



EnvITE NSW

High Conservation Value (HCV) Vegetation Restoration

Action Plan

Wollongbar Rainforest Reserve

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1. BACKGROUND

1.1 General background

Wollongbar Rainforest Reserve (Ballina Shire Council Lot 105, DP 807798) is an area of bushland on the eastern edge of the village of Wollongbar in Northern New South Wales. This action plan is part of a project aimed at restoring native vegetation on the site under a Natural Heritage Trust (NHT) contract for the Big Scrub area.

The site is owned by Ballina Shire Council (BSC). The Reserve was established as part of the overall development of Wollongbar during the 1980s as a residential village and is managed jointly by BSC and the Wollongbar Progress Association. The Progress Association was actively involved in weed removal and replanting activities through the work of a small number of local residents during the 1990s, but its direct involvement has now ceased. Since 2000, intermittent weed control has been carried out by professional bush regenerators in association with EnviTE (Environmental Training and Employment), Lismore.

1.2 Site location and description

Wollongbar Rainforest Reserve is located on Dalmacia Drive, Wollongbar and is 3.94 hectares in area. The reserve is bounded on the north, west and south by urban housing, and land to the east has been cleared for horticulture. Nearest significant areas of comparable native vegetation are at Wollongbar Department of Agriculture and Wollongbar College of TAFE (2.5 km to the west) and at Lumley Park, Alstonville (3km to the east).

Wollongbar Rainforest Reserve represents a true urban remnant of the Big Scrub, as the surrounding areas have been progressively cleared of native vegetation for logging, farming and residential development. Its urban context means that this reserve will require a more complex method of management than if it was located in a rural area. Long term strategies will need to consider the potential effects of increases in housing density, and the lifestyles and expectations of local residents. Some of the human issues which may arise include:

Disadvantages

- Possible damage to neighbouring properties due to fallen limbs.
- Overshading of neighbouring properties.
- Alteration to the hydrology of the reserve due to increased stormwater runoff.
- Introduction of exotic plants by waste dumping or garden escapes.
- Loss of native fauna due to presence of dogs and cats.
- Increased recreational use by local residents.
- Vandalism

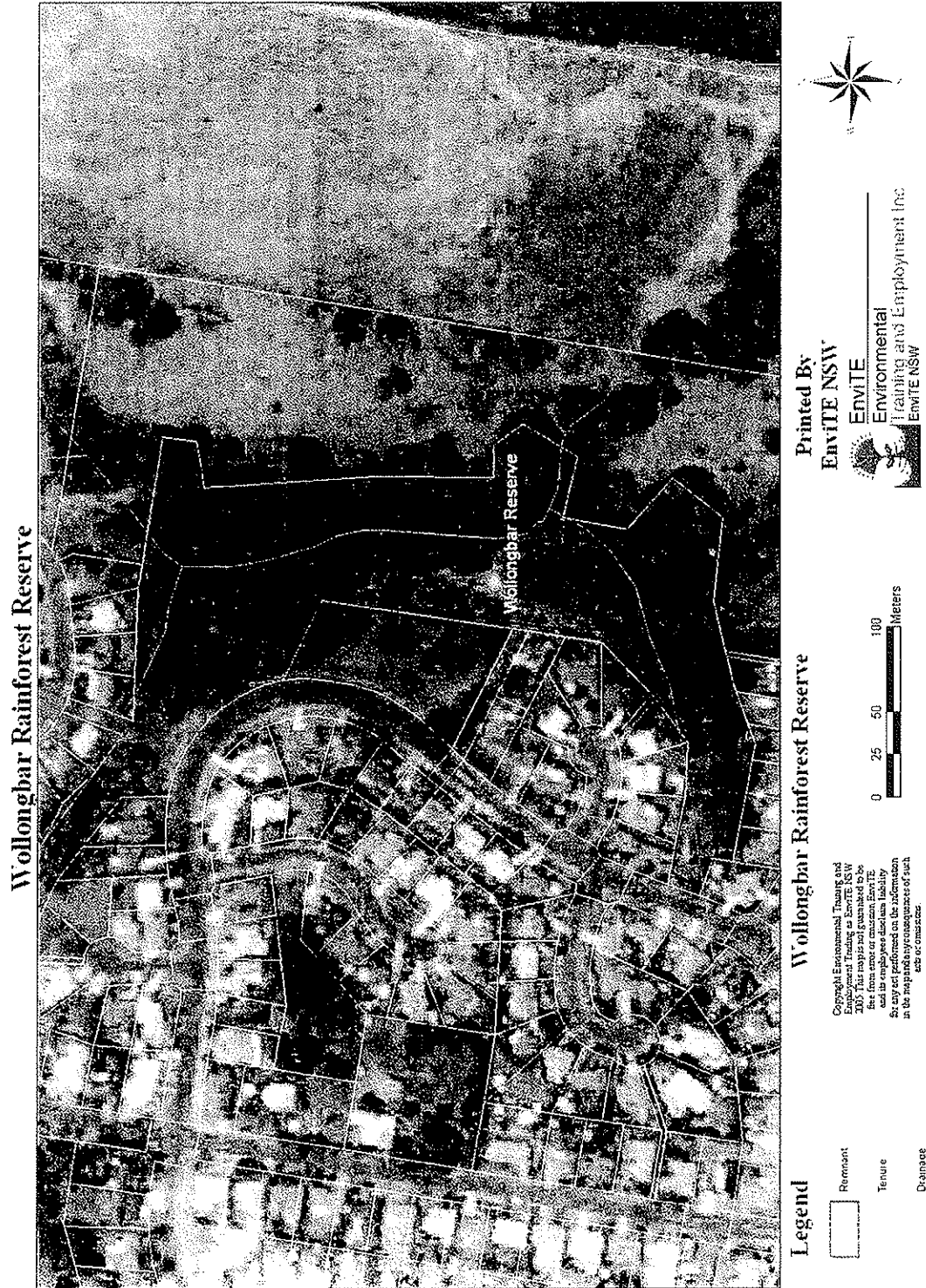
Advantages

- Potential increase in community involvement in the project.

The Reserve is the location for the BSC sewerage transfer tank and the substantial pipeline that follows the creek line through the southern end of the site.

Two perennial creeks flow from the northern end, join near the middle of the property, then flow the length of the reserve to its southern boundary to join Maguire's Creek north of Alstonville.

Figure 1. Wollongbar Rainforest Reserve



2. PROJECT AIMS AND OBJECTIVES

The aim of the project is to continue and extend the process of rehabilitation already commenced on the site, and to improve the health of the native vegetation to the extent possible, within the specified time frame and budget.

The main objectives of the project are to:

- Complete action planning for restoration of native vegetation on the site.
- Use the plan as a practical guide to undertaking on-ground restoration work at the site.
- Enhance the ability and desire of local communities and government for planning and undertaking of forest restoration projects
- Provide advice and / or training
- Monitor, evaluate and report on project activities
- Improve the human amenity of the reserve and improve pedestrian access
- Encourage long-term planning for future maintenance of the site
- Enhance and promote the positive attributes of an urban bushland remnant to the local community

From these objectives, practical work will include:

- Gradual and orderly control of environmental weeds on a zone-by-zone basis
- Replanting where appropriate with local native plants
- On-site monitoring
- Information and training sessions for local community groups, schools and colleges
- Realigning and reconstructing pathways and creek crossings; rebuilding observation decks

3. SITE ASSESSMENT

3.1 Native vegetation description, condition and conservation value

According to Floyd's (1990) structural-physiognomic-floristic classification method, this site is most likely to belong to the White Booyong (*Heritiera trifoliolata*) alliance, suballiance no. 5, Black Bean (*Castanospermum australe*) / Red Bean (*Dysoxylum mollissimum*). The range of native species, topography and location indicate that the site has been part of a former subtropical rainforest community.

