumps with Roundup. Madeira vine should not be cut through before treating, as this prevents the chemical from reaching the aerial potato-like tubers, which are potential new plants. Instead, the stem should be scraped and roundup applied to the freshly scraped area.

Areas now under grass

The important considerations here are to protect your seedlings from drying winds (and frosts in low-lying areas) and to minimise competition from the grass.

(i) *Protection from wind* - In providing protection from wind, you are creating the effect of a rainforest gap. If the area is not already sheltered, plant bushy, low-branching, wind-tolerant plants around the outside. These will screen the other plants

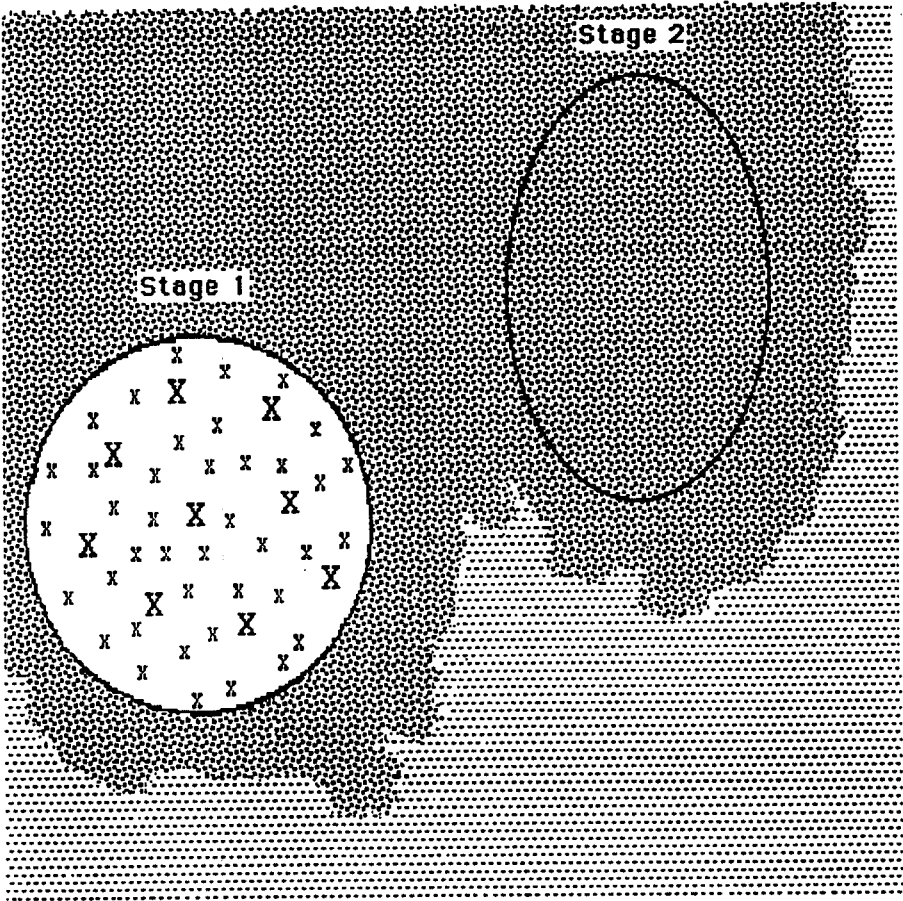
from the wind and help raise the humidity. They will also lessen horizontal light penetration to ground level and thus weaken grass growth. Species to plant include:




<i>Acacia maidenii</i>	Maiden's wattle
<i>Acacia melanoxylon</i>	blackwood
<i>Commersonia bartramia</i>	brown kurrajong
<i>Elaeocarpus obovatus</i>	hard quandong
<i>Glochidion ferdinandi</i>	cheese tree
<i>Grevillea robusta</i>	silky oak
<i>Macaranga tanarius</i>	macaranga
<i>Omalanthus populifolius</i>	bleeding heart

The acacias are particularly valuable in exposed areas, as they are tough, hardy, bushy and fast-growing. There is evidence, however, that they can suppress the growth of other trees planted near them. They are also often short-lived, and may cause considerable damage to surrounding trees when they fall. It may be best, therefore, to confine wattles to very exposed sites, as a front line windbreak at some distance (4-5 metres) from the rest of the planting, or else to include wattles only very sparsely, interplanted with other trees. The diagram on page 9 shows a planting in grassland, with wattles forming a front line windbreak, and protective pioneer species around the outside of the planting.

(ii) *Grass competition* - It is essential to keep grass at least 1 and preferably 2 metres from the base of the trees, in order to maximise

Establishing a rainforest in an area infested with lantana or other weeds



-  Planted trees
-  Area covered with lantana or other weeds
-  Area now grassland

growth. The easiest way, if the resources are available, is to pile on the ground anything which will decompose and which will, in the meantime, keep out light so as to prevent grass growth - newspaper, cardboard, sawdust, bark, grass clippings, straw, manure, hay, old carpet, felt underlay, compost and tree clippings are all examples. There are also fibrous mats available for this purpose. Where the mulch is nutrient poor, as in sawdust, newspaper, mats or cardboard, adding manure or compost will restore a nutrient balance. The mulch can be laid up to a month prior to planting, but simultaneously is fine also. Further details on mulches are provided in the section below.

Another method for controlling grass, if the area is too large for the existing vegetation to be controlled with mulch, is to deep-rip the soil with a tractor. On sloping land, care should be taken to follow the contours, and to leave strips of undisturbed grassland so as to avoid erosion and soil loss in the event of heavy rain. Any remaining logs and branches may be aligned along the contour so as to reduce soil loss. Where the area is flood-prone, deep-ripping is inadvisable, as it can lead to extensive erosion. Ripping the soil has both beneficial and deleterious effects. It results in disturbance of the soil biota (animal and plant life), but also results in a release of soil nitrogen, which benefits establishing seedlings.

The chemical method is to apply roundup about a month prior to planting, to kill the grass. Mulching is still required after ripping or applying chemicals, in a 1-2 m radius around each planted seedling.

