



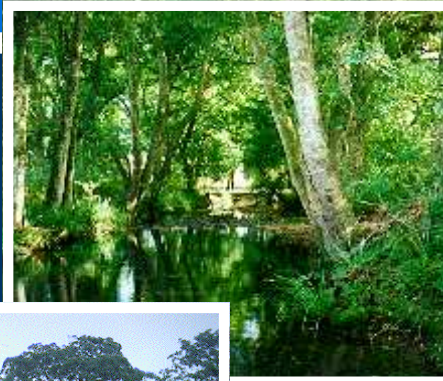
**WALLIS LAKE CATCHMENT**

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# *REVEGETATION*

# *GUIDE*

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# Wallis Lake Catchment Management Plan Implementation Project

This revegetation guide has been prepared as part of the Wallis Lake Catchment Management Plan Implementation Project. This is a project managed by Great Lakes Council through the Wallis Lake Catchment Plan Implementation Group with funding assistance from the Commonwealth Governments' Natural Heritage Trust (NHT). A range of government agencies assist the project, including Bushcare, Greening Australia, Department of Land and Water Conservation and Greater Taree City Council.

The intent of this guide and the overall project is to facilitate cooperation and partnerships between landholders and government agencies to address some of the environmental issues associated with the catchment. Such actions tend to be mutually beneficial, by restoring environmental function or addressing an environmental problem we can also promote sustainable agriculture and land productivity. This project is an attempt by Wallis Lake Catchment Plan Implementation Group to assist farmers with sustainable land management initiatives through both the provision of funding as well as technical advice. By working together we can achieve considerably better outcomes and forge strong partnerships for the future.

Landholders of the Wallis Lake catchment that are interested in discussing a possible project under the terms of the implementation project are strongly urged to contact a

representative of the Wallis Lake Catchment Implementation Group.

Under the project, individuals and groups interested and committed to natural resource management within the Wallis Lake Catchment can apply for available funds. Projects funded may be a variety of works that improve the water quality of Wallis Lake and its catchment including remnant vegetation and wetlands. Eligible project activities may include erosion works/ control, off-stream watering, protecting and enhancing habitat and remnant vegetation, bush regeneration and fencing of wetlands, riparian zones and remnant vegetation.

As part of an approved project, landholders are required to make a contribution to the cost of most activities of not less than 50% of the value of the project. Such contribution can be financial or by in-kind contribution (labour, equipment, etc) or a combination of both.

Further information on this project can be obtained by contacting:

- Ms Stacey Tyack (Great Lakes Council): 02 6591 7378
- Brett Currie (Greater Taree City Council) 02 6592 5246

It is hoped that this guide proves of value in assisting the design, planning and operation of revegetation within the Wallis Lake Catchment.

# Wallis Lake Catchment Revegetation Guide

## About the guide

This guide covers the area of the Wallis Lake Catchment on the Lower Mid North Coast of New South Wales and was developed as part of the Wallis Lake Catchment Management Plan (WLCMP) to assist in managing the broader landscape.

The guide has been designed as a general reference document to act as a starting point for planning vegetation management activities. It contains general information on vegetation communities and revegetation techniques.

The guide should be considered as a starting-point for vegetation management activities and it is recommended that further site specific information be sought. Assistance is available from many sources including the Department of Land and Water Conservation (DLWC), Greening Australia, your local Landcare group, native plant nursery, or an environmental consultant.

## The Guide

The guide comprises three sections, which may be read as a whole or consulted individually.

**Part One** contains general information on catchment health, vegetation in the Wallis Lake catchment, management options and revegetation techniques.

**Part Two** contains examples of vegetation communities supported by different landscapes within the Wallis Lake catchment.

**Part Three** contains general descriptions of the Wallis Lake catchment's vegetation communities.

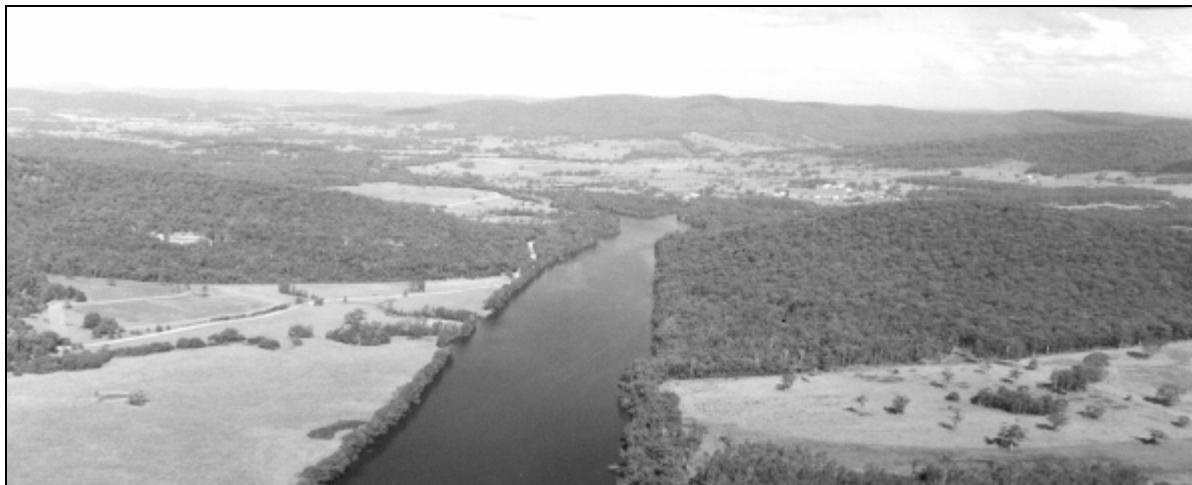


Figure 1: The Wallis Lake catchment, featuring the Wallamba River.

## Acknowledgments

This guide follows the format of the "South West Slopes Revegetation Guide", developed by Fleur Stelling, and has adapted some of the text and graphics for inclusion. Thanks are also due to Simon Skelton for his contribution to the text, in particular, for compiling the vegetation species lists, Sue Botting for editorial work and Graham Carter for the photographs.

# **Part 1**

**Why a revegetation guide for the Wallis Lake catchment?**

**Vegetation in the Wallis Lake catchment**

**Remnant vegetation**

**The value of remnant vegetation**

**Threats to remnant vegetation**

**Whole farm planning**

**The five simple steps to re-establishing native vegetation**

**Targeted revegetation**

## Why a revegetation guide for the Wallis Lake catchment?

The Wallis Lake catchment drains an area of some 144 000 hectares ranging from the ridges and valleys in the west to the coastal plains and estuaries in the east. The catchment can be divided further into the sub-catchments: the Wallamba River, the Wang Wauk River, the Coolongolook River, the Wallingat River, and the tidal estuary.

The diverse landscape of the Wallis catchment supports a variety of industries including agriculture (dairy and beef cattle), tourism, forestry, aquaculture and urban development. These activities all depend, and impact, upon the health of the catchment. The Wallis Lake Catchment Management Plan (WLCMP) identifies some of the most pressing catchment health issues as:

- ◆ declining water quality due to sediment and nutrient pollution.
- ◆ vegetation clearance and altered habitat
- ◆ soil and streambank erosion.

Native vegetation has an important role in maintaining and improving 'catchment services'. It helps to bind our precious topsoil, filters run-off, sequesters carbon, and provides habitat for wildlife.

While much of the catchment has been cleared, the remaining vegetation is threatened by a number of pressures. Threats to biodiversity come from declining habitat quality and altered habitat structure through processes such as **grazing, altered fire regimes and weed invasion**.

Management of the local landscape and protecting our remnant vegetation is vital to the future health of our catchment. Without a diverse range of vegetation communities ('biodiversity') the natural checks and balances necessary for sustainable agriculture and healthy ecosystems will cease to function.

Active management is needed to enhance and extend the catchment's native vegetation; the WLCMP outlined a number of actions to address the issues. A common theme was the need to manage the remaining vegetation and work towards revegetation of strategic areas in the catchment (eg. on steep land, drainage lines and riparian zones).

Successful revegetation is about knowing how to build on remnant vegetation in a way that benefits both the local environment and farm production.

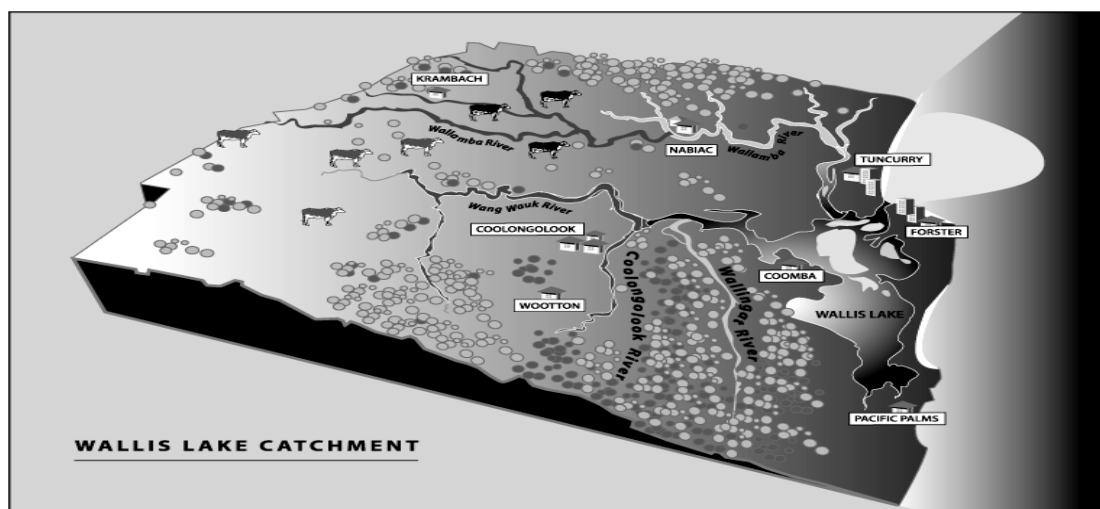


Figure 2: A schematic representation of the Wallis Lake catchment.

## Vegetation in the Wallis Lake catchment

The landscape of the Wallis Lake catchment has been greatly altered and fragmented through settlement and development. About 44% of the total catchment area has been cleared with the Wallamba sub-catchment the most severely impacted (69% cleared) and the Wallingat the least impacted (18% cleared).

Vegetation in the Wallis catchment is highly variable and ranges from lowland wetland ecosystems to wet sclerophyll forests in the hinterland. A total of 51 vegetation communities have been identified, making up 8 major ecosystem types including:

- ◆ 11 rainforest communities,
- ◆ 10 swamp forest communities,
- ◆ 8 moist sclerophyll communities,
- ◆ 6 hinterland dry sclerophyll communities,
- ◆ 7 coastal lowland dry sclerophyll communities,
- ◆ 5 heathland communities,
- ◆ 1 sedgeland community, and
- ◆ 3 disturbed vegetation communities.



*Figure 3: Flooded gums in a coastal lowland dry sclerophyll community*

**NB.** A complete list of ecosystem types and descriptions are given in Part 3.

## Remnant vegetation

Remnant vegetation is the native vegetation remaining in the landscape after widespread clearing. Remnants vary in size, shape, quality (ie presence of different age groups and species variety) and isolation and may include cattle camps, riverine corridors and public reserves like National Parks and State Forests.

In modified catchments, like the Wallamba and Wang Wauk sub-catchments, the preservation of remnant vegetation is critical for biodiversity. It allows for the maintenance of local gene pools, provides important habitat for the local wildlife and may represent otherwise locally extinct or declining vegetation associations.