The entire site has been subject to severe degradation over several decades, and now has serious infestations of environmental weed species. Exotic tree and shrub species, especially Large-leaved Privet (*Ligustrum lucidum*), Camphor Laurel (*Cinnamomum camphora*), Small-leaved Privet (*Ligustrum sinense*) and Ochna (*Ochna serrulata*) occupy much of the existing canopy and understorey. Seedlings of these species, as well as extensive areas of Tradescantia (*Tradescantia fluminensis*) and Lantana (*Lantana camara*), are congesting the ground vegetation layer and inhibiting native seedling germination and development.

Discussion of these and other significant weed species may be found in the following sections 6.1 Threats to native vegetation and 6.3 Proposed restoration works and other activities. Details of their distribution are illustrated by maps in Figures 4 and 5. For the purposes of this action plan, the site has been divided into nine zones **A to J** (Fig. 2), determined by geographical features and the reserve boundaries. The following is a brief description of the present state of the vegetation in each zone.

Zone A is the area on the western side of the reserve which was planted in 1997 by EnviTE (Environmental Training and Employment) work teams. Many of the trees are now well established and up to eight metres in height. The main weed species present are annuals, with occasional woody weed seedlings appearing as well. This zone is adjacent to the recent subdivision on Dalmacia Drive.

Zone B is separated from Zone A by the walking path and its eastern boundary is the creek. The western edge of this area nearest the walking track was part of the original planting. The native vegetation is recovering well, despite the intensity of the work carried out in recent years where large canopy specimens of Large-leaved Privet have been killed and regular follow-up spraying has been necessary.

The forest canopy at the northern end of this zone contained numerous very tall, spreading specimens of Large-leaved Privet, most of which have now been killed by stem injection. Ballina Shire Council has subsequently engaged a tree-lopper to drop the dead stems of several of the larger specimens, in order to avoid potential danger to the public from falling limbs. This has presented further complications to the regeneration process, as the fallen biomass has complicated the process of follow-up in certain areas.

The vegetation on the ground level consists of native seedlings infiltrated by the exotics Large-leaved Privet, Crocosmia (*Crocosmia x crocosmiiflora*) and occasional patches of Tradescantia .

Zone C follows the western boundary up the hill to the entrance from Dalmacia Drive, and is bounded to the north and south by the walking track and to the east by

the western creek tributary. The waterfall and rockpool are at the north eastern corner of this zone.

Of the areas in which work has been carried out, this zone has had the least Large-leaved Privet in its canopy. As a result, the process of recovery is more advanced here, as overall disturbance levels have been lower. A wide range of native trees now forms a healthy mid storey at a height of five to ten metres. Large areas of Tradescantia and Freckle Face (*Hypoestes phyllostachya*) have been brought under control by repeat spraying. Seedlings of Smooth Senna (*Senna x floribunda*) and Large-leaved Privet still appear, but regular monitoring and spraying is adequate to control these species.

Zone D is at the north-western end of the property and has the top end of the western creek as its eastern boundary. This is another area which has suffered from the presence of large mature specimens of Large-leaved Privet in its canopy for many years with carpets of seedlings on the ground throughout. A number of these large trees remain to be treated in future works. The ground cover of Tradescantia over almost one third of this zone has necessitated high time and energy input into its control and maintenance.

Zone E includes the area bounded by the western creek, the northern fence line and the eastern creek. The junction of the two smaller streams occurs at the southern end of this zone. The western side of the zone down to the waterfall has undergone primary weed control and some maintenance follow-up over the past two years. The rest of the zone is severely infested with Large-leaved Privet in the canopy and midstorey, while most of the ground is either a continuous mass of Tradescantia in the more open areas, or of Large-leaved Privet where adult Privet trees are in the canopy, or a combination of both. One central section contains a large population of Brush Bloodwood (*Baloghia inophylla*).

Zone F is a large area with its eastern boundary the eastern perimeter fence, its southern boundary the walking track and its western boundary the main creek. From the creeks, the land here rises quite steeply up to the higher ground to the north and east. Along the narrow riparian area the vegetation consists of mostly exotic species, including grasses, Mistweed (*Ageratina riparia*), Crocosmia, Tradescantia, Impatiens (*Impatiens graveolens*) and seedlings of Large-leaved Privet and Camphor Laurel.

Away from the creek, the vegetation is dominated by Large-leaved Privet at all levels, and especially in the north-eastern section. *Ochna* (*Ochna serrulata*) is numerous in the understorey, and there is some Lantana (*Lantana camara*) as well. Treatment of canopy specimens has been undertaken in the last six months at strategic points to enhance the vigour of adjacent native trees. There is evidence of planted trees, especially on the track edges, carried out as part of previous Landcare Group activities. There is substantial native vegetation in seedling form throughout this zone, except for the northern end.

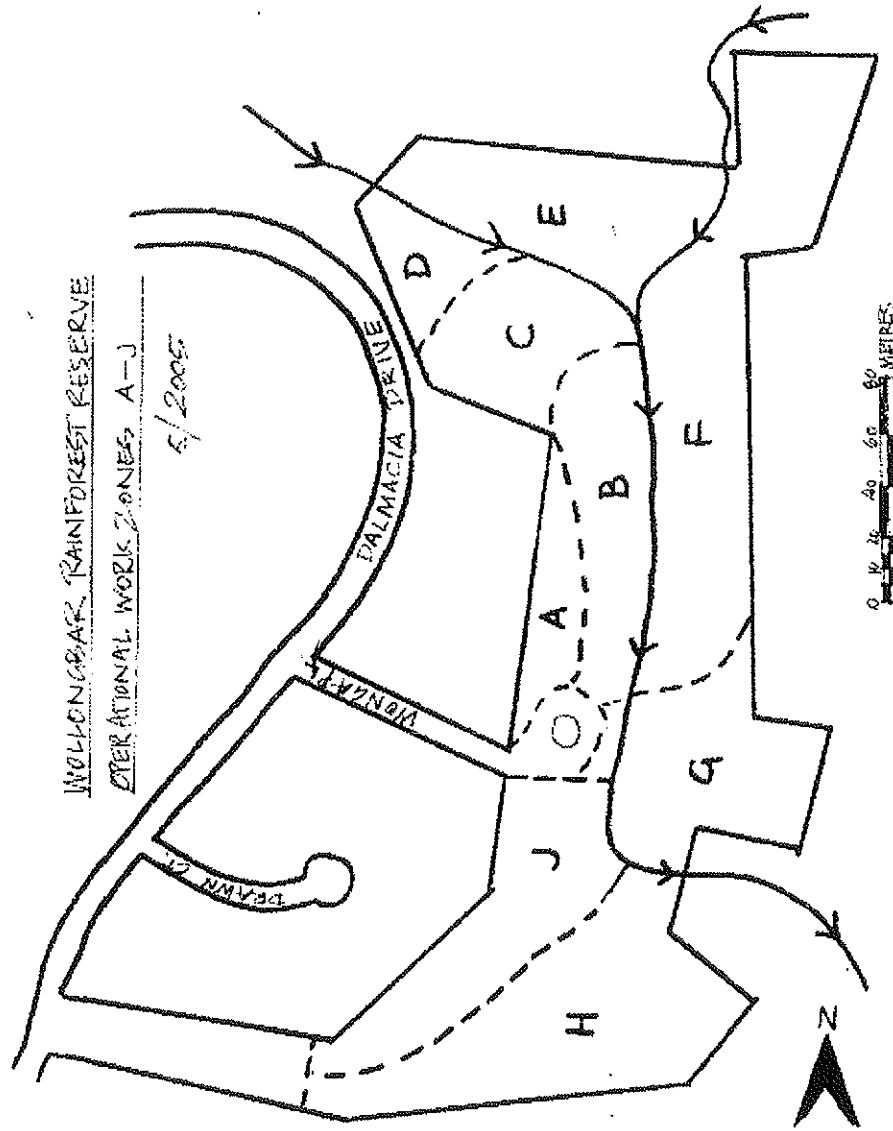
Zone G is separated from Zone F by the walking track and is bounded to the west by the main creek and to the south and east by the perimeter fence. The riparian area here is thickly covered with Lantana, Crofton Weed (*Ageratina adenophora*), Tradescantia and Large-leaved Privet. The higher ground shows a mix of canopy native species and Large-leaved Privet and Camphor Laurel. The ground level and mid storey is heavily infested with Large-leaved Privet seedlings and some *Ochna*. A range of native seedlings shows promising in situ resilience.