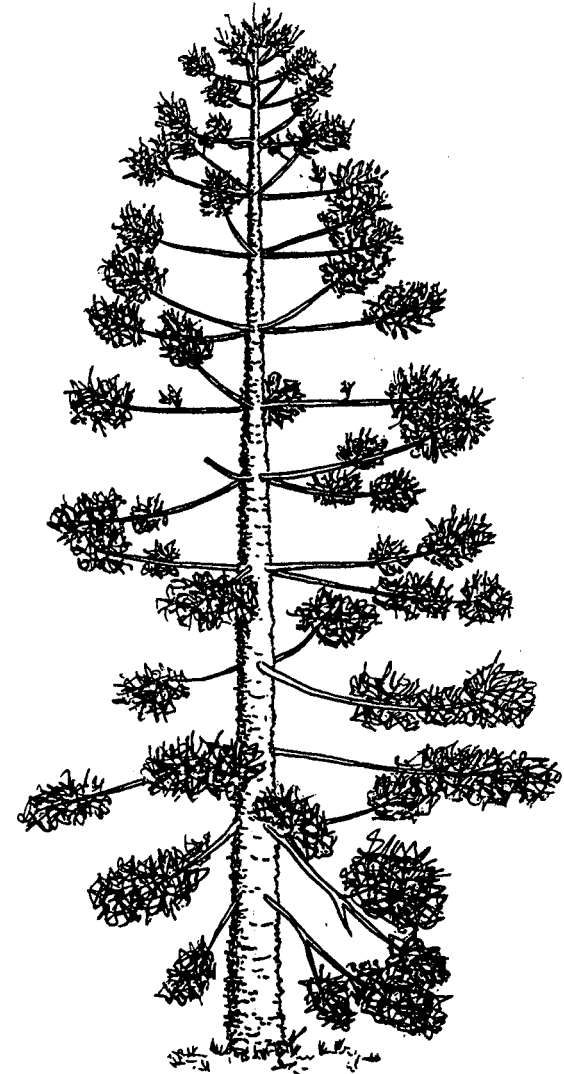
Some local pioneer species can germinate and survive in grassland where most rainforest species cannot. These include:

<i>Alphitonia excelsa</i>	red ash
<i>Aphananthe phillipinensis</i>	axe-handle wood
<i>Grevillea robusta</i>	silky oak
<i>Jagera pseudorhus</i>	foambark
<i>Mallotus</i> spp.	the kamalas
<i>Melia azedarach</i>	white cedar
<i>Toona australis</i>	red cedar

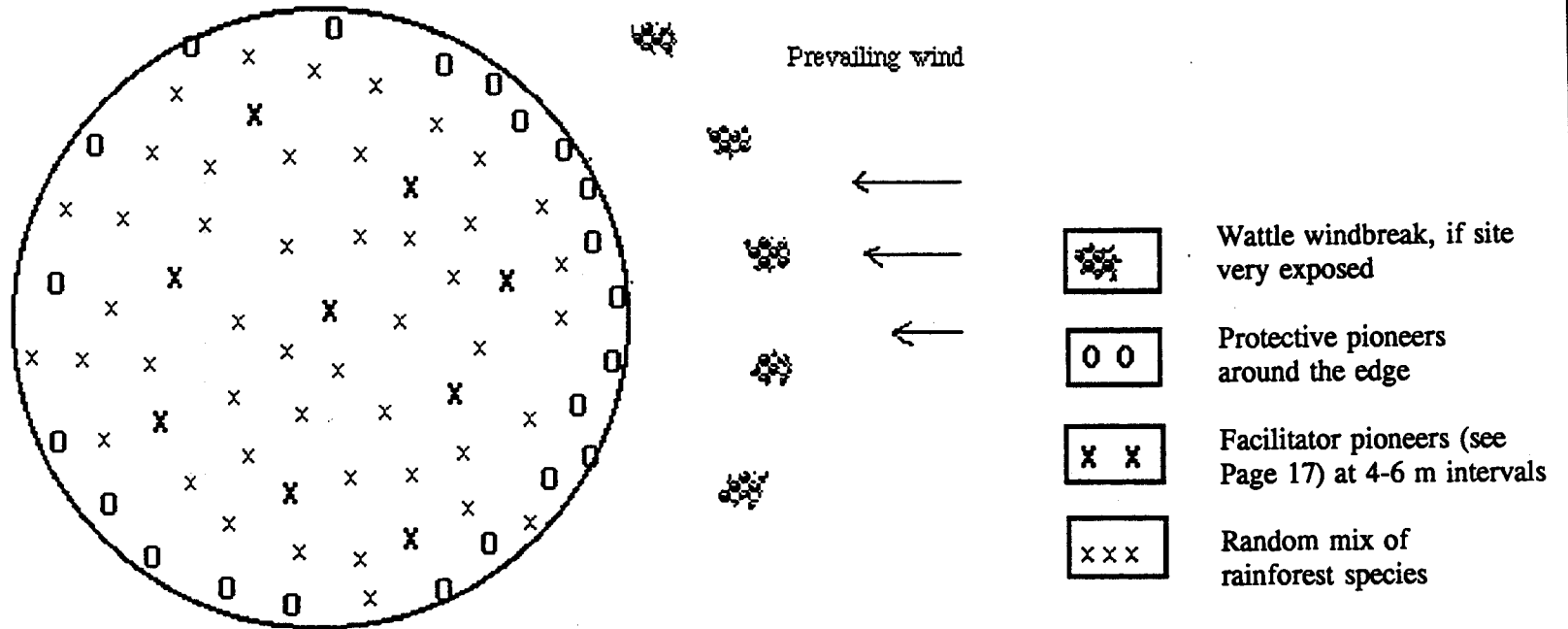
These may be planted liberally in grassed areas, particularly when there is going to be less than optimal after care. White cedar, foambark and silky oak are very attractive trees, particularly when flowering and fruiting.

Mulches

Adequate mulching is an essential prerequisite for successful establishment of rainforest trees. Mulches perform two main functions - they keep the soil cool and they retain soil moisture. Additionally, they help to reduce competition. Organic mulches also



Planting pattern and treatment of gap edges in grassland



improve the underlying soil by increasing activity of microbes and beneficial invertebrates such as earthworms.