*Figure 4: Clearing has fragmented vegetation communities in the Wallis Lake catchment.*

## The value of remnant vegetation

The importance of remnant vegetation lies not only in its environmental benefits but also in its value to sustainable agriculture. Some of the benefits include:

### *Erosion control*

Soil erosion removes topsoil and nutrients, transporting them to waterways where they may cause siltation, pollution and excessive algal growth. Established vegetation binds the soil and protects it from the erosive effects of wind and water. This reduces soil loss, helping to maintain the productivity of the landscape and protect its waterways.

### *Shade and shelter*

Remnant vegetation can provide stock with protection from wind, cold and heat stress. It can also reduce water loss from crops and pastures by reducing wind and providing shade.

### *Direct economic benefits*

There are many potential sources of direct income from remnant vegetation, including grazing opportunities, tourism, education, timber, firewood, cut flowers, oils, tannins and resins.

### *Pest control*

Remnant vegetation attracts and protects native wildlife that predate upon insect pests, which can damage crops and pastures. Native birds, such as thornbills, fairy-wrens and pardalotes, feed on caterpillars, bugs, beetles, scarab grubs, lerps, aphids and thrips. Bats also consume large amounts of insects, providing a natural pest control. Conserving remnant vegetation will also encourage many spiders, parasitic wasps and other insects beneficial to farming.

### *Environmental enhancement*

Remnant vegetation has aesthetic, educational, recreational and scientific values. They give a valuable insight into the pre-European landscape and its ecosystem functions; add to the aesthetic appeal of the landscape; provide recreational opportunities and may be a useful indicator of the sustainability of agricultural systems.



Figure 5: Mangroves in the Wallis Lake catchment.

## Threats to remnant vegetation

Landscapes with fragmented vegetation usually experience different pressures and disturbances to those that occurred prior to clearing. These can impact on ecosystem function and lead to a decline in vegetation quality and health threatening the long-term viability of the remnant

### *Fire*

Changes in the timing, frequency, and intensity of fires alter the long term functioning of vegetation communities. Prescriptive use of fire changes vegetation structure by favouring only those species and age groups suited to that specific fire regime.

### *Grazing*

Grazing pressure leads to the selective removal of palatable plants preventing the regeneration of some species. This can eventually cause the loss of mature trees, as the older trees are not being replaced by younger vegetation. Domestic stock can also impact remnant vegetation indirectly by compacting soil, increase nutrient levels, ringbarking trees and introducing exotic seeds

### *Water and nutrient transfers*

Additional disturbance can arise from new transfers of nutrients, pesticides and water between agricultural land and natural vegetation. These transfers can effect the dynamics of the remnants and, in particular, can support weed species that favour high nutrient conditions. Activities like land clearing increase the amount and rate of catchment run-off. This exacerbates the natural flood and drought regime and decreases the overall availability of water in the catchment.

### *Dieback*

Dieback is the premature death of native vegetation due to a combination of environmental stresses. Much of the dieback in SE Australia can be attributed to insect attacks, which cause a repeated loss of leaves in eucalypt species. In a fragmented landscape these pressures become more intense and sustained leading to a rapid decline in vegetation health.

### *Weeds*

Weed invasion is the most serious threat to biodiversity in our remnant vegetation. Weeds can cause a loss of biodiversity by invading natural ecosystems and altering habitat, out-competing and displacing native species.

### *Environmental Weeds*

Environmental weeds are those plants that are undesirable in a native environment and are often differ from species that are considered agricultural weeds.

Environmental weeds change environmental conditions such as nutrient status and moisture availability affecting the regeneration of native vegetation. Some can also produce chemicals to inhibit germination of other species. They may crowd-out native plants and, with few natural predators, there is little to keep weeds in check.

The proliferation of weeds can also alter the structural integrity of remnant vegetation displacing local fauna. As animals play an integral part in the health and regeneration of native vegetation (eg. feeding on insects, pollinating plants, spreading seeds, and helping leaf litter to decompose) this leads to further breakdown of ecosystem processes.



## Whole Farm Planning

It is now widely accepted that native vegetation is integral to sound land management for agricultural production. To obtain the full benefits of the retention and regeneration of your native vegetation careful planning, implementation and maintenance is essential.

Successful revegetation is about balancing the needs of your property and the needs of the landscape. It involves thorough planning, and planting of the right vegetation in the right places. This guide provides general information on local species, and where they fit in the landscape, as well as general information on revegetation techniques and the benefits of trees on your farm.

However, to attain the full benefits of revegetation on your property you should take into account local conditions and land-uses, and future development needs, when considering revegetation options. A **whole farm plan** using aerial photographs<sup>1</sup> to develop a vegetation plan is an appropriate means of achieving this. Further advice can be obtained from the Department of Land and Water Conservation.

### The five simple steps to re-establishing native vegetation

Before embarking on any planting effort you will need to plan your project according to your reasons for planting and the nature of your site(s). Identify the options you have for minimising your inputs (ie time and money) and maximising your outputs (ie area of native vegetation to be maintained in the long-term). A good approach is to assess your situation based on the principles of:

1. **Retain** – protect your remnant vegetation as a first priority
2. **Regenerate** – allow areas to regenerate by alleviating pressures placed on them
3. **Revegetate** - plant your site with a mixture of local species to provide an appropriate structure of trees, shrubs and ground covers.

A useful guide for site preparation, species selection and maintenance is local experience. Talk to as many people who are engaged in similar types of projects in your area and learn from their success and failures. This section offers suggestions to complement this local knowledge.

#### 1. Identify planting purpose

Planted vegetation can have multiple uses such as:

- ◆ shade and shelter,
- ◆ control of gully and stream erosion,
- ◆ enhancing biodiversity,
- ◆ timber and other non-timber products, and
- ◆ landscape aesthetics.

Identify your planting purpose(s), as this will help determine species selection, site preparation techniques and future maintenance schedules.

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<sup>1</sup> Aerial photographs can be purchased from the Land and Property Information Centre in Bathurst: phone 6332 8200 or [www.lpi.nsw.gov.au](http://www.lpi.nsw.gov.au).

## 2. Species selection and the benefits of local vegetation

The particular mix of species you choose will depend on the purpose of your planting and its position in the landscape. Generally it is best to plant a mixture of trees, shrubs and groundcovers. This will provide a more complex and natural structure with a wider variety of food and shelter options. There are many environmental factors that affect plant growth. Vegetation usually reflects soil types and geology, topography, rainfall and aspect. For example, shallow northerly hillside soils are more suited to dry sclerophyll species such as Spotted Gum and you Sickle wattle rather than rainforest species such as Sassafras. (For further detail see examples of the types of vegetation cross sections in **Part 2**).

There are many benefits in using local vegetation including;

- ◆ increased biodiversity,
- ◆ provision of habitat requirements of local flora and fauna,
- ◆ increase pest control value,
- ◆ adaptation to local conditions, therefore decreasing maintenance requirements, and
- ◆ availability of seed/plants.

## 3. Natural regeneration, planting or direct seeding

A variety of techniques are available to re-establish native vegetation. The technique best suited to your location will depend on site history, site conditions, costs, landholder resources and expertise, and the purpose of your revegetation efforts. The following are some alternatives for consideration:

### Natural regeneration

#### *Fencing off to restrict stock grazing*

This involves fencing an area for the regeneration of native vegetation from the reservoir of seeds stored in the soil (a 'seed bank'). Under the right conditions, and with reduced pressures (eg. grazing), the seeds will germinate. The advantage of this technique is that it is relatively inexpensive, easily implemented and encourages the growth of local species. The disadvantage of is that the seasonal conditions required to trigger germination may not occur for some time resulting in slow regeneration rates. Also, the full range of local species may not grow and weed species may become established if left unchecked.

#### *Burning and fencing*

This option builds on the previous technique by using burning off to reduce competition from pasture and weeds and providing a fertile ash bed for seed germination. Burning off is suited to drier forest types and care should be taken to avoid soil loss. Again, controls need to be implemented to stop weed establishment in the first few years

**NB** Any burning off should be done in consultation with local fire authorities and in accordance with local fire regulations.

#### *Herbicide and fencing*

An alternative to burning, herbicides can be used to reduce competition from pasture and weeds. Care needs to be taken to minimise drift onto neighbouring vegetation and potential run-off into waterways. Pre-emergent (eg. Simazine™) and residual (eg Grazon™) herbicides should not be used as they can affect germination. Most commonly used herbicides are glyphosate products although metsulfuron-methyl based products are a better option on steeper land as they are selective, leaving grasses intact. Maintenance is as above.



Figure 6: Farm forestry -a profitable alternative.

### Traditional establishment techniques

There are two traditional types of revegetation that rely on the direct planting of seeds or seedlings:

*Container grown plants (eg. tubes and pots) and bare-rooted plants.*

A common and familiar method of revegetation is the direct planting of seedlings. This technique has the advantages of allowing for the planting of specific species and fast-tracking the regeneration process. However, it can be more work intensive in the actual planting, protecting (eg. tree guards) and initial maintenance) than direct seeding.

Seedlings for direct planting can be obtained from native plant nurseries or grown from seed. Careful selection of healthy, vigorous stock is of importance and two common defects to be aware of are:

- ◆ kinked or J-rooted seedlings (major tap root is bent), and
- ◆ circling or girdling roots which the roots circle the base of the stem or other roots.

These deformities result from production systems at the nursery and stock with defects should be discarded or returned.

### *Direct seeding into prepared beds*

This involves the spreading of desired seed species into prepared beds. Results can be unpredictable due to seasonal influences and the quality of seed. Success can be maximised by using vigorous seed, carefully preparing and maintaining the site, selecting suitable species and planting during the appropriate season.

Another direct seeding technique currently being trialed is hydro mulching. It is often used on roadsides following road works and involves spraying a glue substance that sticks a mixture of seed and mulch to the soil. Compared with planted sites, both hydro-mulching and direct seeding result in a more natural looking stand of vegetation.

## 4. Site preparation

Regardless of the technique you use, good site preparation is the key to successful revegetation.

### *Weed control*

This is a critical stage of site preparation as weeds compete with native vegetation for moisture, nutrients, light and space.

Weed control techniques include herbicides, mechanical removal and mulching.

There are two main types of herbicides: knockdown (eg. Roundup™) and residual (eg. Simazine™). Knockdown herbicides are applied to the leaves of the target species, which absorb the herbicide transporting it throughout the plant. Residual herbicides are usually applied to bare soil where they attach to clay particles, targeting emerging seeds as they sprout. Applying residual herbicides can produce longer-term weed control but care must be taken during application and handling, as many of the residual herbicides are extremely toxic. Spot and strip spraying can reduce the amount of herbicide used. This is particularly important in sites dominated by native grasses and ground-covers where herbicide use should be kept to a minimum.

**NB** When using herbicides always adhere to manufacturer's directions.

Mechanical weed removal is labour intensive but can be an effective alternative on smaller sites. It is also appropriate for weeds that are difficult to treat effectively with traditional spraying techniques (eg. vines growing amongst other vegetation).

Another technique is to mulch with straw, newspaper, wood chip or manufactured weed mats (eg. jute). Alternatively a suitable 'cover crop' containing species that remain low with little combustible dry matter may be grown. These compete with weed species while allowing revegetation species to establish.

As weeds tend to colonise disturbed native vegetation the best option is often to avoid disturbance. This can be done by keeping tracks to a minimum, reducing heavy machinery use, avoiding over grazing and the over use of fire and using weed control techniques that create the least disturbance (eg. cut and paint or stem injection of herbicides).

### *Deep ripping*

Deep ripping is advantageous on sites that have a history of compaction or cultivation, or in soils with higher clay content, as it can greatly increase growth rates. Soils that are erodible, wet or areas near watercourses should be avoided. Deep ripping involves ploughing a single or multiple tine(s) into the soil to a depth of at least 50cm. This 'shatters' the soil, increasing aeration and water infiltration, allowing rapid root development. Ripping should be done on the contour to avoid channelling rainfall downhill and causing erosion.