Zone H lies to the south of the main creek and its edge follows the perimeter fence around to the southern laneway where the walking track exits the reserve. Housing occurs at the southern and western edges of this zone. The north-western boundary is the bed of the intermittent stream that follows a north-easterly direction downhill to meet the main creek. A loop in the creek line, now cut off from the main creek, is steep-sided and potentially erodable. The stream bed here flows only during peak rain periods and collects a large amount of sediment and trash at these times. Vegetation is similar to that in Zones G and J, with high levels of infestation by Large-leaved Privet, Ochna, Camphor Laurel, Lantana and Tradescantia.

Zone J is a long, narrow area which shares the boundary with Zone H along the intermittent streambed, and backs directly onto houses along its northern and western sides. Its vegetation composition and health are similar to that of Zone H. Towards the western end is an infestation of Indian Coral Tree (*Erythrina X sykesii*), and the section that leads out onto Dalmacia Drive has become a passive recreation area between houses, maintained by the neighbours as lawn with scattered planted trees. One area at the bottom of Wonga Place is regularly used as a dump for garden waste from neighbouring properties.

In summary, the reserve has a severe environmental weed problem demanding immediate intervention by trained professional practitioners, and a program of follow-up procedures needs to be implemented for the reserve's long-term management strategy. It has high potential value to the community for natural habitat, visual amenity and recreation.

Figure 2. Wollongbar Rainforest Reserve Operational Work Zones



3.2 Fauna Assessment

No formal fauna assessment has been carried out. The reserve has adequate habitat types, including an extensive perennial creek system with several pools, open grass areas, rocky outcrops and crevices, fallen timber and leaf litter.

However, the capacity of this reserve to provide secure habitat for native fauna will be greatly limited due to the inevitable infiltration of domestic pets into the reserve from nearby residences. Native fauna observed incidentally includes:

Table 1. Observed Fauna present in reserve

COMMON NAME	SCIENTIFIC NAME
Forest Kingfisher	<i>Todirhamphus (Halcyon) macleayii</i>
Kookaburra	<i>Dacelo gigans</i>
Pacific Baza	<i>Aviceda subcristata</i>
White-bellied Sea Eagle	<i>Haliacetus leucogaster</i>
Pied Currawong	<i>Streptura graculina</i>
Superb Fairy Wren	<i>Malurus cyaneus</i>
Red-browed Firetail Finch	<i>Neochmia temporalis</i>
Brown Cuckoo Dove	<i>Macropygia amboinensis</i>
Noisy Miner	<i>Manorina melanocephala</i>
Lewin's Honeyeater	<i>Meliphaga lewinii</i>
Pheasant Coucal	<i>Centropus phasianinus</i>
Silveryeye	<i>Zosterops lateralis</i>
Green Catbird	<i>Ailuroedus crassirostris</i>
Spangled Drongo	<i>Dicrurus bracteatus</i>
Eastern Whipbird	<i>Psophodes olivaceus</i>
Galah	<i>Cacatua roseicapilla</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>
Northern Brown Bandicoot	<i>Isodon macrourus</i>
Eastern Water Dragon	<i>Physignathus lesueurii</i>

Adults and larvae of the Regent Skipper Butterfly have been observed on plants within the reserve on several occasions.

Workers and visitors should note that from October through to May, mosquitoes, paralysis ticks (*Ixodes holocyclus*) and bush mites (*Trombicula sp.*) are plentiful in all parts of the reserve and can cause severe discomfort and disease.

3.3 Threatened Species Conservation

Two plant species that occur in the reserve are included in the list of Threatened Species in New South Wales (National Parks and Wildlife Service, 2002). These are Arrowhead Vine (*Tinospora tinosporoides*), a rainforest climber which is classified as "Vulnerable", and Acalypha (*Acalypha eremorum*), a shrub classified as "Endangered". Extreme care should be taken to avoid damaging these plants during hand weeding in their vicinity and follow-up spraying should be kept at least three metres from any part of the plants.

6. RECOMMENDATIONS

6.1 Threats to Native Vegetation

6.1.1 Environmental weeds

Environmental weeds constitute the main immediate threat to natural systems in the reserve. The abundance and wide distribution throughout the reserve of three exotic species, namely Large-leaved Privet (*Ligustrum lucidum*), Tradescantia (*Tradescantia fluminensis*) and Ochna (*Ochna serrulata*) represent the major threats to the health of the reserve's vegetation. It is to these three species that most on ground works will be directed. Other potential, but less serious threat species include Crocosmia (*Crocosmia x crocosmiiflora*), Camphor Laurel (*Cinnamomum camphora*), Indian Coral Tree (*Erythrina x sykesii*), Climbing Asparagus (*Asparagus plumosus*) and Lantana (*Lantana camara*).

Large native climbing plants on trunks of dead trees can be a threat, as the burden of their increasing biomass on dead trees can cause large-scale, destructive tree fall which often makes onground work difficult. Pre-emptive cutting of stems of common climbers such as Native Derris (*Derris involuta*), Native Wistaria (*Millettia megasperma*), and the water vines (*Cissus spp.*) can prevent the damaging effect of such events. This technique may be employed if necessary during on-ground works.

6.1.2 Human impacts

The other main threat to the process of rehabilitation of the vegetation on this site is the proximity of the village of Wollongbar. Houses now exist adjacent to the reserve's boundaries to the north, west and south. Consequences are likely to include:

- The escape of exotic plant species from gardens into the reserve.
- Deliberate dumping of garden and other waste by local residents.
- The presence of exotic fauna such as dogs and cats.
- Increased volumes and velocity of water runoff caused by diversion of stormwater into the reserve.
- Increased sedimentation of the creek bed due to earthworks in properties upstream from the reserve.
- Potential conflict about shading and leaf and branch fall caused by large trees near the edges of the reserve.
- The demands of the community on the reserve as a recreational resource.

6.2 Proposed Weed Control Methodology

The information in Appendix 3 outlines weed control methods to be followed during the project. The two variations to these methods will be:

- In dealing with Large-leaved Privet saplings of up to 75mm stem diameter, the Cut-scrape-paint method will be replaced by the more efficient and equally thorough practice of simply cutting stems close to the ground and painting cut stems with the recommended Glyphosate dilution.
- All stem injection procedures will be done using a cordless drill instead of a tomahawk. This method involves drilling 12mm diameter holes about 3-4 cm deep into the stems of target species and filling the holes with Glyphosate solution at the standard dilution for other injection methods. This is considered by many practitioners to be safer and more effective than the tomahawk method.

6.3 Proposed Restoration Works and other activities

6.3.1 Weed control

On-ground works will proceed on a zone by zone basis, as the abundance of the major weed species is quite consistent throughout the parts of the reserve that remain untreated. Works undertaken to date in this reserve have shown that the most successful method is to proceed slowly, and to ensure that areas treated are maintained scrupulously before moving on to a new section. In this way, some adult specimens of woody weeds in the canopy or mid-storey can be treated shortly after the ground areas have been stabilised. This will assist greatly in rapid reduction of weed propagules in treated areas.