Many different materials may be used for mulches, but it is essential that only non-toxic materials be used. Examples of mulching materials are:

- rocks, stones and gravel, which are free and plentiful through most of our area. They are the most durable mulches but are not the most effective as insulators, due to voids between particles;

- wood chips are effective as mulches but are less durable than rocks and stones. They have good insulating qualities and allow penetration of water;

- organic materials, such as cardboard, cotton waste, old carpet and underlay, mulched tree prunings, newspaper and bark, are commonly available and make good mulches - although often of limited durability. Slash pine bark is not recommended as it is too acidic. Care should be taken with tree prunings to avoid seeds of noxious weeds. Mulchers are now available from hardware stores which enable one to get rid of garden "rubbish" and create mulch in one go;

- straw and leaf debris are ideal as mulches but have limited durability and need to be

"topped up" at intervals;

- fresh grass clippings should be mixed in with other organic composting materials; on their own, they are poor as a mulch as they tend to give out excessive heat on composting;

- polythene sheeting restricts water entry and is costly;

- fibrous matting, marketed as "Jutemaster", breaks down in about a year, and is an excellent mulch, but it is fairly expensive. It may be justified on steeply sloping land where the area to be revegetated is small, or on creek banks subject to flooding.

Site topography

Planting procedure may differ depending on the topography of the area to be revegetated. Some sites are better favoured than others. Most favoured are creek or riverside situations, then flat or gently sloping land. Least favoured are the steep hillsides.

(i) *Hillsides or gullies* - rainforests tend not to occur naturally on exposed slopes, particularly northwesterly ones. On hills, rainforests prefer gullies, as these are more protected and collect and funnel moisture from the hillside. When planting a hillside, select the gullies first and slopes most

protected from the elements second. It is important in planting to trap as much water as possible. If it is a stony gully, stones can be piled across the slope at intervals to make small rubble check dams to slow down water flow and trap soil. Check dams can also be created by driving stakes into the ground and piling logs or branches behind the stakes.

When planting, pile rocks or sticks around the tree on the downslope side to trap water. You may want to drive stakes into the ground to keep these secure. If the ground is hard, it is generally a better idea to dig a shallow hole and mound up above ground level with mulch rather than to dig a deep hole and place the tree far into the ground. Surround the seedling liberally with mulch and rocks piled securely around, particularly on the downslope side. A slight depression around the stem will help to prevent water runoff.

In general, using whatever materials are at hand create mulched, water-retaining pockets for the trees, at intervals across and down the slope. Runnels may also be made from one level to the next, guiding the water from tree to tree. Important also is the choice of species, as for hillside and gully planting, trees need to be from the drier, tougher end of the spectrum of rainforest trees. Some suitable species are:

Acronychia laevis

glossy acronychia

<i>Ailanthus triphysa</i>	white bean
<i>Alphitonia excelsa</i>	red ash
<i>Araucaria cunninghamii</i>	hoop pine
<i>Austromyrtus bidwillii</i>	python tree
<i>Brachychiton acerifolius</i>	flame tree
<i>Capparis arborea</i>	brush caper berry
<i>Dendrocnide photinophylla</i>	shiny-leaved stinging tree
<i>Erythrina vespertilio</i>	bat's wing coral tree
<i>Ficus macrophylla</i>	Moreton Bay fig
<i>Flindersia australis</i>	crow's ash
<i>F. bennettiana</i>	Bennet's ash
<i>F. collina</i>	leopardwood
<i>F. schottiana</i>	cudgerie
<i>F. xanthoxyla</i>	yellowwood
<i>Glochidion ferdinandi</i>	cheese tree
<i>Hibiscus heterophyllum</i>	native hibiscus
<i>Jagera pseudorhus</i>	foambark
<i>Lophostemon confertus</i>	brush box
<i>Mallotus</i> spp.	the kamalas
<i>Melia azedarach</i>	white cedar
<i>Melicope micrococca</i>	white euodia
<i>Notelaea longifolia</i>	large mock-olive
<i>Owenia venosa</i>	crow's apple
<i>Pittosporum rhombifolium</i>	hollywood
<i>Podocarpus elatus</i>	brown pine
<i>Polyscias elegans</i>	celerywood
<i>Rhodosphaera rhodanthema</i>	deep yellowwood

On drier slopes, especially those facing northwest, it may be preferred to re-establish a eucalypt forest. A range of appropriate species is provided in a later section.

(ii) *Flat or gently sloping lands* - here there is usually the advantage of deeper soils with better water holding capacity. A possible disadvantage could be waterlogging, and if this is the case, careful choice of species is again necessary, as some rainforest trees thrive under waterlogged conditions and others, such as silky oak (*Grevillea robusta*) cannot grow at all. If waterlogging is not an issue, choice of species is virtually unlimited, if some protection against frost or wind is provided for young trees.

This is a good area to grow a selection of rainforest cabinet timber species as a personal superannuation policy. These species include:

<i>Acacia melanoxylon</i>	blackwood
<i>Ailanthus triphysa</i>	white bean
<i>Alphitonia excelsa</i>	red ash
<i>Araucaria cunninghamii</i>	hoop pine
<i>Argyrodendron trifoliolatum</i>	white booyong
<i>Baloghia inophylla</i>	scrub bloodwood
<i>Castanospermum australe</i>	black bean
<i>Cryptocarya obovata</i>	pepperberry tree
<i>Dysoxylum fraserianum</i>	rosewood
<i>D. rufum</i>	hairy rosewood
<i>Elaeocarpus grandis</i>	blue quandong
<i>Euroschinus falcata</i>	ribbonwood
<i>Flindersia australis</i>	crow's ash
<i>F. bennettiana</i>	Bennett's ash
<i>F. collina</i>	leopard ash
<i>F. schottiana</i>	bumpy ash
<i>F. xanthoxyla</i>	yellowwood