### *Planting*

Once you have selected the species that are best for your site, you will have to determine your planting density. A 3m x 3m grid pattern is common (1000 plants/ha), but spacings will depend on the species and your purpose for planting. While a larger number of plants means a higher initial cost, this may be off-set by reduced maintenance costs as vegetation quickly out-competes weeds.

The best time to plant is generally early autumn when moisture conditions are favourable. Summer tends to be too hot requiring extra watering, while frosts in winter reduce plant survival. Spring is traditionally our driest period. However, it is possible to plant at any time of the year if you are aware of the risks and address them accordingly. Local knowledge and experience will help you assess your options.

### *Planting cont.*

Fertilising plants is recommended. Fertiliser should be dug in to reduce losses through run-off and denitrification to the atmosphere. Care should be taken to avoid positioning the fertiliser too close to the roots. Recommendations regarding the timing of the application vary. Some suggest leaving the plant for 4-6 weeks to establish a root system and fertilising about 150-200mm on the uphill side of the stem. If your site allows you to plant late in autumn or winter, it may be best to wait until spring (ie the growth season) to get the best value from the fertiliser. Again, local knowledge will help in this decision.

## **5. Post planting maintenance**

Maintenance involves managing weed and grass competition, controlling pests and diseases and fertilising and watering when necessary. It can be the most critical stage on any revegetation project and needs to be undertaken on a regular well-planned basis.

Maintenance efforts can be minimised by using species that are suitable for your site, are hardy and fast growing (eg. pioneer species such as wattles and eucalypts), and using appropriate site preparation techniques.

One option to reduce maintenance, particularly on smaller planting's, is to increase the planting density. This will allow the canopy to close earlier, shading out competitive weeds. This will increase the costs associated with planting, but will decrease long-term maintenance costs. As with all stages of any revegetation project, you need to consider all options and make a decision that will best suit you and your site.

## **Targeted revegetation**

### **Riparian revegetation and riverbank erosion control.**

Riparian lands are any land that adjoins water and directly influences, or is directly influenced by, that water. In natural environments it is often easily identified by vegetation distinct from that further out in the catchment. It includes:

- ◆ the land immediately alongside creeks and rivers,
- ◆ gullies and depressions that run with water after rains,
- ◆ areas surrounding lakes, and
- ◆ wetlands and river floodplains which interact with the waterways in times of flood.

Riparian vegetation plays a vital role in healthy, productive landscapes. It offers specialised habitat and corridors linking other parts of the catchment, as well as providing refuges during times of drought. It has a strong influence on the shape and stability of river channels, as well as in-stream health and can affect the water quality and quantity. Riparian lands also have special cultural, recreational and aesthetic values, particularly when in proximity to urban areas.

Vegetation plays a significant role in influencing stream processes and channel shape. It provides a resistance to flow (by increasing hydraulic roughness) and increases bank shear strength (through root systems binding the soil). Riparian vegetation aids in controlling the bed level, with root systems holding the bed material, and the input of fallen trees (large woody debris) maintains structural integrity. Such controls can help reduce streambed degradation and accelerated erosion and also allow scouring, thereby maintaining pool habitats in the stream.

Lack of thoughtful management has led to substantial degradation of riparian lands. The removal, fragmentation and alteration of vegetation cover, combined with changed flow regimes, has increased the incidence of bank erosion, resulting in the loss of productive agricultural lands, changes to the functioning of river systems and decreased water quality.

The loss of riparian vegetation can alter the structure of the river channel through decreased bank and bed stability and the elimination of natural bed level controls. Figures 7 and 8 illustrate the changes to a channel when the vegetation is removed.

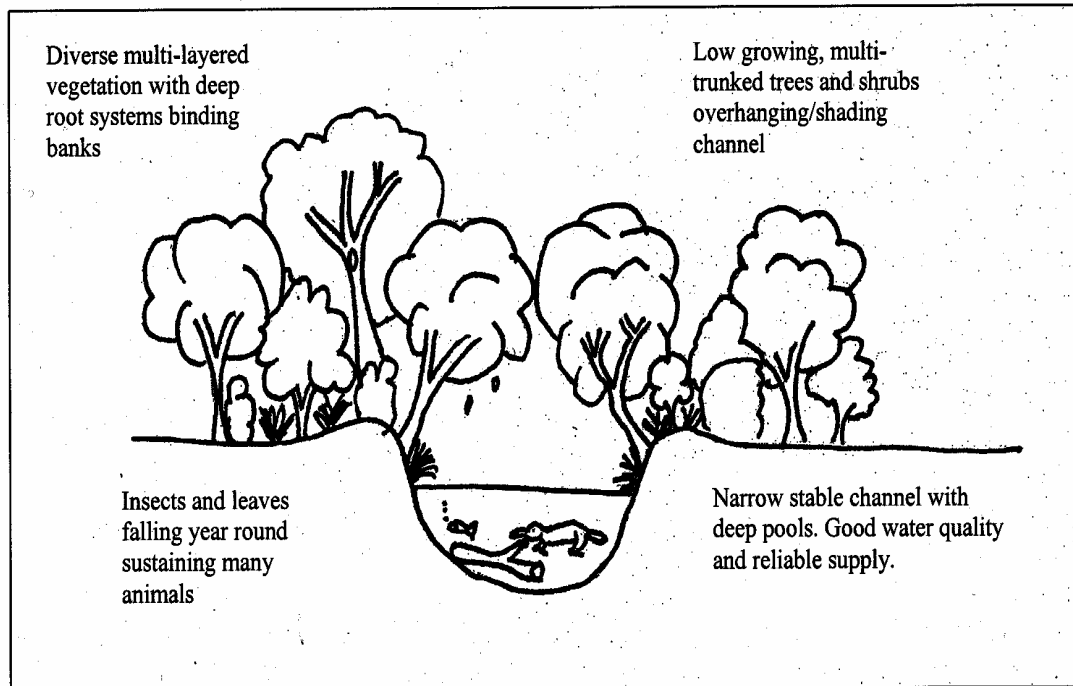


Figure 7: Typical channel cross section of a healthy stream .

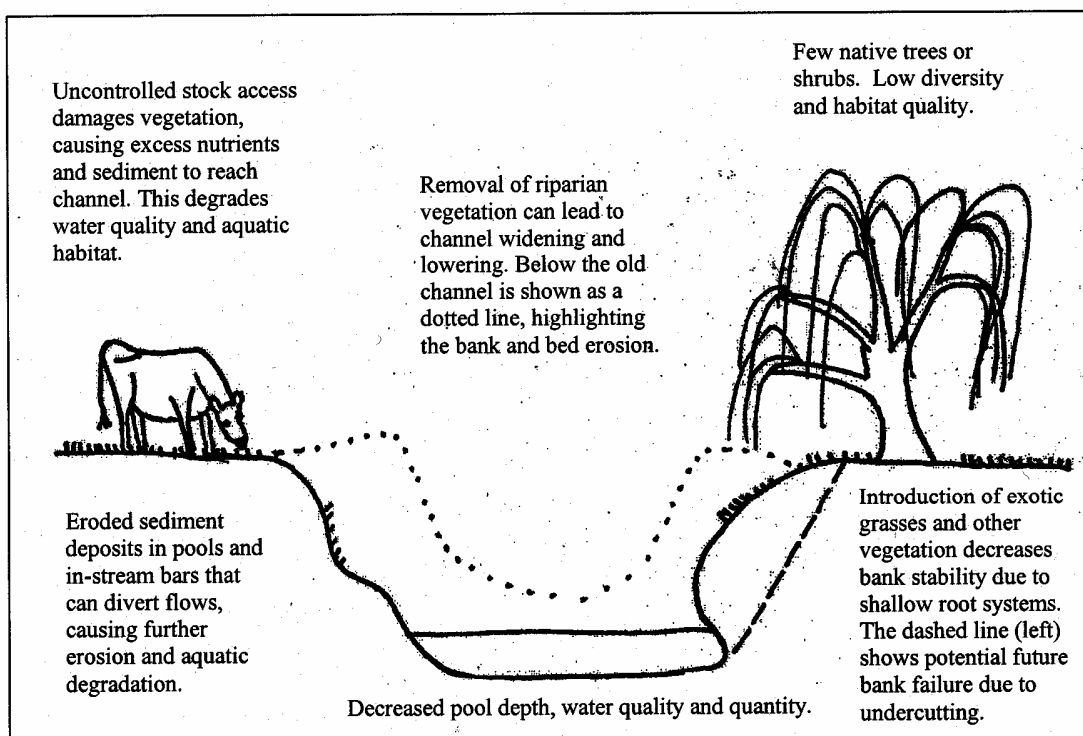


Figure 8: Typical channel cross section of an impacted stream .

## Stock Management

Uncontrolled stock access to riparian land can lead to degradation of riparian vegetation and in-stream conditions. Detrimental effects of uncontrolled stock access include:

- ◆ eating and trampling of riparian vegetation,
- ◆ compaction of the soil,
- ◆ direct soil erosion, particularly from steep banks;
- ◆ creation of tracks which can concentrate flows down the bank, initiating gully erosion,;
- ◆ addition of excess nutrients with manure and urine, and
- ◆ pugging of soil and stirring up of mud.

In areas where restoration is needed, either by planting or natural regeneration, it is necessary to control stock access, especially during the establishment phase. However, the long term aim of management should be sustainable grazing that does not cause direct damage to the vegetation cover. It is possible through the strategic management of stock and grazing pressure to both improve productivity and recoup fencing and watering costs while improving environmental management.



*Figure 9: Riparian vegetation on a stream in the Wallis Lake catchment.*

## Revegetation

It is generally recommended that riverbanks denuded of vegetation be revegetated to obtain the benefits described above. Species need to be from the local area and planted randomly to ensure different densities and root structures. The control of weeds, including woody weeds, assists the establishment of a riverine corridor.

The most important consideration when planning the re-establishment of riverine vegetation is selecting species to plant and where to plant them. In selecting suitable species for a particular site, it is best to choose those which naturally occur in the area (ie are indigenous to the area). It is important to use a variety of species, including ground covers and other understorey species, shrubs and trees. Initially, a protective cover of hardy pioneer species (eg wattles and, eucalypts) that can tolerate frost, wind and drier conditions will assist the establishment of slower-growing and more vulnerable seedlings (eg. ironwoods).

Figure 10 shows a typical vegetation profile that would be found on a healthy stream. The profile illustrates the three main zones on the bank to guide appropriate species selection.

Additional information on appropriate vegetation species can be found in parts 2 and 3 of this guide or by contacting your local Landcare group or DLWC office.