The level of eradication of these adult weed specimens will vary according to the presumed ability of existing native species to quickly reoccupy the space in canopy or mid-storey thus provided. The decisions about timing and number of trees to be injected in a given area will be the province of the practitioner.

Zones A, B, C and D are now at a level of management that requires occasional hand weeding, spraying of annual exotics on the outer edges and maintenance spraying of ground level areas where weed species recur at intervals. There are still several large specimens of Large-leaved Privet in Zones B and D, which will be injected at the appropriate time.

In Zone E, some primary work has been performed in the riparian section and follow-up spraying has succeeded in maintaining this area. Simultaneous treatment of the Tradescantia, the woody weed seedlings on the ground, and woody weed saplings in the understorey in the remainder of this zone will be the next primary weed control work undertaken. Hand weeding around native seedlings and along the edge of the creek bank can be followed by spraying of the Tradescantia and smaller woody weed seedlings. Sapling size woody weeds will be treated by the methods indicated. Stem injection of selected adult Large-leaved Privet may then be undertaken as deemed appropriate by the practitioner. Follow-up work, consisting of minor hand weeding, and spray maintenance will then be necessary on an ever-reducing, but permanent basis.

Work will then follow a similar pattern throughout the reserve, commencing in Zone F and proceeding southward into Zones G, then H, then J. Restoration of the riparian areas in consecutive zones should be the first issue addressed. Constant maintenance of riparian areas upstream will be necessary to minimise the incidence of weed propagules downstream.

Open riparian areas, with little or no tree cover, are the areas of lowest resilience on the reserve and would be ideal planting sites. Planting should be done in anticipation of extended wet periods, species chosen should reflect local rainforest composition and stock should be sourced from local provenance.

The area of Indian Coral Tree in Zone J requires treatment sooner than the proposed schedule indicates, as it is causing severe congestion of the watercourse and its surrounds.

The end portion of Zone J which exits to Dalmacia Drive appears to be maintained as a lawn area with specimen shrubs and trees. Altering its current status would require consultation with neighbours.

6.3.2 Other activities

These activities will attempt to offer solutions to the issues outlined in Section 6.1.2 Human Impacts.

The escape of exotic plant species from gardens into the reserve

Education of local residents to use compatible plants in adjoining gardens should be attempted, formally through organised field sessions, and informally by practitioners on site. Letterboxing neighbours with information encouraging compatible practices should also be considered. However, most future work will likely be in monitoring and controlling garden escapes, as the process will almost certainly continue.

Deliberate dumping of garden and other waste by local residents

Signs discouraging waste dumping should be erected at entrances to the reserve.

The presence of dogs and cats

At present, dogs are permitted in the reserve but must be on a leash.

Increased levels and velocity of water run-off caused by diversion of stormwater into the reserve

The recent development of housing on the Dalmacia Drive edge has already caused significant rill erosion through that section of the bush and across the main walking track, due to increased volume and velocity of stormwater from the subdivision. This may be alleviated by construction of flow mitigation fencing at strategic points within the reserve. The velocity of water flow in the creek system during peak rain periods is a threat to stream bank stability and native plant establishment at critical points. Flow inhibitors such as gabions, silt traps and waste filters would be useful, but expensive, future additions which would need to be considered and undertaken by Ballina Shire Council.

Increased sedimentation of the creek bed due to earthworks in properties upstream from the reserve

Flow control measures as discussed in the previous item would help to alleviate this problem. The stream bed and banks of the intermittent stream in Zone J have been scoured out by high velocity stormwater and debris and sediment continue to be deposited around its junction with the main creek.

Potential conflict about shading and leaf and branch fall caused by large trees near the edges of the reserve

There is already evidence in several places on the edge of the reserve of lopping of native and exotic vegetation by local residents. The concerns of the local community

need to be considered and addressed by consultation between residents, practitioners and representatives of Ballina Shire Council.

The demands of the community on the reserve as a recreational resource

The human amenity of the reserve needs to be improved in several areas. These include repair or removal of the damaged observation decks, improvement of existing walking tracks and construction of safe creek crossings.

A list of native ferns found in the reserve is currently being prepared.

6.4 Monitoring and Evaluation

- Daily work sheets will record practical information according to the form in Appendix 5.
- Transect belts will be set up at strategic points to record changes in species richness, species diversity, and percentage foliar cover over the course of the project and thereafter.
- Photographic points will be established to observe gross changes in the vegetation structure.
- Chemical operator's data sheet to be filled out daily, as in Appendix 6.
- Report on progress of works to be completed at the end of the current project period.

7. REFERENCES

Floyd, A. (1987) Australian Rainforests in New South Wales, vol.2, Surrey Beatty & Sons, N.S.W.

N.S.W. National Parks and Wildlife Service (2002), Threatened Species of the Upper North Coast of New South Wales: Flora

Appendices

Appendix 1. Wollongbar Rainforest Remnant: Native Plant Species

1a. Trees and shrubs		
FAMILY	SCIENTIFIC NAME	COMMON NAME
Apocynaceae	<i>Tabernaemontana pandacaqui</i>	Banana Bush
Areaceae	<i>Archontophoenix cunninghamii</i>	Bangalow Palm
Asteliaceae	<i>Cordyline petiolaris</i>	Broad-leaved Palm Lily
	<i>Cordyline rubra</i>	Red-fruited Palm Lily
Capparidaceae	<i>Capparis arborea</i>	Brush Caperberry
Ebenaceae	<i>Diospyros pentamera</i>	Myrtle Ebony
Elaeocarpaceae	<i>Elaeocarpus angustifolius</i>	Blue Fig
	<i>Elaeocarpus obovatus</i>	Hard Quandong
	<i>Sloanea australis</i>	Maiden's Blush
Euphorbiaceae	<i>Acalypha eremorum</i>	Acalypha
	<i>Actephila lindleyi</i>	Actephila
	<i>Breynia oblongifolia</i>	Breynia
	<i>Briedelia exaltata</i>	Brush Ironbark
	<i>Glochidion ferdinandi</i>	Cheese Tree
	<i>Mallotus discolor</i>	Yellow Kamala
	<i>Mallotus philippensis</i>	Red Kamala
	<i>Eupomatia bennettii</i>	Small Boiwarra
Fabaceae		
subfamily Faboideae	<i>Castanospermum australe</i>	Black Bean
subfamily Mimosoideae	<i>Acacia melanoxylon</i>	Sally Wattle
	<i>Archidendron muellerianum</i>	Veiny Lace Flower
	<i>Pararchidendron pruinosum</i>	Snow Wood
Lauraceae	<i>Cinnamomum virens</i>	Red-barked Sassafras
	<i>Cryptocarya obovata</i>	Pepperberry
	<i>Endiandra pubens</i>	Hairy Walnut
	<i>Litsea australis</i>	Brown Bolly Gum
	<i>Neolitsea australiensis</i>	Green Bolly Gum
	<i>Neolitsea dealbata</i>	White Bolly Gum
Meliaceae	<i>Dysoxylum fraserianum</i>	Rosewood
	<i>Dysoxylum mollissimum</i>	Red Bean
	<i>Dysoxylum rufum</i>	Hairy Rosewood
	<i>Synoum glandulosum</i>	Scentless Rosewood
	<i>Toona ciliata</i>	Red Cedar
Monimiaceae	<i>Wilkiea huegeliana</i>	Veiny Wilkiea
	<i>Wilkiea macrophylla</i>	Large-leaved Wilkiea
Moraceae	<i>Ficus coronata</i>	Creek Sandpaper Fig
	<i>Ficus fraseri</i>	Forest Sandpaper Fig
	<i>Ficus watkinsiana</i>	Nipple Fig
Myrtaceae	<i>Acmena smithii</i>	Creek Lilly Pilly
	<i>Ptilidostigma glabrum</i>	Plum Myrtle