<i>Gmelina leichhardtii</i>	white beech
<i>Grevillea robusta</i>	silky oak
<i>Harpullia pendula</i>	tulipwood
<i>Lophostemon confertus</i>	brush box
<i>Melia azedarach</i>	white cedar
<i>Podocarpus elatus</i>	brown pine
<i>Rhodosphaera rhodanthema</i>	deep yellowwood
<i>Siphonodon australe</i>	ivorywood
<i>Stenocarpus sinuatus</i>	firewheel tree
<i>Toona australis</i>	red cedar

The fastest growing of these include blackwood, blue quandong, red cedar (if not attacked by tip moth) and white cedar. Blue quandong, although not currently noted in our area, occurs naturally in the nearby ranges. Bumpy ash, white beech and brush box can also grow quite fast. Hoop pine is initially slow, but grows more rapidly after the first few years. In contrast, species such as silky oak and deep yellowwood are initially quick-growing, but slow down after the first six years or so. The most valuable timbers include white beech, red cedar, silky oak, black bean, rosewood, tulipwood and crow's ash. White beech was probably the most sought after timber in the early days; by now it has become almost extinct in our district.

(iii) *Creek or riverside* - Where vegetation has been cleared from creek banks, it is particularly important to plant trees. Trees help to prevent creekbank erosion by the

binding action of their roots. The continuity of creeks - and creekside vegetation - potentially provides corridors for wildlife to move to and from large forested areas at the headwaters of the creeks.

When planting on creek banks, place stones, rocks and wood across slopes and anchor by stakes or wedges where erosion appears likely. Jutemaster matting may also be used to hold the soil. If the creek floods and plants are likely to be partly submerged for a period, species which can withstand submersion should be selected. Species selected should also have root systems which are strong enough to withstand strong currents, when the creek is in flood. Silky oak, with its deep taproot, is a good species as long as immersion or waterlogging is not prolonged, and brown pine (*Podocarpus elatus*) is also good. Many of the species listed below can withstand prolonged flooding. A stake can be driven through the rootball into the ground where regular, severe flooding occurs.

Suitable creek or riverside species include:

<i>Araucaria cunninghamii</i>	hoop pine
<i>Callistemon viminalis</i>	weeping bottlebrush
<i>Castanospermum australe</i>	black bean
<i>Casuarina cunninghamiana</i>	river oak
<i>Cryptocarya triplinervis</i>	three-veined cryptocarya
<i>Diploglottis australis</i>	native tamarind

<i>Elaeocarpus grandis</i>	blue quandong
<i>Ficus coronata</i>	creek sandpaper fig
<i>Gmelina leichhardtii</i>	white beech
<i>Streblus brunonianus</i>	whalebone tree
<i>Syzygium australe</i>	creek lilly pilly
<i>Waterhousea floribunda</i>	weeping lilly pilly

Further species are listed on page 146.

Aftercare

The important features of aftercare are:

- weed control
- water
- protection from animals

(i) *Weed control* - The answer for controlling grass and other herbaceous weeds is mulch, and more mulch, if it is available. In this climate, grass and weed growth is a major problem in the first two years, or until the trees grow sufficiently to provide a canopy of shade. Other than repeated and heavy mulching, methods for control of such weeds are physical extraction or the use of such herbicides as roundup. Exotic weedy vines such as Madeira vine are an ever-present danger. Once established in an area, they not only compete with young trees, but can smother them - and not so young trees too. Regular physical removal from growing trees and destruction, if possible, of segments capable of resprouting in the surrounding area is the only alternative to use of chemicals. A useful, but mainly chemical

guide to controlling some of our most troublesome weeds is included in the recently published book by Tim Low - "Dinkum Gardening".

(ii) *Water* - If trees are planted in an area to which they are adapted, water should not be a problem after the first month, unless there is a drought. In the drought that we have experienced in the early 1990s, though, you must be prepared to water your young trees.

For minimal aftercare, planting should be carried out when there is a full profile of soil moisture, but this is not always possible. During the first month, particularly, watch out for wilting and water if plants are wilted or the soil appears to have dried out. If plants are adequately mulched, there will be little moisture loss through the soil surface, and watering may not be necessary at all.

Growtubes are polythene tubes which maintain humidity around a young plant. There is a folded lip at the base of the growtube, which holds water for some time after watering or rain, maintaining humidity for a long period of time. They are not suitable for some dry rainforest and marginal pioneer species such as *Acacia* spp., which may become subject to fungal attack due to the unaccustomed high humidity. If used with subtropical rainforest species, including many of the cabinet timbers, they can be very successful. They also provide some

protection against animals, which can be quite destructive to young trees.

(iv) *Protection from animals* - Wallabies, hares, bandicoots and scrub turkeys can be very destructive to young trees, as can horses, goats and cows. Piling large stones around the base of tree seedlings dissuades scrub turkeys from scratching around, and blood and bone sprinkled around the base can deter hares and wallabies. If all else fails, physical protection such as that afforded by growtubes or chicken wire is advisable.

Horses and cows, besides browsing on young plants or trampling them, cause compaction of the soil. This is detrimental to root growth, water penetration and soil aeration, and horses and cows should therefore be excluded from the general area by fencing, if at all possible.

Natural regeneration

When livestock are removed from an area, plant species able to establish in competition with grass and weeds will start to appear, providing a seed source is not too far away, or viable seed is present in the soil. If a corner of a paddock is fenced off, nature can be left to take its course. If a remnant tree is in the area, then so much the better, as it provides some shelter for establishing

seedlings and is a resting place for seed-carrying animals, such as birds.

When grasses in a fenced off area are removed as well as the livestock, many more species are able to germinate and grow. Weeds need to be removed at frequent intervals, to prevent them from smothering the young regenerating seedlings. Exotic tree species such as privet (*Ligustrum* spp.), Chinese elm (*Celtis sinensis*) and camphor laurel (*Cinnamomum camphora*) are also likely to appear and should be removed. Understorey exotics, such as ochna (*Ochna serrulata*), a weedy shrub, also commonly appear in these situations, and need to be removed.

Within these constraints, it can be a rewarding experience watching the bush regenerate. Success is related to proximity to remnant patches of forest, which act as a seed source, and, in the case of species which require animals for seed dispersal, to the survival of the animal in the vicinity. It will also depend on the presence of pollinators such as bees and butterflies in the area, for the setting of viable seed in any remnant rainforest trees.