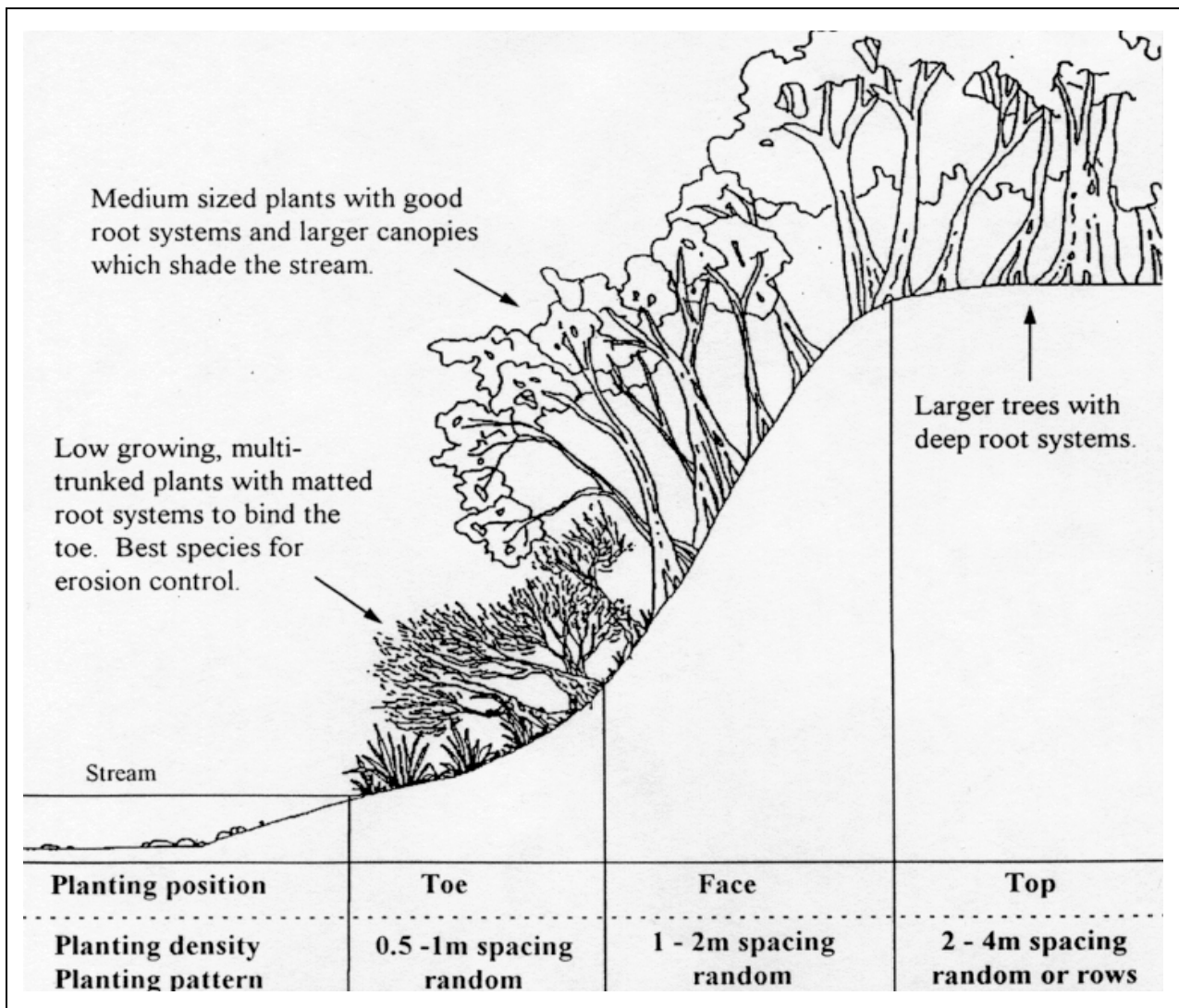


Figure 10: Plant species selection and planting position. (Source: Gardiner and Raine; 1995).



# **Part 2**

## **Wallamba River**

- lower estuary area Wallamba Broadwater - Failford

## **Wallamba River**

- upper estuary area Failford – Nabitac

## **Wallamba River sub-catchment**

– northern Nabitac and Krumbach areas

## **Wallamba River sub-catchment**

– Dyers crossing

## **Upper Wallamba River sub-catchment**

– Bucca Wauka / Tipperary / Mimi area

## **Wallingat and Coolongalook sub-catchments**

– Coolongalook, Wooton and Topi Topi area

## **Wang Wauk River sub-catchment**

– Bunyah Village – Willina

## **Wang Wauk sub-catchment**

- Upper Bunyah area

# Wallamba River - lower estuary area Wallamba Broadwater – Failford



LANDFORM	Tidal waterways		Levee bank (not always present)		Back swamp		Salt marsh	
VEGETATION	Mangroves		Riparian rainforest		Swamp forest		Grassland	
GEOLOGY AND SOILS	Mostly alluvium		Mostly alluvium		Mostly alluvium		Mostly alluvium	
LOCATION EXAMPLE	Wallamba Broadwater		Manns Road		Darawank		Adjacent the Mud Cut	
TREES > 8m			Swamp Oak	<i>Casuarina glauca</i>	Swamp Oak	<i>Casuarina glauca</i>		
			Green Wattle	<i>Acacia irrorata</i>	Broad-leaved Paperbark	<i>Melaleuca quinquenervia</i>		
			Flooded Gum	<i>Eucalyptus grandis</i>	Forest Red Gum	<i>Eucalyptus tereticornis</i>		
			Shatterwood	<i>Backhousia sciadpohora</i>	Swamp Mahogany	<i>Eucalyptus robusta</i>		
			Lilly Pilly	<i>Acmena smithii</i>	Cabbage Gum	<i>Eucalyptus amplifolia</i>		
			Tuckeroo	<i>Cupaniopsis anacardioides</i>	Slaty Red Gum	<i>Eucalyptus glaucina</i>		
			Moreton Bay Fig	<i>Ficus macrophylla</i>	Cabbage Palm	<i>Livistonia australis</i>		
			Small-leaved Fig	<i>Ficus obliqua</i>	Flooded Gum	<i>Eucalyptus grandis</i>		
			Cabbage Palm	<i>Livistonia australis</i>				
			Rusty Fig	<i>Ficus rubiginosa</i>				
			Deciduous Fig	<i>Ficus superba</i>				
			Strangling Fig	<i>Ficus watkinsiana</i>				
			Brush Box	<i>Lophostemon confertus</i>				
			Whalebone Tree	<i>Streblus brunonianus</i>				
			Brush Cherry	<i>Syzygium australe</i>				
			Red Ash	<i>Alphitonia excelsa</i>				
			Red Olive Plum	<i>Cassine australis</i>				
			Red Kamala	<i>Mallotus philippensis</i>				
			Black Apple	<i>Planchonella australis</i>				
SHRUBS 1m – 8m	Grey Mangrove	<i>Avicennia marina</i>	Elderberry	<i>Cuttsia viburnea</i>	Willow Bottlebrush	<i>Callistemon salignus</i>		
	River Mangrove	<i>Aegiceras corniculatum</i>	Star Bush	<i>Asterolasia correifolia</i>	Prickly-leaved Paperbark	<i>Melaleuca styphelioides</i>		
	<b>NB.</b> Grey Mangrove ( <i>Avicennia marina</i> ) becomes the dominant species the further you travel downstream in the Wallamba estuary.		Coogera	<i>Arytera divaricata</i>	Narrow leaved Paperbark	<i>Melaleuca linariifolia</i>		
			Native Quince	<i>Alectryon subcinereus</i>	Prickly Tea-tree	<i>Leptospermum juniperinum</i>		
			Murrogun	<i>Cryptocarya microneura</i>	Broom Spurge	<i>Amperea xiphoclada</i>		
			Scrub Turpentine	<i>Rhodamnia rubesens</i>	Cheese Tree	<i>Glochidion ferdinandi</i>		
			Bolly Gum	<i>Litsea reticulata</i>	Swamp Baeckea	<i>Baeckea linifolia</i>		
			Native Peach	<i>Trema aspera</i>	Crimson Bottlebrush	<i>Callistemon citrinus</i>		
			Cheese Tree	<i>Glochidion ferdinandi</i>	Narrow-leaved Bottlebrush	<i>Callistemon linearis</i>		
					Willow-leaved Hakea	<i>Hakea salicifolia</i>		
					Mangrove Boobialla	<i>Myoporum acuminatum</i>		
GROUND COVERS <1m	Common Reed	<i>Phragmites australis</i>	Slender Palm Lily	<i>Cordyline stricta</i>	Swamp Lily	<i>Crinum pedunculatum</i>	Sea Rush	<i>Juncus kraussii</i>
			Maidenhair Fern	<i>Adiantum aethiopicum</i>	Tall Sedge	<i>Carex appressa</i>	Rush	<i>Juncus mollis</i>
			Birds Nest Fern	<i>Asplenium australasicum</i>	Tufted Sedge	<i>Carex gaudichaudiana</i>	Common Rush	<i>Juncus usitatus</i>
			Cunjevoi	<i>Alocasia macrorrhizos</i>	Drooping Sedge	<i>Carex longebrachiata</i>	Marine Couch	<i>Sporobolus virginicus</i>
			Native Ginger	<i>Alpinia caerulea</i>	Common Rush	<i>Juncus usitatus</i>	Suaeda sp.	<i>Suaeda australis</i>
					Rush Lily	<i>Sowerbaea juncea</i>	Pigface	<i>Carpobrotus glaucescens</i>
							Sesuvium sp.	<i>Sesuvium portulacastrum</i>
							Sarcocornia sp.	<i>Sarcocornia quinqueflora</i>

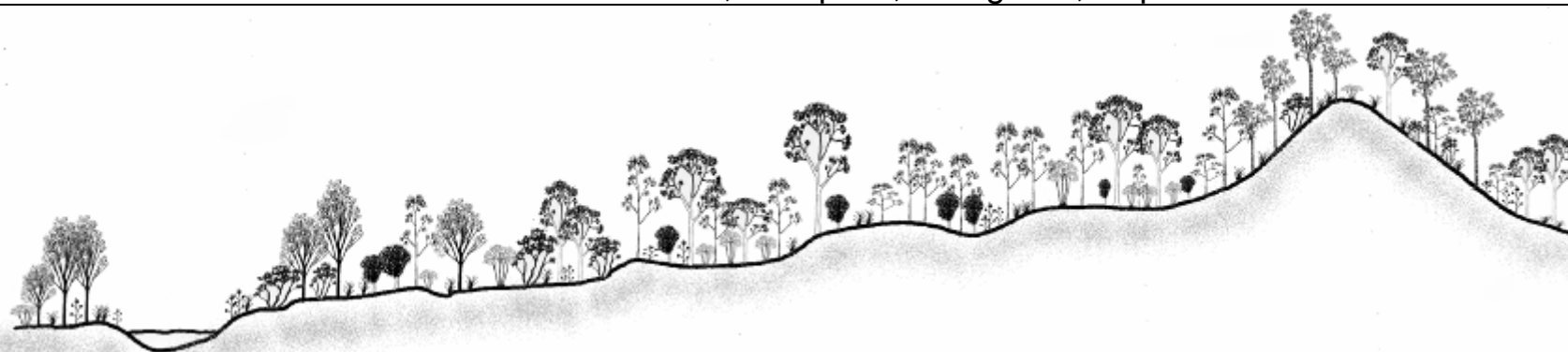
# Wallamba River - upper estuary area Failford - Nabiac