	<i>Rhodamnia rubescens</i>	Scrub Turpentine
	<i>Syzygium australe</i>	Brush Cherry
	<i>Syzygium oleosum</i>	Blue Lilly Pilly
Pittosporaceae	<i>Hymenosporum flavum</i>	Native Frangipani
	<i>Pittosporum multiflorum</i>	Orange Thorn
	<i>Pittosporum revolutum</i>	Hairy Pittosporum
	<i>Pittosporum undulatum</i>	Sweet Pittosporum
Rhamnaceae	<i>Alphitonia excelsa</i>	Red Ash
Rutaceae	<i>Citrus australasicus</i>	Finger Lime
	<i>Flindersia schottiana</i>	Cudgerie
	<i>Flindersia xanthoxyla</i>	Yellow Wood
	<i>Pentaceras australis</i>	Bastard Crow's Ash
	<i>Sarcomelicope simplicifolia</i>	Bauerella
Sapindaceae	<i>Alectryon tomentosus</i>	Hairy Alectryon
	<i>Arytera distylis</i>	Twin-leaf Coogera
	<i>Diploglottis australis</i>	Native Tamarind
	<i>Elattostachys nervosa</i>	Green Tamarind
	<i>Guioa semiglauca</i>	Guioa
	<i>Jagera pseudorhus</i>	Foambark
	<i>Sarcopteryx stipata</i>	Steelwood
	<i>Toechima dasyrrhache</i>	Blunt-leaved Steelwood
Simaroubaceae	<i>Quassia sp. aff. bidwillii</i>	Southern Quassia
Solanaceae	<i>Duboisia myoporoides</i>	Duboisia
Sterculiaceae	<i>Commersonia bartramia</i>	Brown Kurrajong
	<i>Heritiera trifoliolata</i>	White Booyong
Verbenaceae	<i>Clerodendrum floribundum</i>	Smooth Clerodendrum
1b. Climbing plants		
FAMILY	SCIENTIFIC NAME	COMMON NAME
Amaranthaceae	<i>Deeringia arborescens</i>	Climbing Deeringia
Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod
Araceae	<i>Pothos longipes</i>	Pothos
Arecaceae	<i>Calamus muelleri</i>	Lawyer Vine
Aristolochiaceae	<i>Pararistolochia praevenosa</i>	Aristolochia
Asclepiadaceae	<i>Marsdenia rostrata</i>	Common Milk Vine
Bignoniaceae	<i>Pandorea baileyana</i>	Long-leaved Wonga Vine
	<i>Pandorea pandorana</i>	Wonga Vine
Celastraceae	<i>Celastrus subspicatus</i>	Large-leaved Staff Vine
Cucurbitaceae	<i>Diplocyclos palmatus</i>	Native Bryony
Dilleniaceae	<i>Hibbertia scandens</i>	Guinea Flower
Dioscoreaceae	<i>Dioscorea transversa</i>	Native Yam
Fabaceae		
subfamily Faboideae	<i>Austrosteenisia blackii</i>	Blood Vine
	<i>Derris involuta</i>	Native Derris
	<i>Millettia megasperma</i>	Native Wistaria
Luzuriagaceae	<i>Geitonoplesium cymosum</i>	Scrambling Lily

Menispermaceae	<i>Carronia multisejala</i>	Carronia
	<i>Stephania japonica var. discolor</i>	Snake Vine
	<i>Tinospora tinosporoides</i>	Arrowhead Vine
Monimiaceae	<i>Palmeria scandens</i>	Anchor Vine
Moraceae	<i>Maclura cochinchinensis</i>	Cockspur
	<i>Trophis scandens</i>	Burny Vine
Myrsinaceae	<i>Embelia australiana</i>	Embelia
Piperaceae	<i>Piper novaehollandiae</i>	Giant Pepper Vine
Rosaceae	<i>Rubus rosifolius</i>	Native Raspberry
Rubiaceae	<i>Morinda jasminoides</i>	Morinda
Smilacaceae	<i>Ripogonum album</i>	White Supplejack
	<i>Ripogonum discolor</i>	Prickly Supplejack
	<i>Smilax australis</i>	Native Sarsparilla
Vitaceae	<i>Cayratia clematidea</i>	Slender Grape
	<i>Cissus antarctica</i>	Water Vine
1c. Native herbs, groundcovers etc.		
FAMILY	SCIENTIFIC NAME	COMMON NAME
Commelinaceae	<i>Aneilema biflorum</i>	Aneilema
	<i>Commelina cyanea</i>	Blue Commelina
	<i>Pollia crispata</i>	Pollia
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Lamiaceae	<i>Plectranthus graveolens</i>	Plectranthus
	<i>Pseuderanthemum variabile</i>	Pastel Flower
Phormiaceae	<i>Dianella caerulea</i>	Flax Lily
Poaceae	<i>Oplismenus aemulus</i>	Basket Grass
	<i>Oplismenus imbecilis</i>	Basket Grass
Violaceae	<i>Viola hederacea</i>	Native Violet
Zingiberaceae	<i>Alpinia caerulea</i>	Native Ginger
1d. Planted Native Species		
FAMILY	SCIENTIFIC NAME	COMMON NAME
Anacardiaceae	<i>Euroschinus falcata</i>	Ribbon Wood
Araliaceae	<i>Polyscias elegans</i>	Celery Wood
Arecaceae	<i>Archontophoenix cunninghamiana</i>	Bangalow Palm
Araucariaceae	<i>Agathis robusta</i>	Kauri Pine
	<i>Araucaria cunninghamii</i>	Hoop Pine
Asteliaceae	<i>Cordyline petiolaris</i>	Broad-leaved Palm Lily
	<i>Cordyline rubra</i>	Red-fruited Palm Lily
Elaeocarpaceae	<i>Sloanea australis</i>	Maiden's Blush
Euphorbiaceae	<i>Glochidion ferdinandi</i>	Cheese Tree
	<i>Macaranga tanarius</i>	Macaranga
	<i>Mallotus discolor</i>	Yellow Kamala
	<i>Mallotus philippensis</i>	Red Kamala
	<i>Premna lignum-vitae</i>	Lignum Vitae