Soil type and fertilisation

Soil type may be less important to many rainforest trees than some other factors, and, in our area, moisture may be the major consideration. Nitrogen, a major component

of soil fertility, is generally deficient in our soils, but substantial quantities of atmospheric nitrogen can be fixed by soil microorganisms, such as bacteria, if conditions are conducive. A conducive environment is one in which extremes of temperature and moisture are reduced and where there is sufficient carbon substrate (such as rotting wood and mulch) for fixation to occur. Also important are fungi such as those forming mycorrhizae, many of which require similar conditions. They appear to be important for phosphorus availability to plants, may harbour nitrogen-fixing bacteria, and may provide inter-plant linkages as well.

In addition to the major nutrients, trace elements are important for tree growth, and these are lacking in some soils. Where we are re-vegetating an area with species which used to occur there naturally, it is unlikely that trace element deficiencies will be a problem, unless the soil has been seriously degraded.

In less fertile soils, it may help to apply some Dynamic Lifter or other organic fertiliser, to give the plant a good start in life. Most rainforest trees are tolerant of fertiliser and benefit from application of moderate amounts early in the growing season (unlike many native Australian plants, such as the banksias).

Spacing

Here there are no rules (as there are none in the rainforest), and advice from experts ranges from a 1-2 m spacing to 3-4 m. However, remember that the closer the planting, the sooner the canopy overhead will close. As the light penetrating through to ground level becomes less, competition from grasses and other weeds is reduced. Most weeds require high light intensities; they lose vigour and die out as the canopy closes. While it is easy to thin out trees later, it is not so easy to interplant, because of root competition from previously established trees. The closer the trees, the faster the ground becomes self-mulching. The closeness of planting, therefore, is dictated more by availability of trees, their cost, and energy available for planting, than by any lower limits as to how close they should be.

It is a good idea to map out pathways at the time of planting, particularly if planting closely, as this avoids soil compaction around trees when walking through the area.

Planting times

It is best to plant all trees in the same season. Preferably, plants should be planted at a time which allows them to establish their roots before the dry season. Planting in midsummer may cause heat stress, or moisture stress due to the drying effects of the sun, or scouring of disturbed soil due to torrential rains. Thus, March, April and

May are perhaps the best months. There is likely to be ample soil moisture after the summer rains, there is less heat stress, and the plants are entering their season for root growth, which occurs mainly during winter. After establishing their root systems over winter, plants are well poised for fast growth when the rains start in spring or summer, and are equipped to deal with periods of moisture stress in the meantime. Other advantages of autumn planting are that competition from summer weeds is not so strong, and, importantly, conditions for the workers are a little cooler than earlier in the season!

Canopy closure (when the leaves of adjacent trees are touching), should take place within two to four years, depending on spacing between trees and growth rates achieved. The area should then be relatively maintenance free. Understorey trees and shrubs, ferns and ground covers can be planted after the canopy has closed overhead, when light and humidity levels are more conducive to the growth of these shade-loving species.

Once the first gap is planted and the aftercare managed, it is possible to start on the next. If the overall area for planting is large, it is a good idea to put the second gap at some distance from the first. As the trees grow, flower and seed, and as birds fly in and the winds blow, spreading seeds, natural

regeneration will start to fill in the areas between the planted gaps. Keeping the planting in well-defined areas also saves the risk of forgotten planted trees being choked out by weeds, disappearing in long grass, run over by the lawnmower or ringbarked by the slasher.

If the overall area is not too large, and is well sheltered, you may prefer to expand outwards from your initial planting, but remember that previously planted trees may retard the growth of new ones planted close to them.

Plants may be purchased in a range of sizes, and, for larger areas, plants grown in tubes are cheaper and are the obvious choice. For smaller areas, larger plants in pots stand a better chance of survival. When purchasing plants, avoid plants which have been too long in the pot and have become rootbound - contorted and misshapen roots can inhibit the normal development of a healthy root system. For the enthusiast, seed may be collected from trees in the wild, germinated and grown. Seed of some rainforest trees only survives for a few weeks at most after collection, and so this should be borne in mind by those who wish to grow their own plants.

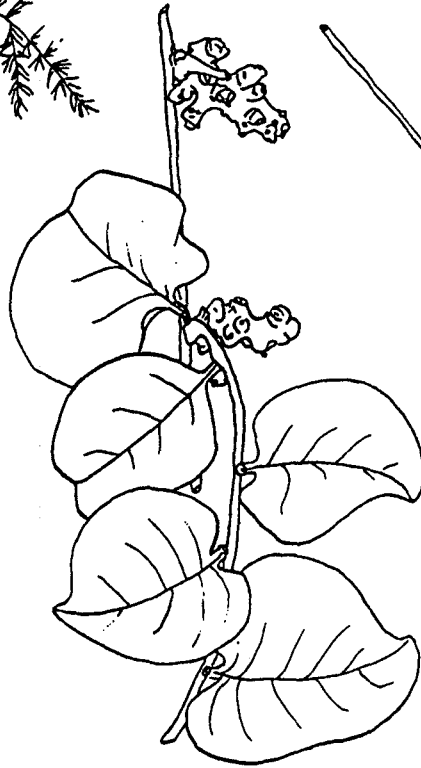
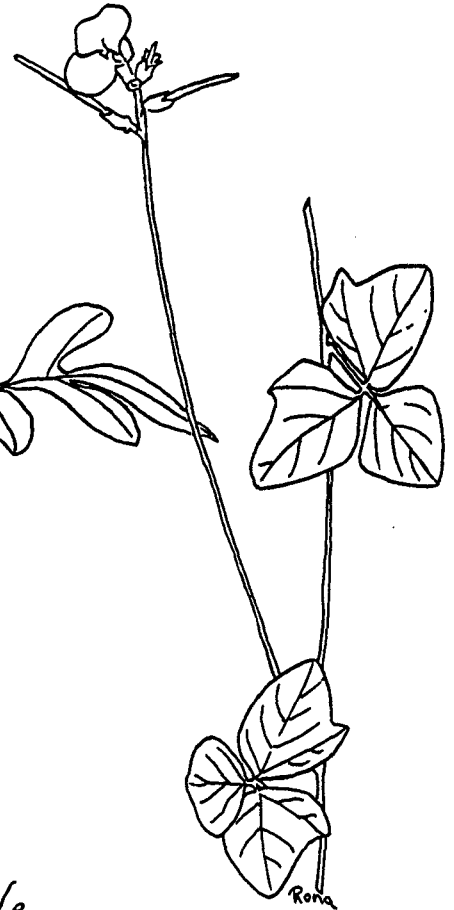
Asparagus vine