LANDFORM	Tidal waterways		Levee bank (not always present)		Back swamp	
VEGETATION	Mangroves		Coastal dry sclerophyll forest		Swamp forest	
GEOLOGY AND SOILS	Mostly alluvium		Shallow yellow podsolic on shale, siltstone and mudstone		Mostly alluvium	
LOCATION EXAMPLE						
<b>TREES &gt; 8m</b>			Swamp Oak Flooded Gum Blackbutt Tallowwood Moreton Bay Fig Small-leaved Fig Cabbage Palm Rusty Fig Smooth-barked Apple Scribbly Gum Brush Box Bloodwood Forest Oak Brush Cherry Red Ash Coast Banksia Saw Banksia Lilly Pilly	<i>Casuarina glauca</i> <i>Eucalyptus grandis</i> <i>Eucalyptus pilularis</i> <i>Eucalyptus microcorys</i> <i>Ficus macrophylla</i> <i>Ficus obliqua</i> <i>Livistonia australis</i> <i>Ficus rubiginosa</i> <i>Angophora costata</i> <i>Eucalyptus signata</i> <i>Lophostemon confertus</i> <i>Corymbia gummifera</i> <i>Allocasuarina torulosa</i> <i>Syzygium australe</i> <i>Alphitonia excelsa</i> <i>Banksia integrifolia</i> <i>Banksia serrata</i> <i>Acmena smithii</i>	Swamp Oak Broad-leaved Paperbark Prickly-leaved Paperbark Forest Red Gum Swamp Mahogany Sydney Blue Gum Cabbage Gum Slaty Red Gum Cabbage Palm Flooded Gum	<i>Casuarina glauca</i> <i>Melaleuca quinquenervia</i> <i>Melaleuca styphelioides</i> <i>Eucalyptus tereticornis</i> <i>Eucalyptus robusta</i> <i>Eucalyptus salignus</i> <i>Eucalyptus amplifolia</i> <i>Eucalyptus glaucina</i> <i>Livistonia australis</i> <i>Eucalyptus grandis</i>
<b>SHRUBS 1m – 8m</b>	Grey Mangrove River Mangrove  <b>NB.</b> Grey Mangrove ( <i>Avicennia marina</i> ) becomes the dominant species the further you travel downstream in the Wallamba estuary.	<i>Avicennia marina</i> <i>Aegiceras corniculatum</i>	Murrogun Green Wattle Hakea Coastal Wattle Wallum Banksia Native Peach Cheese Tree Hard Corkwood Melaleuca spp. Coastal Tea-tree Willow Bottlebrush Mangrove Boobialla	<i>Cryptocarya microneura</i> <i>Acacia irrorata</i> <i>Hakea salicifolia</i> <i>Acacia longifolia</i> <i>Banksia aemula</i> <i>Trema aspera</i> <i>Glochidion ferdinandi</i> <i>Endiandra sieberi</i> <i>Melaleuca nodosa</i> <i>Leptospermum laevigatum</i> <i>Callistemon salignus</i> <i>Myoporum acuminatum</i>	Willow Bottlebrush Prickly Tea-tree Broom Spurge Cheese Tree Swamp Baeckea Crimson Bottlebrush Narrow-leaved Bottlebrush Willow-leaved Hakea Mangrove Boobialla	<i>Callistemon salignus</i> <i>Leptospermum juniperinum</i> <i>Amperea xiphioclada</i> <i>Glochidion ferdinandi</i> <i>Baeckea linifolia</i> <i>Callistemon citrinus</i> <i>Callistemon linearis</i> <i>Hakea salicifolia</i> <i>Myoporum acuminatum</i>
<b>GROUND COVERS &lt;1m</b>	Common Reed	<i>Phragmites australis</i>	Guinea Flower Flax Lily Flax Lily Mat Rush	Hibbertia scandens <i>Dianella caerulea</i> <i>Dianella longifolia</i> <i>Lomandra longifolia</i>	Swamp Lily Tall Sedge Tufted Sedge Drooping Sedge Common Rush Rush Lily	<i>Crinum pedunculatum</i> <i>Carex appressa</i> <i>Carex gaudichaudiana</i> <i>Carex longibrachiata</i> <i>Juncus usitatus</i> <i>Sowerbaea juncea</i>

# Wallamba River sub-catchment – northern Nabiac and Krambach areas

Creek-lines and rivers, floodplain, rolling hills, slopes

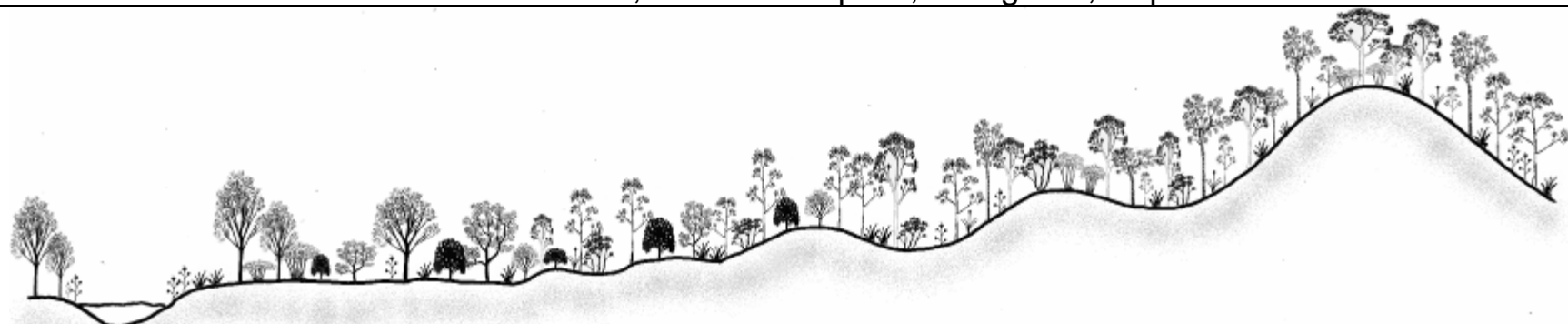


LANDFORM	River and creeks		Floodplain and lower country		Low hills and mid slopes		Upper slopes and ridges	
Vegetation	Riparian rainforest		Coastal dry sclerophyll forest		Hinterland wet and dry sclerophyll forest		Coastal dry sclerophyll forest	
GEOLOGY AND SOILS	Mostly alluvium				Deeper yellow podsolic on shale, siltstone and mudstone		Shallow yellow podsolic on shale, siltstone and mudstone	
LOCATION EXAMPLE	Nabiac Creek		Candoormakh Creek road		Mount Talawahl		Calvary Hill	
<b>TREES &gt; 8m</b>	Ironwood Water Gum River Oak  Flooded Gum Forest Red Gum Blackwood Rough-leaved Elm Lilly Pilly Red Ash Hard Quandong Brush Cherry Cabbage Palm Guioa Cheese Tree	<i>Waterhousia floribunba</i> <i>Tristaniopsis laurina</i> <i>Casuarina cunninghamiana</i> <i>Eucalyptus grandis</i> <i>Eucalyptus tereticornis</i> <i>Acacia melanoxylon</i> <i>Aphananthe phillippinensis</i>  <i>Acmena smithii</i> <i>Alphitonia excelsa</i> <i>Elaeocarpus obovatus</i> <i>Syzygium australe</i> <i>Livistonia australis</i> <i>Guioa semiglauca</i> <i>Glochidion ferdinandi</i>	Forest Red Gum Broad-leaved Apple Swamp Mahogany Sydney Blue Gum Grey Gum Cabbage Gum Grey Box Slaty Red Gum	<i>Eucalyptus tereticornis</i> <i>Angophora subvelutina</i> <i>Eucalyptus robusta</i> <i>Eucalyptus salignus</i> <i>Eucalyptus punctata</i> <i>Eucalyptus amplifolia</i> <i>Eucalyptus moluccana</i> <i>Eucalyptus glaucina</i>	Blackbutt Tallowwood Corkwood Red Mahogany Turpentine Bloodwood Forest Oak Stringybark Brush Box Grey Gum Sydney Blue Gum Flooded Gum Red Ash Guioa Lilly Pilly	<i>Eucalyptus pilularis</i> <i>Eucalyptus microcorys</i> <i>Dubosia myoporoides</i> <i>Eucalyptus resinifera</i> <i>Syncarpia glomulifera</i> <i>Corymbia gummifera</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus globoidea</i> <i>Lophostemon confertus</i> <i>Eucalyptus punctata</i> <i>Eucalyptus salignus</i> <i>Eucalyptus grandis</i> <i>Alphitonia excelsa</i> <i>Guioa semiglauca</i> <i>Acmena smithii</i>	White Mahogany Forest Oak Grey Gum Grey Ironbark Red Ironbark Northern Ironbark Spotted Gum Bloodwood Tallowwood Grey Box	<i>Eucalyptus acemoides</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus punctata</i> <i>Eucalyptus placita</i> <i>Eucalyptus fibrosa</i> <i>Eucalyptus siderophloia</i> <i>Corymbia maculata</i> <i>Corymbia gummifera</i> <i>Eucalyptus microcorys</i> <i>Eucalyptus moluccana</i>
<b>SHRUBS 1m – 8m</b>	Green Wattle Pink-tipped Bottlebrush Tree Violet Sandpiper Fig Native Frangipani Native Hibiscus Tree Lomatia	<i>Acacia irrorata</i> <i>Callistemon salignus</i>  <i>Hymenanthera dentata</i> <i>Ficus coronata</i> <i>Hymenosporum flavum</i> <i>Hibiscus heterophyllus</i> <i>Lomatia arborescens</i>	Orange Thorn-Bush Pink-tipped Bottlebrush Willow-leaved Hakea Prickly Paperbark Narrow leaved Paperbark	<i>Citriobatus pauciflorus</i> <i>Callistemon salignus</i>  <i>Hakea salicifolia</i>  <i>Melaleuca styphelioides</i> <i>Melaleuca linariifolia</i>	Native Hibiscus Hakea Banksia Scrub Turpentine Bolly Gum Native Peach Cheese Tree	<i>Hibiscus heterophyllus</i> <i>Hakea salicifolia</i> <i>Banksia integrifolia</i> <i>Rhodamnia rubesens</i> <i>Litsea reticulata</i> <i>Trema aspera</i> <i>Glochidion ferdinandi</i>	Banksia Pittosporum Geebung Hop Bush Forest Sedge Pinnate Boronia	<i>Banksia integrifolia</i> <i>Pittosporum revolutum</i> <i>Persoonia linearis</i> <i>Dodonaea triquetra</i> <i>Carex incomitata</i> <i>Boronia pinnata</i>
<b>GROUND COVERS &lt;1m</b>	Spiny Mat Rush Mat Rush Maidenhair Fern	<i>Lomandra hystrix</i> <i>Lomandra longifolia</i> <i>Adiantum aethiopicum</i>	Riceflower Kangaroo Grass Wallaby Grass Weeping Grass	<i>Pimelea linifolia</i> <i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Microlaena stipoides</i>	Guinea Flower Flax Lily Flax Lily Kangaroo Grass Wallaby Grass Weeping Grass	<i>Hibbertia scandens</i> <i>Dianella caerulea</i> <i>Dianella longifolia</i> <i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Microlaena stipoides</i>	Grass Triggerplant Riceflower Slender Violet Kangaroo Grass Wallaby Grass Weeping Grass	<i>Stylidium graminifolium</i> <i>Pimelea linifolia</i> <i>Hybanthus monopetalus</i> <i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Microlaena stipoides</i>

Only plant in streams where already present.