Fabaceae		
subfamily Faboideae	<i>Castanospermum australe</i>	Black Bean
subfamily Mimosoideae	<i>Pararchidendron pruinatum</i>	Snow Wood
Lauraceae	<i>Cinnamomum virens</i>	Red Barked Sassafras
	<i>Cryptocarya glaucescens</i>	Jackwood
	<i>Cryptocarya obovata</i>	Pepperberry
	<i>Cryptocarya rigida</i>	Velvet Laurel
	<i>Neolitsea australiensis</i>	Green Bolly Gum
	<i>Neolitsea dealbata</i>	White Bolly Gum
Lomandraceae	<i>Lomandra hystrix</i>	Spiny Mat Rush
	<i>Lomandra longifolia</i>	
Meliaceae	<i>Dysoxylum fraserianum</i>	Rosewood
	<i>Dysoxylum mollissimum</i>	Red Bean
	<i>Synoum glandulosum</i>	Scentless Rosewood
	<i>Toona ciliata</i>	Red Cedar
Monimiaceae	<i>Wilkiea huegeliana</i>	Veiny Wilkiea
Moraceae	<i>Ficus coronata</i>	Creek Sandpaper Fig
	<i>Ficus fraseri</i>	Forest Sandpaper Fig
	<i>Ficus macrophylla</i>	Moreton Bay Fig
Myrtaceae	<i>Acmena smithii</i>	Creek Lilly Pilly
	<i>Austromyrtus lasioclada</i>	Velvet Myrtle
	<i>Rhodamnia rubescens</i>	Scrub Turpentine
	<i>Syzygium oleosum</i>	Blue Lilly Pilly
	<i>Syzygium moorei</i>	Coolamon
Pittosporaceae	<i>Hymenospermum flavum</i>	Native Frangipani
	<i>Pittosporum undulatum</i>	Sweet Pittosporum
	<i>Pittosporum revolutum</i>	Hairy Pittosporum
Podocarpaceae	<i>Podocarpus elatus</i>	Plum Pine
Proteaceae	<i>Macadamia tetraphylla</i>	Bush Nut
	<i>Stenocarpus sinuatus</i>	Firewheel Tree
Rutaceae	<i>Flindersia schottiana</i>	Cudgerie
	<i>Flindersia australis</i>	Australian Teak
	<i>Flindersia xanthoxyla</i>	Yellow Wood
	<i>Melicope elleryana</i>	Pink Euodia
	<i>Sarcomelicope simplicifolia</i>	Bauerella
Sapindaceae	<i>Alectryon tomentosus</i>	Hairy Alectryon
	<i>Arytera distylis</i>	Twin-leaved Coogera
	<i>Diploglottis australis</i>	Native Tamarind
	<i>Diploglottis campbellii</i>	Small-leaved Tamarind
	<i>Guioa semiglauca</i>	Guioa
	<i>Harpullia pendula</i>	Tulip Wood
	<i>Jagera pseudorhus</i>	Foam Bark
	<i>Sarcopteryx stipata</i>	Steel Wood
	<i>Toechima dasyrrache</i>	Blunt-leaved Steel Wood
Sterculiaceae	<i>Brachychiton acerifolium</i>	Illawarra Flame Tree
	<i>Commersonia bartramia</i>	Brown Kurrajong
	<i>Herietiera trifoliolata</i>	White Booyong
	<i>Sterculia quadrifida</i>	Peanut Tree

Appendix 2. Wollongbar Rainforest Reserve: Environmental Weeds

FAMILY	SCIENTIFIC NAME	COMMON NAME
Acanthaceae	<i>Hypoestes phyllostachya</i>	Freckle Face
Arecaceae	<i>Syagrus romanzoffianum</i>	Cocos Palm
Asparagaceae	<i>Asparagus plumosus</i>	Climbing Asparagus
Asteraceae	<i>Ageratina adenophora</i>	Crofton Weed
	<i>Ageratina riparia</i>	Mist Weed
	<i>Ageratum houstonianum</i>	Blue Billygoat Weed
Balsaminaceae	<i>Impatiens graveolens</i>	Impatiens, Dizzy Lizzy
Basellaceae	<i>Anredera cordifolia</i>	Madeira Vine
Commelinaceae	<i>Commelina benghalensis</i>	Hairy Commelina
	<i>Tradescantia fluminensis</i>	Tradescantia
	<i>Tradescantia zebrina</i>	Zebrina
Fabaceae		
subfamily Faboideae	<i>Desmodium intortum</i>	Green-leaved Desmodium
	<i>Desmodium uncinatum</i>	Silver-leaved Desmodium
subfamily Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i>	Winter Senna
	<i>Senna x floribunda</i>	Smooth Senna
Iridaceae	<i>Crocasmia x crocosmiiflora</i>	Montbretia
Lauraceae	<i>Cinnamomum camphora</i>	Camphor Laurel
Myrsinaceae	<i>Ardisia crenata</i>	Ardisia
Ochnaceae	<i>Ochna serrulata</i>	Ochna, Mickey Mouse Plant
Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet
	<i>Ligustrum sinense</i>	Small-leaved Privet
Rutaceae	<i>Murraya koenigii</i>	Curry Plant
	<i>Murraya paniculata</i>	Sweet Jessamine
Sapindaceae	<i>Koehltreuteria paniculata</i>	Golden Rain Tree
Verbenaceae	<i>Lantana camara</i>	Lantana

Appendix 3a: Control Methods for Weed Species

The main weeds onsite are listed in Appendix 2. The information below includes additional species information for Reference purposes and due to the fact that the entire remnant has not been surveyed yet.

Note: Ratios for Application of Herbicide

Dilution ratios for application of a mix of herbicide (Glyphosate based such as Round Up®) and water are provided. For example, 1:50 means that one part by volume of herbicide is mixed with fifty parts by volume of water. All cut, scrape and paint at 1:1.5 refers to Glyphosate.

For some weeds a combination of Glyphosate and Metsulfuron is recommended, however a permit will be required for this off label usage.

Protec® is added in some treatments to assist the transfer of the herbicide through the surface tissue – particularly plants with waxy leaves, such as Camphor Laurel, Madeira Vine and Wandering Jew.

Trees and Shrubs

Scientific Name	Common Name	Control Method
<i>Cinnamomum camphora</i>	Camphor Laurel	Stem inject 1:1.5 larger trees, cut scrape and paint 1:1.5 small plants. Spray seedlings glyphosate 1:50 + Protec®
<i>Koelreuteria paniculata</i>	Golden Rain Tree	Stem inject larger specimens 1:1.5 or spray seedlings <i>glyphosate</i> 1:100 + Protec®
<i>Lantana camara</i>	Lantana	Lopper and cut, scrape and paint base 1:1.5 . Spray regrowth <i>glyphosate</i> 1:100 + Protec®
<i>Ligustrum lucidum</i>	Large-Leaved Privet	Stem inject 1:1.5 larger trees. Cut, scrape and paint 1:1.5 small plants. Spray seedlings <i>glyphosate</i> 1:50 + Protec®
<i>Ligustrum sinense</i>	Small-Leaved Privet	Stem inject 1:1.5 larger trees. Cut, scrape and paint 1:1.5 small plants. Spray seedlings <i>glyphosate</i> 1:50 + LI700 . For multi-stemmed specimens chainsaw and cut, scrape and paint 1:1.5
<i>Murraya paniculata</i>	Murraya	Stem inject 1:1.5 larger trees. Cut, scrape and paint small plants 1:1.5 . Spray seedlings <i>glyphosate</i> 1:100 + Protec®
<i>Ochna serrulata</i>	Ochna	Cut, scrape and paint 1:1.5 . Spray seedlings <i>glyphosate</i> 1:50 + Protec® Difficult to pull will regrow from broken root. Paint stem on larger specimens with neat <i>glyphosate</i> to a height of 50 cm
<i>Syagrus romanzoffianum</i>	Cocos Palm	Hand pull or crown seedlings, cut larger plants below growing point, spray resistant
<i>Senna pendula</i> var. <i>glabrata</i>	Winter Senna	Hand pull young plants or spray seedlings <i>glyphosate</i> 1:50 + Protec® Cut, scrape and paint 1:1.5 . Stem inject large specimens 1:1.5 , bag seeds
<i>Senna septemtrionalis</i>	Smooth Senna	Hand pull young plants, cut, scrape and paint 1:1.5 . Spray seedlings <i>glyphosate</i> 1:100 + Protec® , bag seeds

Vines and Scramblers

Scientific Name	Common Name	Control Method
<i>Anredera cordifolia</i>	Madeira Vine	Scrape as much stem as possible (on one side) and paint with 100% glyphosate, tubers: scrape/gouge and paint (100%); spray ground infestations 1:50 + Protec® . Bag tubers. Do not cut the stem.
<i>Asparagus plumosus</i>	Climbing Asparagus Fern	Crowning, cut stems at chest height, then at ground level, spray regrowth <i>glyphosate 1:50 + Protec®</i>
<i>Desmodium umcinatum</i>	Silver-Leaved Desmodium	Bag seed heads, spray 1:50 + Protec®
<i>Tradescantia fluminensis</i>	Wandering Jew	Spray <i>glyphosate 1:50 + Protec®</i> . In small areas carefully remove
<i>Tradescantia zebrina</i>	Zebrina	Spray <i>glyphosate 1:50 + Protec®</i>