Glycine



Siratro



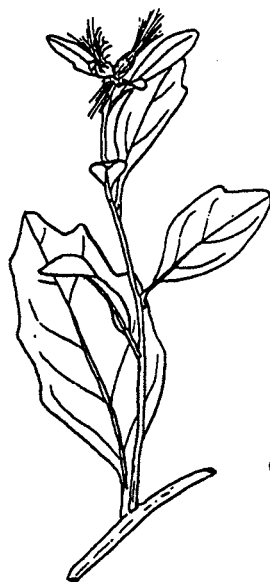
Madeira vine

Brazilian nightshade



Some vine weeds which are troublesome in the Brookfield-Pullenvale-Moggill district

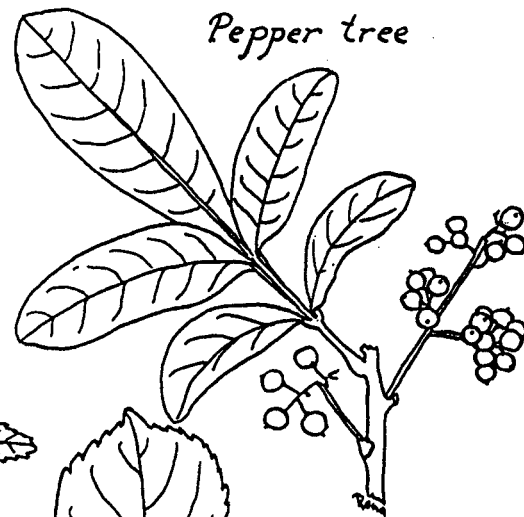
Groundsel



Privet



Pepper tree



Ochna



Chinese elm (*Celtis*)

Lantana

Some shrub and tree weeds which are troublesome in the Brookfield-Pullenvale-Moggill district

Planting patterns

In a natural forest, trees occur in a seemingly random arrangement. One thing to avoid at all costs is to plant trees in lines or rows, unless it is a timber plantation and the regular arrangement facilitates management.

There are certain pioneer trees in the rainforest which appear to facilitate the growth of other species, most likely because of their modification of the environment beneath their canopy. These trees are fast growing, upright, often sparsely branching species which outstrip other trees in height and provide light shade. They may shed their leaves quite rapidly and thus provide mulch for the ground. The diagram on page 9 shows the suggested planting pattern with protective pioneer species around the edges and facilitator pioneers at intervals within the planting. The following list provides some examples:

Facilitator pioneers

<i>Alphitonia excelsa</i>	red ash
<i>Brachychiton discolor</i>	lacebark
<i>Commersonia bartramia</i>	brown kurrajong
<i>Dendrocnide photinophylla</i>	shiny-leaved stinging tree
<i>Elaeocarpus grandis</i>	blue quandong
<i>Flindersia schottiana</i>	bumpy ash
<i>Melia azedarach</i>	white cedar
<i>Polyscias elegans</i>	celerywood

These species, when planted at intervals of

4 - 6 metres within the gap, provide a focus around which other species can be planted. Plant a random mix of other species around these pioneers. Then just sit back and watch them grow!

Potential uses of Rainforest plants

(i) *Specimen plants and amenity trees* - Many rainforest trees and shrubs are attractive and often showy, in flowers or fruit, foliage, bark or form, and are suitable for planting in gardens, parks or along streetside footpaths. Their form is often attractively compact and many are not over-tall in such situations. Choice of what to plant as a specimen tree or shrub depends very much on who is doing the choosing, and almost all the trees and shrubs listed in this book have their own particular charm. Below is a short list of some plants which we think make attractive specimens, listed as shrubs, and various types of tree. Small tree species are particularly well represented in our area, and many of the tree species listed at the end of this book fall into this category.

Shrubs

<i>Alyxia ruscifolia</i>	chain fruit
<i>Hibiscus heterophyllus</i>	native hibiscus
<i>Hovea acutifolia</i>	pointed-leaved hovea
<i>Carissa ovata</i>	carissa
<i>Tabernaemontana pandacaqui</i>	banana bush
<i>Turraea pubescens</i>	turraea
<i>Wilkiea macrophylla</i>	large-leaved wilkiea

Small trees

<i>Austromyrtus bidwillii</i>	python tree
<i>Harpullia pendula</i>	tulipwood
<i>Jagera pseudorhus</i>	foambark
<i>Hymenosporum flavum</i>	native frangipani
<i>Pittosporum rhombifolium</i>	hollywood
<i>Pararchidendron pruinosum</i>	

	monkey's ear-rings
<i>Planchonella pohlmaniana</i>	engravers wood
<i>Sterculia quadrifida</i>	peanut tree
<i>Toechima tenax</i>	pitted-leaf steelwood

Tall, compact trees

<i>Brachychiton discolor</i>	lacebark
<i>Elaeocarpus grandis</i>	blue quandong
<i>Flindersia collina</i>	leopardwood
<i>Gmelina leichhardtii</i>	white beech
<i>Lophostemon confertus</i>	brush box
<i>Podocarpus elatus</i>	brown pine
<i>Stenocarpus sinuatus</i>	firewheel tree

Broad, spreading trees

<i>Diploglottis australis</i>	native tamarind
<i>Dysoxylum rufum</i>	hairy rosewood
<i>Ficus virens</i>	white fig
<i>Melia azedarach</i>	white cedar
<i>Premna lignumvitae</i>	lignumvitae
<i>Tristanopsis laurina</i>	watergum
<i>Waterhousia floribunda</i>	weeping lilly pilli

Besides being attractive, there are many commercial uses. Our most valuable cabinet timbers are drawn from the ranks of these trees, and a list of local timber trees is provided on page 11. As well as cabinet timbers, the timber of local trees has found

many uses, such as flooring (crow's ash and brush box), window frames (silky oak), and a multitude of other uses, where the particular attributes of the timber are special.