# Wallamba River sub-catchment – Dyers Crossing area

Creeklines and rivers, alluvial floodplain, rolling hills, slopes



LANDFORM	Rivers and creeks		Floodplain and lower country		Low hills and mid slopes		Upper slopes and ridges	
VEGETATION TYPE	Riparian rainforest		Coastal dry sclerophyll forest		Coastal dry sclerophyll forest		Coastal dry sclerophyll forest	
GEOLOGY AND SOILS	Mostly alluvium							
LOCATION EXAMPLE								
TREES > 8m	Ironwood Water Gum River Oak Flooded Gum Forest Red Gum Blackwood Rough-leaved Elm Lilly Pilly Red Ash Hard Quandong Brush Cherry Cabbage Palm Guioa Cheese Tree	<i>Waterhousia floribunba</i> <i>Tristaniopsis laurina</i> <i>Casuarina cunninghamiana</i> <i>Eucalyptus grandis</i> <i>Eucalyptus tereticornis</i> <i>Acacia melanoxylon</i> <i>Aphananthe phillippinensis</i> <i>Acmena smithii</i> <i>Alphitonia excelsa</i> <i>Elaeocarpus obovatus</i> <i>Syzygium australe</i> <i>Livistonia australis</i> <i>Guioa semiglauca</i> <i>Glochidion ferdinandi</i>	Forest Red Gum Broad-leaved Apple Swamp Mahogany Grey Gum Cabbage Gum Grey Box Slaty Red Gum	<i>Eucalyptus tereticornis</i> <i>Angophora subvelutina</i> <i>Eucalyptus robusta</i> <i>Eucalyptus punctata</i> <i>Eucalyptus amplifolia</i> <i>Eucalyptus moluccana</i> <i>Eucalyptus glaucina</i>	Spotted Gum Tallowwood White Mahogany Red Mahogany Turpentine Bloodwood Forest Oak Stringybark Grey Gum Brush Box	<i>Corymbia maculata</i> <i>Eucalyptus microcorys</i> <i>Eucalyptus acemoides</i> <i>Eucalyptus resinifera</i> <i>Syncarpia glomulifera</i> <i>Corymbia gummifera</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus globoidea</i> <i>Eucalyptus punctata</i> <i>Lophostemon confertus</i>	White Mahogany Forest Oak Grey Gum Grey Ironbark Red Ironbark Northern Ironbark Spotted Gum Bloodwood Tallowwood Grey Box	<i>Eucalyptus acemoides</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus punctata</i> <i>Eucalyptus placita</i> <i>Eucalyptus fibrosa</i> <i>Eucalyptus siderophloia</i> <i>Corymbia maculata</i> <i>Corymbia gummifera</i> <i>Eucalyptus microcorys</i> <i>Eucalyptus moluccana</i>
SHRUBS 1m – 8m	Green Wattle Pink-tipped Bottlebrush Tree Violet Sandpiper Fig Native Frangipani Native Hibiscus Tree Lomatia	<i>Acacia irrorata</i> <i>Callistemon salignus</i>  <i>Hymenanthera dentata</i> <i>Ficus coronata</i> <i>Hymenosporum flavum</i> <i>Hibiscus heterophyllus</i> <i>Lomatia arborescens</i>	Narrow leaved Tea Tree Prickly Tea Tree Pink-tipped Bottlebrush Willow-leaved Hakea	<i>Melaleuca linearifolia</i>  <i>Melaleuca styphelioides</i> <i>Callistemon salignus</i>  <i>Hakea salicifolia</i>	Hakea Banksia Scrub Turpentine Native Peach Orange Thorn-Bush Cheese Tree	<i>Hakea salicifolia</i> <i>Banksia integrifolia</i> <i>Rhodamnia rubesens</i> <i>Trema aspera</i> <i>Citriobatus pauciflorus</i> <i>Glochidion ferdinandi</i>	Banksia Pittosporum Geebung Hop Bush	<i>Banksia integrifolia</i> <i>Pittosporum revolutum</i> <i>Persoonia linearis</i> <i>Dodonaea triquetra</i>
GROUND COVERS <1m	Spiny Mat Rush Mat Rush Maidenhair Fern	<i>Lomandra hystrix</i> <i>Lomandra longifolia</i> <i>Adiantum aethiopicum</i>	Kangaroo Grass Wallaby Grass Weeping Grass	<i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Microlaena stipoides</i>	Guinea Flower Flax Lily Flax Lily	<i>Hibbertia scandens</i> <i>Dianella caerulea</i> <i>Dianella longifolia</i>	Grass Triggerplant Riceflower Slender Violet	<i>Stylidium graminifolium</i>  <i>Pimelea linifolia</i> <i>Hybanthus monopetalus</i>

# Upper Wallamba River sub-catchment – Bucca Wauka / Tipperary / Mimi area

Creek-lines and rivers, rolling hills, slopes



LANDFORM	River and creeks		Low and mid slopes, especially southern aspects		Low and mid slopes, especially northern aspects		Upper slopes and ridges, exposed northern aspects	
VEGETATION	Riparian rainforest		Myrtle dry rainforest		Coastal dry sclerophyll forest		Coastal dry sclerophyll forest	
GEOLOGY AND SOILS	Mostly alluvium		Deep red soils of basaltic origin		Shallow yellow podsolic on shale, siltstone and mudstone		Shallow yellow podsolic on shale, siltstone and mudstone	
LOCATION example	Upstream of Karkatt Bridge, Wallamba River		Tipperary Mountain		Bucca Wauka		Bucca Wauka	
TREES > 8m	Ironwood Water Gum River Oak <sup>2</sup>  Blue Gum Forest Red Gum Blackwood Rough-leaved Elm Lilly Pilly Red Ash Hard Quandong Brush Cherry Guioa Cheese Tree Forest Red Gum Cabbage Gum Grey Gum	<i>Waterhousia floribunba</i> <i>Tristaniopsis laurina</i> <i>Casuarina cunninghamiana</i> <i>Eucalyptus saligna</i> <i>Eucalyptus tereticornis</i> <i>Acacia melanoxylon</i> <i>Aphananthe phillippinensis</i> <i>Acmena smithii</i> <i>Alphitonia excelsa</i> <i>Elaeocarpus obovatus</i> <i>Syzygium australe</i> <i>Guioa semiglauca</i> <i>Glochidion ferdinandi</i> <i>Eucalyptus tereticornis</i> <i>Eucalyptus amplifolia</i> <i>Eucalyptus punctata</i>	Shatterwood Grey Myrtle Blue Gum Giant Stinger Scentless Rosewood Rosewood Yellow Wood Tamarind Small-leaved Tuckeroo Sassafras Socketwood Lilly Pilly Rusty Fig Strangling Fig Hard Quandong Red Cedar Koda Brush Cherry Guioa Brush Box Grey Gum Blackwood	<i>Backhousia sciadpohora</i> <i>Backhousia myrtifolia</i> <i>Eucalyptus saligna</i> <i>Dendrocnide excelsa</i> <i>Synoum glandulosum</i> <i>Dysoxylum fraserianum</i> <i>Acronychia obongifolia</i> <i>Dipolglottis australis</i> <i>Cupaniopsis parvifolia</i> <i>Doryphora sassafras</i> <i>Daphnandra micrantha</i> <i>Acmena smithii</i> <i>Ficus rubiginosa</i> <i>Ficus watkinsiana</i> <i>Elaeocarpus obovatus</i> <i>Toona ciliata</i> <i>Ehretia acuminata</i> <i>Syzygium australe</i> <i>Guioa semiglauca</i> <i>Lophostemon confertus</i> <i>Eucalyptus punctata</i> <i>Acacia melanoxylon</i>	Forest Red Gum Broad-leaved Apple Cabbage Gum Grey Box Slaty Red Gum Forest Oak Grey Gum Grey Ironbark Red Ironbark Spotted Gum <sup>2</sup> Bloodwood White Mahogany	<i>Eucalyptus tereticornis</i> <i>Angophora subvelutina</i> <i>Eucalyptus amplifolia</i> <i>Eucalyptus moluccana</i> <i>Eucalyptus glaucina</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus punctata</i> <i>Eucalyptus placita</i> <i>Eucalyptus fibrosa</i> <i>Corymbia maculata</i> <i>Corymbia gummifera</i> <i>Eucalyptus fibrosa</i> <i>Corymbia maculata</i> <i>Corymbia gummifera</i> <i>Eucalyptus acemoides</i>	White Mahogany Forest Oak Grey Gum Grey Ironbark Red Ironbark Northern Ironbark Spotted Gum <sup>2</sup> Bloodwood Grey Box Forest Red Gum	<i>Eucalyptus acemoides</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus punctata</i> <i>Eucalyptus placita</i> <i>Eucalyptus fibrosa</i> <i>Eucalyptus siderophloia</i> <i>Corymbia maculata</i> <i>Corymbia gummifera</i> <i>Eucalyptus moluccana</i> <i>Eucalyptus tereticornis</i>
SHRUBS 1m – 8m	Green Wattle Pink-tipped Bottlebrush Tree Violet Sandpiper Fig Native Frangipani Native Hibiscus Tree Lomatia	<i>Acacia irrorata</i> <i>Callistemon salignus</i>  <i>Hymenanchera dentata</i> <i>Ficus coronata</i> <i>Hymenosporum flavum</i> <i>Hibiscus heterophyllus</i> <i>Lomatia arborescens</i>	Green Wattle Tree Violet Scrub Turpentine Native Peach Cheese Tree Native Frangipani Native Hibiscus Tree Lomatia	<i>Acacia irrorata</i> <i>Hymenanchera dentata</i> <i>Rhodamnia rubesens</i> <i>Trema aspera</i> <i>Glochidion ferdinandi</i> <i>Hymenosporum flavum</i> <i>Hibiscus heterophyllus</i> <i>Lomatia arborescens</i>	Green Wattle Pink-tipped Bottlebrush Willow-leaved Hakea Prickly Paperbark Narrow leaved Paperbark Native Cherry	<i>Acacia irrorata</i> <i>Callistemon salignus</i>  <i>Hakea salicifolia</i> <i>Melaleuca styphelioides</i> <i>Melaleuca linariifolia</i> <i>Exocarpos cupressiformis</i>	Banksia Pittosporum Hop Bush Forest Sedge Pinnate Boronia Native Cherry	<i>Banksia integrifolia</i> <i>Pittosporum revolutum</i> <i>Dodonaea triquetra</i> <i>Carex inomitata</i> <i>Boronia pinnata</i> <i>Exocarpos cupressiformis</i>
GROUND COVERS <1m	Spiny Mat Rush Mat Rush Maidenhair Fern	<i>Lomandra hystrix</i> <i>Lomandra longifolia</i> <i>Adiantum aethiopicum</i>	Slender Palm Lily Maidenhair Fern Birds Nest Fern Cunjevoi Native Ginger	<i>Cordyline stricta</i> <i>Adiantum aethiopicum</i> <i>Asplenium australasicum</i> <i>Alocasia macrorrhizos</i> <i>Alpinia caerulea</i>	Riceflower Guinea Flower Mat Rush Kangaroo Grass Wallaby Grass Weeping Grass	<i>Pimelea linifolia</i> <i>Hibbertia scandens</i> <i>Lomandra longifolia</i> <i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Microlaena stipoides</i>	Grass Triggerplant Riceflower Guinea Flower Slender Violet Kangaroo Grass Wallaby Grass	<i>Styidium graminifolium</i> <i>Pimelea linifolia</i> <i>Hibbertia scandens</i> <i>Hybanthus monopetalus</i> <i>Themeda australis</i> <i>Danthonia richardsonii</i>

<sup>1</sup> Only present downstream from Karkatt area.

<sup>2</sup> Only plant on waterways where already present.