Herbs, Ferns and Grasses

Scientific Name	Common Name	Control Method
<i>Ageratum houstonianum</i>	Billygoat Weed	Spray <i>glyphosate 1:100 + Protec®</i> . Hand pull and hang up
<i>Ageratina adenophora</i>	Crofton Weed	Spray <i>glyphosate 1:100 + Protec®</i> . Hand pull and hang up
<i>Ageratina riparia</i>	Mist Weed	Spray <i>glyphosate 1:100 + Protec®</i> . Hand pull and hang up
<i>Ardisia crenata</i>	Ardisia	Cut and paint 1:1.5 . Difficult to hand pull
<i>Commelina benghalensis</i>	Hairy Commelina	Spray <i>glyphosate 1:50 + Protec®</i>

Appendix 3b: Control Techniques for Weed Species

Cut-scrape-paint method

This method applies to all woody shrubs, trees and some vines.

1. Cut plant low to the ground (approx 1–2 cm above soil level) and at an angle.
2. Apply herbicide immediately at the rate of **1 part Glyphosate:1.5 parts water** with a paintbrush approximately 1.5cm wide.
3. Scrape all sides of the remaining stump lightly to reveal green tissues and apply the herbicide to the scraped area.
4. Take care that the brush is not contaminated with soil.

Note all seed that has high viability and longevity should be removed from the parent and either composted on site or removed from the site eg. *Senna* spp. and other members of the Fabaceae family or plants with a high invasive potential such as *Lantana camara* (Lantana).

Note large trunks should be scraped and painted in sections as cells quickly shut down once exposed preventing the translocation of herbicide.

Gouge-paint method

This method applies to those plant species that have a fleshy root system such as rhizomes or large bulbs. It is particularly appropriate for the treatment of *Protasparagus africanus* (Asparagus Fern).

1. Cut the stems of the plant at head height and then at ground level. The stems are then cut up and spread over the ground to act as part of the leaf litter.
2. *Gouge out sections of the fleshy base with a knife.*
3. Apply **1 part Glyphosate:1.5 parts water** with a paintbrush approximately 1.5cm wide avoiding contact with soils.

Stem Injection method

This method applies to all woody trees and shrubs with a diameter of about 6-10cm or greater.

1. With a tomahawk make a cut the width of the blade at an angle of about 45° into the trunk. **Note** it is important not to make cuts too deep.
2. Apply herbicide immediately into the cut using a tree injecting device. If using **Glyphosate apply at the rate of 1:1.5.**
3. Repeat this procedure in a brickwork pattern around the circumference of the tree as close to the ground as possible. Where the presence of a crotch angle makes this difficult make a cut above it. Ensure cuts are also made on the inside of forks. **Note** two rows of cuts will be sufficient for trees with trunks of 6-10cm. Larger trunk diameters will need correspondingly more.
4. Treat all visible lateral roots as per 1.

Scrape and paint method

This method is applicable to many species of vines where it is desirable to treat the vines intact, particularly those with aerial tubers such as *Anredera cordifolia* (Madeira Vine) or those which will propagate from segments eg. *Delairia odorata* (Cape Ivy).

1. Scrape the stem tissue on **one side of the stem only** for up to 100cm if possible before leaving a small gap (approx. 5cm) and changing sides. **Note** on Madeira Vine it is necessary to scrape heavily. Scrape as much of the stem as possible.
2. Apply undiluted Glyphosate with a paintbrush within 7 seconds of scraping the stem ie. scrape and paint in sections.
3. In the case of *Anredera cordifolia* (Madeira Vine) it is essential that ground tubers and lateral roots are also treated with a heavy scrape and paint. If the tuber is of substantial size a ditch can be made into the tuber with a knife and apply herbicide. Any side roots must also be scraped and painted. **Note** where possible remove and bag tubers before scraping to avoid dislodging them during treatment.

Spraying method

This is carried out using a 15 litre backpack spray unit with a modified spray nozzle that gives an accurate and easily adjustable spray pattern eg. Rega®. Glyphosate is the main herbicide used with the addition of a marker dye. For plants that show some resistance to herbicides or have a waxy leaf covering eg. *Anredera cordifolia* (Madeira Vine) or *Tradescantia Fluminensis* (Wandering Jew), or when growing conditions are not optimal an acidifying agent LI700® is also added.

Dilution Rates:

- Plants with more or less succulent leaves eg. *Tradescantia Fluminensis* **Note** autumn to winter is the optimum time for spraying this plant, *Anredera cordifolia*, *Chlorophytum* spp., *Asparagus* spp. **Glyphosate 1:50 water + LI700® 0.5%.**
- *Lantana camara* and *Macfadyena unguis-cati* **Glyphosate 1:100 water.**
- Other soft leaved plants, annuals and grasses **Glyphosate 1:100 water.**
- *Chrysanthemoides monilifera* ssp. *rotundata* **Glyphosate 1:150 -1:400 water.**
Note weaker solutions are most effective in the winter months.

Overspray method

This method is applicable to large, dense infestations of such plants as *Chrysanthemoides monilifera* ssp. *rotundata* (Bitou Bush) and *Lantana camara* (Lantana). This method may be used where it is desirable to leave partially dead or dead plants intact to prevent erosion and over exposure of large areas, to protect native seedlings from predators such as wallabies and to avoid trampling by humans.

1. Spray over the top of the infestation using a weak solution of Glyphosate. **Note** any native plants that may be under the weed will be protected by the foliage cover of the weed.
2. Leave the sprayed plants intact so that native seedlings can establish under the shelter provided.

Note for *Lantana camara* (Lantana) the usual dilution rate is **Glyphosate 1:100 water.** For *Chrysanthemoides monilifera* ssp. *rotundata* (Bitou Bush) **Glyphosate 1:150 - 1:400 water.** Weaker solutions are most effective in the winter months.

Alternatively weeds can be cut and flattened with brush hooks or loppers and the subsequent regrowth sprayed with Glyphosate or Metsulfuron.

Crowning method

This method is applicable to weeds which have their growing points at ground level or below the surface of the ground such as corms, bulbs, rhizomes, clumped or fibrous root systems eg. *Asparagus* spp., *Chlorophytum comosum* (Spider Plant) and grasses.

1. Grasp the leaves or stems and hold them tightly and close to the ground so that the base of the plant is visible.
2. Insert the knife close to the base of the plant at a slight angle with the tip well under the root system.
3. Cut through the roots close to the base. Depending on the size of the plant two or more cuts may be needed to sever all the roots.
4. Remove the plant. Make sure that the base of the plant where the roots begin is completely removed.
5. Shake off excess soil and hang the plant up in a tree to prevent it from reshooting, or remove it from site.

Source: modified from Joseph, R., 2001. *Course Notes for Certificate II in Bushland Regeneration*. Wollongbar TAFE.

Appendix 4: Daily Work Sheet

Name of Site: _____ **Zone:** _____

Date: _____ **Hours worked:** _____

Weather conditions (temperature, wind speed & direction, cloud cover, rain)

Personnel:

Work undertaken (main weed species, control methods, zone worked)

Zone	Activity	Method	Area	Comments

Additional observations: Flowering/fruitleting/germination/fauna sightings

Comments: Previous work/Follow up/reminder

Note the above information will need to be summarised into the standard EnviTE Monthly Record of activities sheet and activity report.