(ii) *Medicinal and other uses* - Many of our local trees have been used for a variety of purposes. Thus, *duboisia* (*Duboisia myoporoides*), which used to be found not far from Gold Creek Reservoir, contains scopalamine, which prevents sea-sickness, and other compounds used in the production of sedatives and ophthalmics. Hybrids with another species, *D. leichhardtii*, are grown commercially as a source of these compounds. The leaves of these species are

toxic to stock. White cedar, one of our most common local trees, has bark, leaves, flowers and fruit with medicinal qualities, and an insecticide spray may be made from the crushed fruit. Black bean (*Castanospermum australe*) has recently been attracting attention as the seeds have been found to contain a compound which is active against the HIV virus. Greasenut (*Hernandia bivalvis*) is an endangered species which contains a compound called hernandine in its bark, as well as various alkaloids.

Other species in our area which contain pharmacologically active compounds include chain fruit (*Alyxia ruscifolia*), red olive plum

(*Cassine australis*), *Cryptocarya* spp., *Pentaceras australis* (bastard crow's ash), *Planchonella pohlmanniana* (engraver's wood) *Sarcomelicope simplicifolia* (baurella) and *Stephania japonica* (tape vine). *S. simplicifolia* contains various compounds, one of which has a broad spectrum of anti-tumour activity

An extract from the bark of foambark (*Jagera pseudorhus*) has been used as an additive to beer, to make it froth. Aborigines used leaves from sandpaper figs (e.g. *Ficus coronata*) for fashioning wood. Red ash (*Alphitonia excelsa*) contains compounds which will lather, and may be used as soap or shampoo.

Planting eucalypt forests

Species in our Eucalypt forests

Although it is rainforest trees that hold the public imagination, much of our area was clothed in eucalypt forest before settlement by Europeans, and much still is. Areas which were naturally eucalypt-dominant were on thinner, less fertile soils, and in exposed situations sloping to the north and west. Eucalypt dominance could also have resulted from burning, as eucalypts are tolerant of fire, whereas rainforest trees are not.

Re-establishing a eucalypt forest is more straightforward than re-establishing a

rainforest. Typically, eucalypt forests are dominated by perhaps three to six species of *Eucalyptus* and the mix varies depending on the area. In our district, the poorest soils, on the higher ridges, tend to be dominated by:

<i>Eucalyptus acmenoides</i>	yellow stringybark
<i>E. crebra</i>	narrow-leaved ironbark
<i>E. intermedia</i>	pink bloodwood
<i>E. maculata</i>	spotted gum
<i>E. moluccana</i>	gum-topped box
<i>E. propinqua</i>	grey gum
<i>E. resinifera</i>	red stringybark

E. siderophloia grey ironbark

The much less common broad-leaved spotted gum (*E. henryi*) also occurs near creeks to the north of our area. In genera other than *Eucalyptus*, forest she-oak (*Allocasuarina torulosa*), rusty gum (*Angophora leiocarpa*), red ash (*Alphitonia excelsa*), kurrajong (*Brachychiton populneus*) and in some areas, grass trees (*Xanthorrhoea* sp.) also occur and provide further variety in the vegetation.

The eucalypt species occurring on lower ridges are typically grey gum (*Eucalyptus*

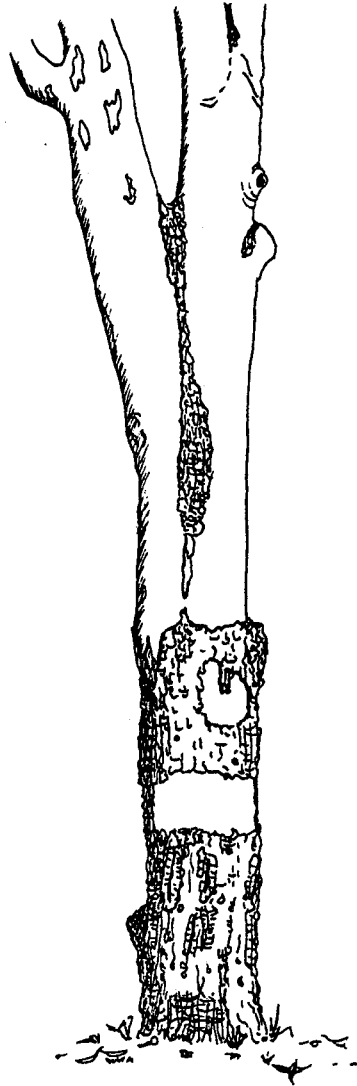
propinqua), spotted gum (*E. maculata*) and grey ironbark (*E. siderophloia*), with gum-topped box (*E. moluccana*) also present in some areas. Brush box (*Lophostemon confertus*), blackwood (*Acacia melanoxylon*) and red ash (*Alphitonia excelsa*) are also frequent.

Where lower valleys are dominated by eucalypts, the main species are:

<i>Acacia fimbriata</i>	Brisbane golden wattle
<i>A. melanoxylon</i>	blackwood
<i>Alphitonia excelsa</i>	red ash
<i>Angophora subvelutina</i>	broadleaf apple
<i>E. melanophloia</i>	silver-leaved ironbark
<i>E. tereticornis</i>	Queensland blue gum
<i>E. tessellaris</i>	Moreton Bay ash

Further up the valleys, Queensland blue gum and Moreton Bay ash give way to grey and narrow-leaved ironbark.

A range of understorey shrubs occur under eucalypt forest. On sandstone-derived soils, the colourful grey bush pea (*Pultenaea cunninghamii*) is to be found, and also species of *Hovea*. The natural grassland under open eucalypt forest used to be dominated by the attractive kangaroo grass (*Themeda triandra*), but a wide range of other grasses also occur now, including many aggressive exotic grasses, such as rhodes grass (*Chloris gayana*) and green panic (*Panicum maximum*), introduced for pastures.