# Wallingat and Coolongolook sub-catchments – Coolongolook, Wooton and Topi Topi area

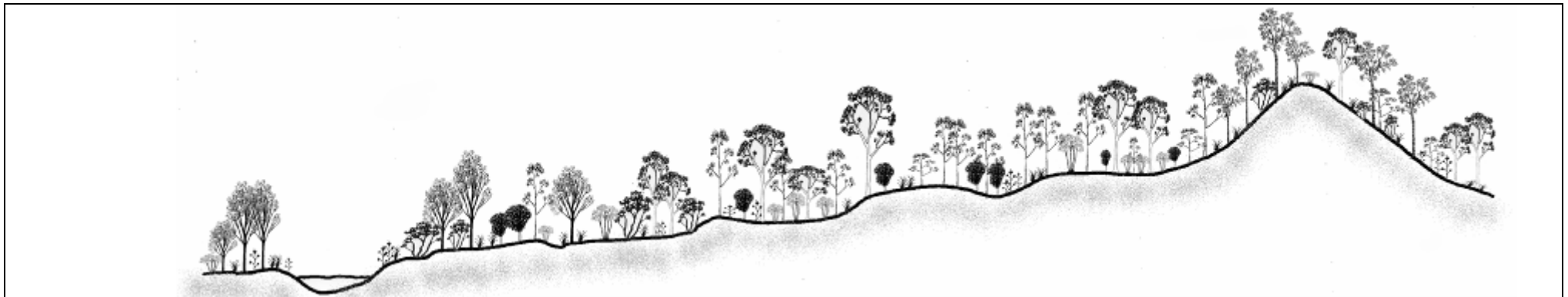
## Creek-lines and rivers, low hills, gullies and slopes



LANDFORM	River and creeks		Low hills and mid slopes		Brushy gullies		Upper slopes and ridges	
VEGETATION	Riparian rainforest		Coastal wet and dry sclerophyll forest		Sub-tropical rainforest		Coastal dry sclerophyll forest	
GEOLOGY AND SOILS	Mostly alluvium							
LOCATION EXAMPLE								
<b>TREES &gt; 8m</b>	Ironwood Water Gum River Oak  Flooded Gum Forest Red Gum Blackwood Rough-leaved Elm Lilly Pilly Red Ash Hard Quandong Brush Cherry Cabbage Palm Guioa Cheese Tree	<i>Waterhousia floribunba</i> <i>Tristaniopsis laurina</i> <i>Casuarina cunninghamiana</i> <i>Eucalyptus grandis</i> <i>Eucalyptus tereticornis</i> <i>Acacia melanoxylon</i> <i>Aphananthe phillippinensis</i> <i>Acmena smithii</i> <i>Alphitonia excelsa</i> <i>Elaeocarpus obovatus</i> <i>Syzygium australe</i> <i>Livistonia australis</i> <i>Guioa semiglauca</i> <i>Glochidion ferdinandi</i>	Blackbutt Tallowwood White Mahogany Red Mahogany Turpentine Bloodwood Forest Oak Stringybark Brush Box Grey Gum Smooth-barked Apple Scribbly Gum Sydney Blue Gum Flooded Gum Guioa Lilly Pilly	<i>Eucalyptus pilularis</i> <i>Eucalyptus microcorys</i> <i>Eucalyptus acemoides</i> <i>Eucalyptus resinifera</i> <i>Syncarpia glomulifera</i> <i>Corymbia gummifera</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus globoidea</i> <i>Lophostemon confertus</i> <i>Eucalyptus punctata</i> <i>Angophora costata</i>  <i>Eucalyptus haemastoma</i> <i>Eucalyptus salignus</i> <i>Eucalyptus grandis</i> <i>Guioa semiglauca</i> <i>Acmena smithii</i>	Coachwood Black Booyong Flooded Gum Giant Stinger Sassafras Socketwood Lilly Pilly Strangling Fig Hard Quandong Red Cedar Tamarind Prickly Ash Brown Alder Cabbage Palm Bangalow Palm Koda Brush Cherry Guioa Brush Box White Beech Blackwood	<i>Ceratopetalum apetalum</i> <i>Argyrodendron actinophylla</i> <i>Eucalyptus grandis</i> <i>Dendrocnide excelsa</i> <i>Doryphora sassafras</i> <i>Daphnandra micrantha</i> <i>Acmena smithii</i> <i>Ficus watkinsiana</i> <i>Elaeocarpus obovatus</i> <i>Toona ciliata</i> <i>Dipolglottis australis</i> <i>Orites excelsa</i> <i>Caldcluvia paniculosa</i> <i>Livistonia australis</i> <i>Archontophoenix cunninghamiana</i> <i>Ehretia acuminata</i> <i>Syzygium australe</i> <i>Guioa semiglauca</i> <i>Lophostemon confertus</i> <i>Gmelina leichhardtii</i> <i>Acacia melanoxylon</i>	White Mahogany Forest Oak Grey Gum Grey Ironbark Red Ironbark Northern Ironbark Spotted Gum Bloodwood Tallowwood Grey Box Smooth-barked Apple	<i>Eucalyptus acemoides</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus punctata</i> <i>Eucalyptus placita</i> <i>Eucalyptus fibrosa</i> <i>Eucalyptus siderophloia</i> <i>Corymbia maculata</i> <i>Corymbia gummifera</i> <i>Eucalyptus microcorys</i> <i>Eucalyptus moluccana</i> <i>Angophora costata</i>
<b>SHRUBS 1m – 8m</b>	Green Wattle Pink-tipped Bottlebrush Tree Violet Sandpiper Fig Native Frangipani Native Hibiscus Tree Lomatia Black Wattle	<i>Acacia irrorata</i> <i>Callistemon salignus</i>  <i>Hymenanthera dentata</i> <i>Ficus coronata</i> <i>Hymenosporum flavum</i> <i>Hibiscus heterophyllus</i> <i>Lomatia arborescens</i> <i>Callicoma serratifolia</i>	Murrogun Hakea Banksia Scrub Turpentine Bolly Gum Native Peach Cheese Tree Blueberry Ash	<i>Cryptocarya microneura</i> <i>Hakea salicifolia</i> <i>Banksia integrifolia</i> <i>Rhodamnia rubesens</i> <i>Litsea reticulata</i> <i>Trema aspera</i> <i>Glochidion ferdinandi</i> <i>Elaeocarpus reticulatus</i>	Maiden's Blush Tree Violet Scrub Turpentine Native Peach Featherwood Cheese Tree Native Frangipani Native Hibiscus Tree Lomatia	<i>Solanea australis</i> <i>Hymenanthera dentata</i> <i>Rhodamnia rubesens</i> <i>Trema aspera</i> <i>Polyosma cunninghamii</i> <i>Glochidion ferdinandi</i> <i>Hymenosporum flavum</i> <i>Hibiscus heterophyllus</i> <i>Lomatia arborescens</i>	Banksia Pittosporum Geebung Hop Bush Gynea Lily Grass Tree	<i>Banksia integrifolia</i> <i>Pittosporum revolutum</i> <i>Persoonia linearis</i> <i>Dodonaea triquetra</i> <i>Doryanthes excelsa</i> <i>Xanthorrhoea australis</i>
<b>GROUND COVERS &lt;1m</b>	Spiny Mat Rush Mat Rush Maidenhair Fern	<i>Lomandra hystrix</i> <i>Lomandra longifolia</i> <i>Adiantum aethiopicum</i>	Guinea Flower Kangaroo Grass Wallaby Grass Mat Rush	<i>Hibbertia scandens</i> <i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Lomandra longifolia</i>	Slender Palm Lily Maidenhair Fern Birds Nest Fern Cunjevoi Native Ginger	<i>Cordyline stricta</i> <i>Adiantum aethiopicum</i> <i>Asplenium australasicum</i> <i>Alocasia macrorrhizos</i> <i>Alpinia caerulea</i>	Guinea Flower Kangaroo Grass Wallaby Grass Mat Rush Purple Fan Flower	<i>Hibbertia scandens</i> <i>Themeda australis</i> <i>Danthonia sp.</i> <i>Lomandra longifolia</i> <i>Scaevola ramosissima</i>

# Wang Wauk River sub-catchment – Bunyah Village - Willina

Creek-lines and rivers, floodplain, rolling hills, slopes



LANDFORM	River and creeks		Floodplain and lower country		Low hills and mid slopes		Upper slopes and ridges	
VEGETATION	Riparian rainforest		Coastal dry sclerophyll forest		Coastal dry sclerophyll forest		Coastal dry sclerophyll forest	
GEOLOGY AND SOILS	Mostly alluvium		Shallow yellow podsolc on shale, siltstone and mudstone		Shallow yellow podsolc on shale, siltstone and mudstone		Shallow yellow podsolc on shale, siltstone and mudstone	
LOCATION EXAMPLE	Lavinia Murray Bridge, Bunyah Creek		Between Bunyah Road and Wang Wauk River		Upper Bunyah		Manning Hill Road	
<b>TREES &gt; 8m</b>	Ironwood <sup>1</sup> Water Gum River Oak <sup>1</sup> Flooded Gum Forest Red Gum Blackwood Rough-leaved Elm Lilly Pilly Red Ash Hard Quandong Brush Cherry Cheese Tree	<i>Waterhousia floribunba</i> <i>Tristaniopsis laurina</i> <i>Casuarina cunninghamiana</i> <i>Eucalyptus grandis</i> <i>Eucalyptus tereticornis</i> <i>Acacia melanoxylon</i> <i>Aphananthe philippinens</i> <i>Acmena smithii</i> <i>Alphitonia excelsa</i> <i>Elaeocarpus obovatus</i> <i>Syzygium australe</i> <i>Glochidion ferdinandi</i>	Forest Red Gum Broad-leaved Apple Grey Box Swamp Mahogany Grey Gum Cabbage Gum Slaty Red Gum	<i>Eucalyptus tereticornis</i> <i>Angophora subvelutina</i> <i>Eucalyptus moluccana</i> <i>Eucalyptus robusta</i> <i>Eucalyptus punctata</i> <i>Eucalyptus amplifolia</i> <i>Eucalyptus glaucina</i>	Forest Red Gum Cabbage Gum Grey Box Spotted Gum Tallowwood White Mahogany Red Mahogany Turpentine Bloodwood Forest Oak Stringybark Brush Box Grey Gum	<i>Eucalyptus tereticornis</i> <i>Eucalyptus amplifolia</i> <i>Eucalyptus moluccana</i> <i>Corymbia maculata</i> <i>Eucalyptus microcorys</i> <i>Eucalyptus acemoides</i> <i>Eucalyptus resinifera</i> <i>Syncarpia glomulifera</i> <i>Corymbia gummifera</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus globoidea</i> <i>Eucalyptus punctata</i>	White Mahogany Forest Oak Grey Gum Grey Ironbark Red Ironbark Northern Ironbark Spotted Gum Bloodwood Tallowwood Grey Box	<i>Eucalyptus acemoides</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus punctata</i> <i>Eucalyptus placita</i> <i>Eucalyptus fibrosa</i> <i>Eucalyptus siderophloia</i> <i>Corymbia maculata</i> <i>Corymbia gummifera</i> <i>Eucalyptus microcorys</i> <i>Eucalyptus moluccana</i>
<b>SHRUBS 1m – 8m</b>	Green Wattle Sally Wattle Pink-tipped Bottlebrush Tree Violet Sandpiper Fig Native Frangipani Native Hibiscus Tree Lomatia	<i>Acacia irrorata</i> <i>Acacia floribunda</i> <i>Callistemon salignus</i>  <i>Hymenanthera dentata</i> <i>Ficus coronata</i> <i>Hymenosporum flavum</i> <i>Hibiscus heterophyllus</i> <i>Lomatia arborescens</i>	Pink-tipped Bottlebrush Willow-leaved Hakea Prickly Paperbark Narrow leaved Paperbark	<i>Callistemon salignus</i>  <i>Hakea salicifolia</i>  <i>Melaleuca styphelioides</i> <i>Melaleuca linariifolia</i>	Hakea Banksia Scrub Turpentine Native Peach Cheese Tree Native Cherry	<i>Hakea salicifolia</i> <i>Banksia integrifolia</i> <i>Rhodannia rubesens</i> <i>Trema aspera</i> <i>Glochidion ferdinandi</i> <i>Exocarpos cupressiformis</i>	Banksia Pittosporum Geebung Hop Bush Native Cherry	<i>Banksia integrifolia</i> <i>Pittosporum revolutum</i> <i>Persoonia linearis</i> <i>Dodonaea triquetra</i> <i>Exocarpos cupressiformis</i>
<b>GROUND COVERS &lt;1m</b>	Spiny Mat Rush Mat Rush Maidenhair Fern	<i>Lomandra hystrix</i> <i>Lomandra longifolia</i> <i>Adiantum aethiopicum</i>	Kangaroo Grass Wallaby Grass Weeping Grass Riceflower	<i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Microlaena stipoides</i> <i>Pimelea linifolia</i>	Guinea Flower Grass Triggerplant Riceflower Slender Violet	Hibbertia scandens Stylidium graminifolium  <i>Pimelea linifolia</i> <i>Hybanthus monopetalus</i>	Kangaroo Grass Wallaby Grass Weeping Grass Riceflower	<i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Microlaena stipoides</i> <i>Pimelea linifolia</i>

<sup>1</sup> Only plant on waterways where already present.