In better-favoured areas of eucalypt forest, some rainforest trees may also occur - for example white cedar (*Melia azedarach*) and foambark (*Jagera pseudorhus*). When replanting eucalypt forest, consideration could be given to including such species along drainage lines.

Where the eucalypt forest has been cleared and allowed to re-establish, as on Mt Coottha, frequently there is a mix of species which differs from that which occurred prior to European settlement. It is likely that all the species listed above can be grown throughout our area with little difficulty. However, particularly on the thinnest soils and where access to water for irrigation is a problem, there could be advantages in selecting species which are known to be tolerant of droughty, infertile soils.

Planting

Areas to be re-established to eucalypt forest are likely to be run-down pasture. Individual planting sites should be cleared of competing vegetation, especially grass, to a diameter of about a metre. This can be done by hand, or by spraying Roundup (glyphosate). Eucalypt seedlings for planting need not be large, and often there is better survival when small plants are planted.

As with rainforest plants, best results are obtained when planting is in autumn, after

the period of summer stress. Ideally, the soil should be moist to a reasonable depth; if soil water is limiting, even our hardy eucalypts should be watered at intervals. It also helps if a shallow depression is left around each plant to retain water after storms or irrigation.

If possible, plantings should be contiguous with existing eucalypt forests, to extend the habitat of wildlife and to provide corridors for movement and refuge. Several eucalypt species are important food plants for koalas, especially grey gum (*E. propinqua*) and Queensland blue gum (*E. tereticornis*) in our district. Narrow-leaved ironbark (*E. crebra*), tallwood (*E. microcorys*) and Queensland white stringybark (*E. nigra*) also provide feed for koalas, which are present in our district, although in reduced numbers due in part to deforestation and predation by dogs. Other mammals which benefit from eucalypt plantings are gliders, including the delicate and charming feather-tailed glider, and the rarely-seen brush tailed phascogale.

Understorey plants can be planted at the same time as the taller trees, as they tolerate full sunlight. Re-establishing native grasses in our area has, as far as we know, not been attempted, and seed is not available commercially. Many of our native grasses, such as kangaroo grass, despite their large seed heads, do not produce much seed, so a considerable amount needs to be collected to

achieve any effect. Assuming seed has been collected in late summer-autumn, it should be dried in racks and kept over-winter before sowing the following spring. Grass seed does not survive for more than a few months in our hot and humid summer weather.

Alternatively, grasses may be planted vegetatively. Individual plants may be split into conveniently-sized bits and planted into areas cleared of competing vegetation.

Whatever the method, it is important to avoid any soil disturbance which might lead to erosion. If the land to be revegetated is steeply sloping, only clear strips along the contour, planting or sowing the native grasses progressively. Similarly, avoid planting larger areas than you can manage - native grasses are in general not tolerant of competition from aggressive exotic grasses such as carpet grass.

Management

Although to the European eye a park-like appearance, with mown grass between stately trees, is the most desirable, this should not be the goal. Mown grass allows rapid runoff after storms, increasing gully erosion and preventing infiltration. This results in less moisture being available to the trees. Also, native grasses do not respond well to mowing, and are soon replaced by exotic weeds.

When young, eucalypts do not survive fire, although they do when well established. It has been common practice to burn the understorey of mature eucalypt forest at intervals. However, it is uncertain whether this is always beneficial. In general, a fairly frequent light fire is likely to be less deleterious than a more infrequent fire, when more fuel has accumulated. Burning is generally carried out in spring, before the hot winds which may occur in summer. It is a good idea to vary the timing of the burn, so as to avoid burning any species at a particularly sensitive stage of its development. It is also important to obtain permission from either the local fire-warden or the fire-brigade before burning and to make appropriate arrangements with any neighbours. A prime objective in any decision as to whether or when to burn must be safety, both to life and property. The terrible bush fires which swept New South Wales in 1993 are an indication of what can happen, under extreme conditions.

Another departure from the well-ordered parkland scene is that old dead and dying trees should be left standing, unless there is any danger of them causing damage if they fall or shed large branches. These trees frequently have hollow trunks and access holes where branches have fallen. They provide nesting sites for many of our bird and animal species, such as lorikeets, kookaburras and gliders.

Getting started

The last two or three decades have seen a great increase in population in our district. Thus, many of us have lived in the district for a relatively short period of time and perhaps come from a part of Australia or elsewhere with a quite different climate. Getting started in a revegetation project can be quite difficult, without some help.

If possible, it is a good idea to join in with one or several neighbours. Sharing experiences, and also some of the heavier tasks, can be mutually beneficial. Also, it allows planning over a larger area, making it possible to develop larger areas of revegetation. This is especially important if there is a creek running through the properties. In this way, corridors of bushland can be built up which could make all the difference for wildlife preservation.

Most of the trees and shrubs illustrated in this book are growing in the Mt Coot-tha Botanic Gardens. Free minibus trips can be arranged - why not invite friends and neighbours to a tour? The 12-seater bus can be booked during office hours, by phoning the Botanic Garden. The bus is equipped with self-guiding tapes, so that you can really appreciate the 52 hectares of garden. Alternatively, visit the Garden in a group and use the services of one of the garden volunteers for a one-hour guided tour.

A number of local groups are active in revegetation activities. REPA (Rural Environment Planning Association Inc.), who are producing and publishing this book, are active in a revegetation project at Rafting Ground Park at the time of writing. There is likely to be a member living near you, but, if not, the City Council Pullenvale Ward Office in Kenmore will be able to advise you. Greening Australia, the Society for Growing Australian Plants and Men of the Trees are all very active groups in the Brisbane area as well as further afield.

Often local schools have revegetation and landcare activities, which it is fun for the whole family to participate in. Several landcare groups have been active for a number of years, particularly in Upper Brookfield and Savages Road.

In and around Brisbane there are a number of specialist nurseries which have native plants for sale, including many of the species listed in this book. Nurserymen are always glad to offer advice. Wherever you live in the district, there are bound to be others keen to bring back the forest, who can help to get you started.