# Wang Wauk sub-catchment – Upper Bunyah area

Creek-lines and rivers, low slopes, rolling hills, slopes



LANDFORM	River and creeks		Low and mid slopes, especially southern aspects		Low hills and mid slopes		Upper slopes and ridges, exposed northern aspects	
VEGETATION	Riparian rainforest		Myrtle dry rainforest		Coastal dry sclerophyll forest		Coastal dry sclerophyll forest	
GEOLOGY AND SOILS	Mostly alluvium		Deep red soils of basaltic origin		Shallow yellow podsolic on shale, siltstone and mudstone		Shallow yellow podsolic on shale, siltstone and mudstone	
LOCATION EXAMPLE	Bunyah Creek		Bulby Brush		West of Manning Hill Road		Upper Bunyah	
<b>TREES &gt; 8m</b>	Ironwood <sup>1</sup> Water Gum River Oak <sup>1</sup>  Flooded Gum Forest Red Gum Blackwood Rough-leaved Elm Lilly Pilly Red Ash Hard Quandong Brush Cherry Cheese Tree	<i>Waterhousia floribunba</i> <i>Tristaniopsis laurina</i> <i>Casuarina cunninghamiana</i> <i>Eucalyptus grandis</i> <i>Eucalyptus tereticornis</i> <i>Acacia melanoxylon</i> <i>Aphananthe phillippinensis</i> <i>Acmena smithii</i> <i>Alphitonia excelsa</i> <i>Elaeocarpus obovatus</i> <i>Syzygium australe</i> <i>Glochidion ferdinandi</i>	Shatterwood Grey Myrtle Blue Gum Giant Stinger Sassafras Socketwood Lilly Pilly Strangling Fig Hard Quandong Red Cedar Turpentine Koda Brush Cherry Guioa Brush Box Grey Gum Blackwood	<i>Backhousia sciadpohora</i> <i>Backhousia myrtifolia</i> <i>Eucalyptus saligna</i> <i>Dendrocnide excelsa</i> <i>Doryphora sassafras</i> <i>Daphnandra micrantha</i> <i>Acmena smithii</i> <i>Ficus watkinsiana</i> <i>Elaeocarpus obovatus</i> <i>Toona ciliata</i> <i>Syncarpia glomulifera</i> <i>Ehretia acuminata</i> <i>Syzygium australe</i> <i>Guioa semiglauca</i> <i>Lophostemon confertus</i> <i>Eucalyptus punctata</i> <i>Acacia melanoxylon</i>	Spotted Gum Tallowwood White Mahogany Red Mahogany Grey Ironbark Turpentine Bloodwood Forest Oak Stringybark Brush Box Grey Gum	<i>Corymbia maculata</i> <i>Eucalyptus microcorys</i> <i>Eucalyptus acemoides</i> <i>Eucalyptus resinifera</i> <i>Eucalyptus placita</i> <i>Syncarpia glomulifera</i> <i>Corymbia gummifera</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus globoidea</i> <i>Lophostemon confertus</i> <i>Eucalyptus punctata</i>	White Mahogany Forest Oak Grey Gum Grey Ironbark Red Ironbark Northern Ironbark Spotted Gum Bloodwood Grey Box	<i>Eucalyptus acemoides</i>  <i>Allocasuarina torulosa</i> <i>Eucalyptus punctata</i> <i>Eucalyptus placita</i> <i>Eucalyptus fibrosa</i> <i>Eucalyptus siderophloia</i>  <i>Corymbia maculata</i> <i>Corymbia gummifera</i> <i>Eucalyptus moluccana</i>
<b>SHRUBS 1m – 8m</b>	Green Wattle Pink-tipped Bottlebrush Tree Violet Sandpiper Fig Native Frangipani Native Hibiscus Tree Lomatia	<i>Acacia irrorata</i> <i>Callistemon salignus</i> <i>Hymenanchera dentata</i> <i>Ficus coronata</i> <i>Hymenosporum flavum</i> <i>Hibiscus heterophyllus</i> <i>Lomatia arborescens</i>	Tree Violet Scrub Turpentine Native Peach Cheese Tree Native Frangipani Native Hibiscus Tree Lomatia	<i>Hymenanchera dentata</i> <i>Rhodamnia rubesens</i> <i>Trema aspera</i> <i>Glochidion ferdinandi</i> <i>Hymenosporum flavum</i> <i>Hibiscus heterophyllus</i> <i>Lomatia arborescens</i>	Hakea Banksia Scrub Turpentine Native Peach Cheese Tree	<i>Hakea salicifolia</i> <i>Banksia integrifolia</i> <i>Rhodamnia rubesens</i> <i>Trema aspera</i> <i>Glochidion ferdinandi</i>	Banksia Pittosporum Geebung Hop Bush Gynea Lily Grass Tree	<i>Banksia integrifolia</i> <i>Pittosporum revolutum</i> <i>Persoonia linearis</i> <i>Dodonaea triquetra</i> <i>Doryanthes excelsa</i> <i>Xanthorrhoea australis</i>
<b>GROUND COVERS &lt;1m</b>	Spiny Mat Rush Mat Rush Maidenhair Fern	<i>Lomandra hystrix</i> <i>Lomandra longifolia</i> <i>Adiantum aethiopicum</i>	Maidenhair Fern Slender Palm Lily Birds Nest Fern Cunjevoi Native Ginger	<i>Adiantum aethiopicum</i> <i>Cordylina stricta</i> <i>Asplenium australasicum</i> <i>Alocasia macrorrhizos</i> <i>Alpinia caerulea</i>	Guinea Flower Riceflower Slender Violet Kangaroo Grass Wallaby Grass Weeping Grass	<i>Hibbertia scandens</i> <i>Pimelea linifolia</i> <i>Hybanthus monopetalus</i> <i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Microlaena stipoides</i>	Kangaroo Grass Wallaby Grass Weeping Grass	<i>Themeda australis</i> <i>Danthonia richardsonii</i> <i>Microlaena stipoides</i>

<sup>1</sup> Only plant on waterways where already present.



## Part 3

### VEGETATION COMMUNITIES OF THE WALLIS LAKE CATCHMENT

## **VEGETATION COMMUNITIES**

The vegetation of Wallis Lake catchment is highly variable, ranging from lowland wetland ecosystems to dry sclerophyll forests in the hinterland. Vegetation mapping has classified a total of 51 vegetation communities in the catchment. These communities have been amalgamated here into eight ecosystem types including:

- rainforests (consisting of 11 communities);
- swamp forests (10 communities);
- moist sclerophyll forests (eight communities);
- hinterland dry sclerophyll forests (six communities);
- coastal lowland dry sclerophyll forests (seven communities);
- heathlands (five communities);
- sedgeland/rushland (one community); and
- disturbed vegetation (three communities).

### **RAINFOREST**

Rainforest is found throughout the catchment from the coast to the hinterland in sheltered valleys or sheltered headlands. It is reliant on moist conditions and shelter from wind and extreme temperatures. This ecosystem is characterised by a complex closed structure, usually consisting of a large number of structural layers. The canopy ranges from low in headland situations (6–8 m in height), to taller hinterland rainforests up to 30 m high. The floristic composition of this ecosystem type is diverse but always contains a mix of moisture-loving trees. Eucalypts and eucalypt associates are usually absent. The understorey is usually composed of ferns, sedges and grasses. It is found throughout the catchment, from the coast to the hinterland. It occupies about 2 780 ha in the catchment area.

### **SWAMP FOREST**

Swamp forests normally occur close to the coast, although some types occur inland. They occur in poorly drained sites that are periodically waterlogged. Brackish water may also be encountered in communities that form this ecosystem. Characteristic species associated with swamp forests are swamp mahogany, paperbark, swamp oak and mangrove. This ecosystem covers about 4 540 ha in the Great Lakes Council catchment area. It is mainly found in the sub-catchments of Wallingat River, Darawank Creek, Lake Body and Minimbah and covers 5 500 ha of the catchment.

### **WET SCLEROPHYLL FOREST**

Wet sclerophyll forest occurs on sheltered slopes, usually in the transitional zone between rainforest communities in the gullies and dry sclerophyll communities on the ridges. Trees in this ecosystem usually exceed 40 m and are occasionally over 60 m in height, with an understorey of mesophytic shrubs. Some of the wet sclerophyll communities develop a rainforest understorey in the absence of fire. Characteristic species include tallowwood, flooded gum, Sydney blue gum, brush box and blackbutt. This ecosystem covers about 8 200 ha in the catchment areas of Great Lakes Council. It is found throughout the catchment, although is more prevalent in the south and western portions.

### **HINTERLAND DRY SCLEROPHYLL FOREST**

Hinterland dry sclerophyll forest is common on steep slopes and ridgetops and mainly occurs on excessively drained sites with soil ranging from deep fertile soils to stony shallow soils. It is the most common ecosystem of the catchment. The structure of this ecosystem type is usually a tall open to partially closed overstorey up to 35 m high. Dominant tree species in this ecosystem are grey gum, white mahogany, spotted gum and ironbark. A sparse shrub layer is often present, while grasses dominate the understorey. This ecosystem occurs throughout the catchment, although it is generally absent from the sub-catchments of Hallidays Point, Darawank Creek, Nine Mile, Bungwahl and Lake Edge. In the catchment, this ecosystem covers an area in excess of 18 500 ha.

## **COASTAL LOWLAND DRY SCLEROPHYLL FOREST**

In Wallis Lake catchment this ecosystem predominantly occurs on the coastal lowlands, with scribbly gum occupying sites with impeded drainage. It is typically made up of dry sclerophyll forests or heath woodlands. It generally occurs on sandy soils with very low nutrient status. The structure of this ecosystem is variable, ranging from low woodland 12 m high to taller forests up to 25 m tall. The shrub layer is usually either non-existent or very dense heathland, while the understorey is composed of grasses, sedges and often bracken fern. This ecosystem occupies 2 500 ha of the catchment, mainly in the eastern edge of the catchment in areas such as the Nine Mile and Minimbah sub-catchments.

## **HEATHLANDS**

This ecosystem type includes those vegetation communities that lack trees and are dominated by other forms of woody plants reaching a height of at least 0.3 m high. In Wallis Lake catchment this ecosystem type is usually 2–6 m in height. The structure of this ecosystem is a closed shrub layer and usually a sparse herb layer. Dominant species are highly variable and can include wet heathland and dry heathland species. This ecosystem occupies about 2 400 ha of the Wallis Lake catchment. It mainly occurs in the north-east of the catchment in the Nine Mile, Lake Body and Minimbah and Darawank Creek sub-catchments.

## **SEDGELAND/RUSHLAND**

These are herb-dominated communities occurring in perpetually moist sites; they are dominated by sedges, rushes and ferns. Shrubs and trees are generally absent although isolated clumps or individuals do occur. This community occupies about 1 000 ha of the catchment, in the eastern portion of the area.

## **DISTURBED VEGETATION**

This ecosystem contains vegetation that has been disturbed either through logging, mining or agriculture. It includes regrowth communities, open woodlands with highly disturbed understoreys and heathlands disturbed through sandmining activities. It covers an area of 1 250 ha in the Wallis Lake catchment in small isolated pockets throughout the area.

## **CLEARED GRASSLAND**

This ecosystem type has been created from cleared lands, land which is generally used for agricultural pursuits. It consists of a low to tall grassland dominated by a variety of native and introduced grasses, with weed species common. It covers an area of 49 570 ha in the Wallis Lake catchment.

## **URBAN SETTLEMENTS**

Roads, buildings and industrial developments dominate these areas. Most plants that occur in this area are planted species in urban gardens. Urban areas cover 1 377 ha of the Wallis Lake catchment.