Appendix 5: Chemical Operators Data Sheet

<u>Operator</u>										
Date/Time	Specific Site Details	Target	Chemical Used	Batch Number / Date	Rate Used	Quantity Used (mls)	Additives	Equipment	Wind Speed, Direction	Other Weather Details
			Glyphosate Roundup Bioactive® Weedmaster Duo ® Metsulfuron Methyl Brushkiller® Brushoff ®		1:100 1:50 1:1.5 1:50 +1.5g/10l Neat		Li700 Protec Dye	Backpack Stem Injector Poison Pot	Strong NE Gusty SE Light SW Calm NW	Showers Overcast Clear Sky Calm
			Glyphosate Roundup Bioactive® Weedmaster Duo ® Metsulfuron Methyl Brushkiller® Brushoff ®		1:100 1:50 1:1.5 1:50 +1.5g/10l Neat		Li700 Protec Dye	Backpack Stem Injector Poison Pot	Strong NE Gusty SE Light SW Calm NW	Showers Overcast Clear Sky Calm
			Glyphosate Roundup Bioactive® Weedmaster Duo ® Metsulfuron Methyl Brushkiller® Brushoff ®		1:100 1:50 1:1.5 1:50 +1.5g/10l Neat		Li700 Protec Dye	Backpack Stem Injector Poison Pot	Strong NE Gusty SE Light SW Calm NW	Showers Overcast Clear Sky Calm
			Glyphosate Roundup Bioactive® Weedmaster Duo ® Metsulfuron Methyl Brushkiller® Brushoff ®		1:100 1:50 1:1.5 1:50 +1.5g/10l Neat		Li700 Protec Dye	Backpack Stem Injector Poison Pot	Strong NE Gusty SE Light SW Calm NW	Showers Overcast Clear Sky Calm

Appendix 6: Job Safety Analysis

Site: Work Activity: Bush Regeneration Staff consulted: Julie Reid Date to commence:
 Prepared by: P. O'Connor Signature: Date of JSA:

Item	Job Step Break the job down into steps	Potential hazard What can harm you?	Risk Rating	Controls What you are going to do to make the job as safe as reasonably practicable	Person who will ensure this happens
1	<i>Assess the site</i>				Site Supervisor
2	<i>Operational issues</i>				Site Supervisor

Reviewed by: Mike Delaney Operations Manager Signature Date

Appendix 7: Monitoring and Evaluation Data Sheet

Site														
Plot Number	Area sampled	Dimensions			Number of Individual Stems									
Date	Habitat Features present % occurrence &/or depth	Leaf Litter	Lge Tree Hollows trunk		Sm tree hollows (branch)		Mistletoe	Epiphytes	Fleshy Fruit	Flowers				
			< 20 cm	20 - 50 cm	50cm - 1m	1m - 2m					2m - 5m	> 5m	Comments	
Recorders														
Scientific Name	Common Name	Cover Abundance (Braun-Blanquet)	DAFOR		20 - 50 cm		50cm - 1m		1m - 2m		2m - 5m		Comments	
Trees & Shrubs														
Ground Covers (Herbs, Ferns and Grasses)														

Wollongbar Rainforest Reserve Action Plan

Scientific Name	Common Name	Cover Abundance (Braun-Blanquet)	DAFOR	Number of Individual Stems					Comments	
				< 20 cm	20 - 50 cm	50cm - 1m	1m - 2m	2m - 5m		> 5m
Vines										
Other										

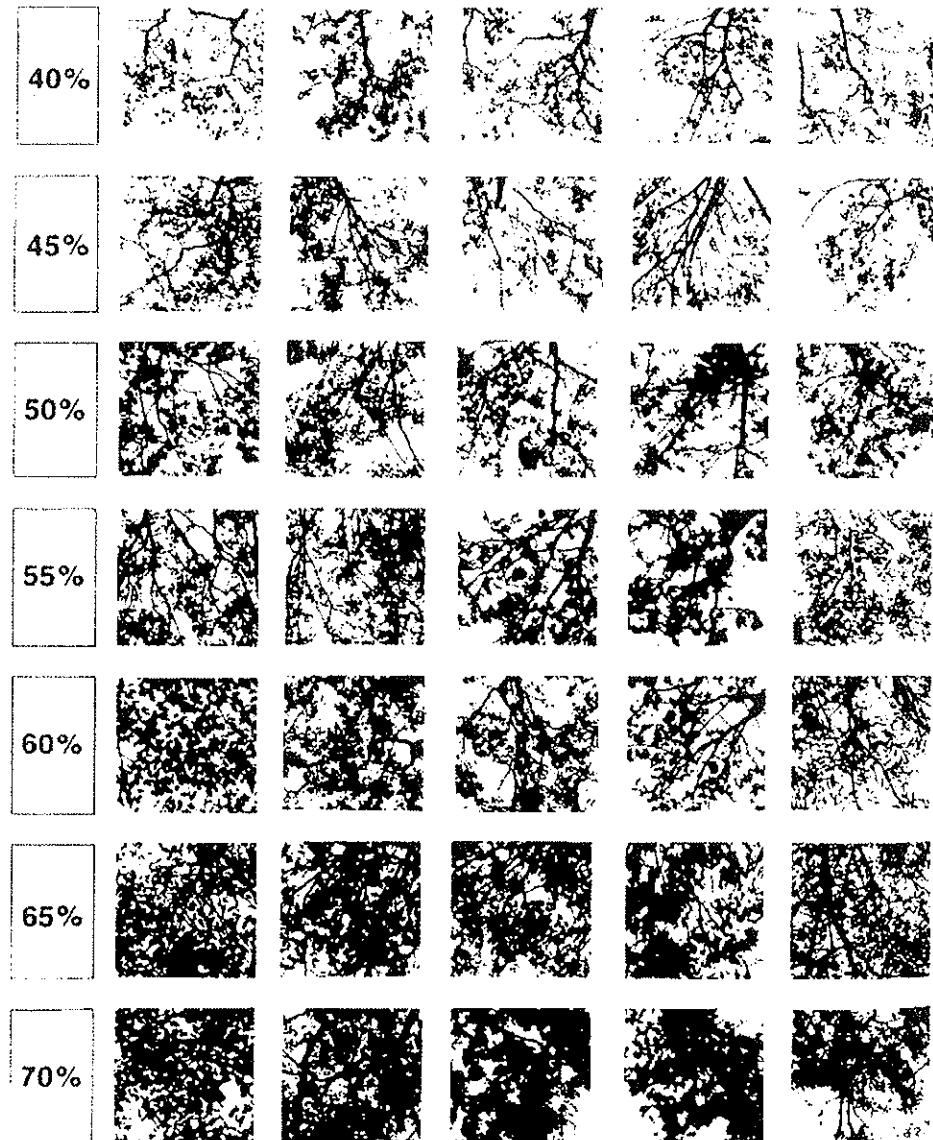
Note can record native species and exotics on separate sheets if this makes recording / sampling easier.

Appendix 8: Monitoring and Evaluation Cover Abundance Reference Images

Vegetation classification

Classification of vegetation is commonly made according to percentage foliage cover of the dominant species.

In the bush there are very few cases where abrupt changes between vegetation types occur, generally it changes gradually and continually across an area. If we adhere strictly to this viewpoint, there is no system to group or classify vegetation into units as that there is a means of communication and comparison. While Australian scientists have accepted that vegetation forms a continuum, they have also generally accepted a system of classification put forward by R.L. Specht. This system is independent of the species and uses the height and percentage foliage cover of the dominant to divide Australia's vegetation. Percentage foliage cover is the percentage of the sample site occupied by the vertical projections of the



Source: McDonald et al. *Australian Soil and Land Survey*, 1984

Figure 3. Wollongbar Rainforest Reserve: On-ground Works Complete

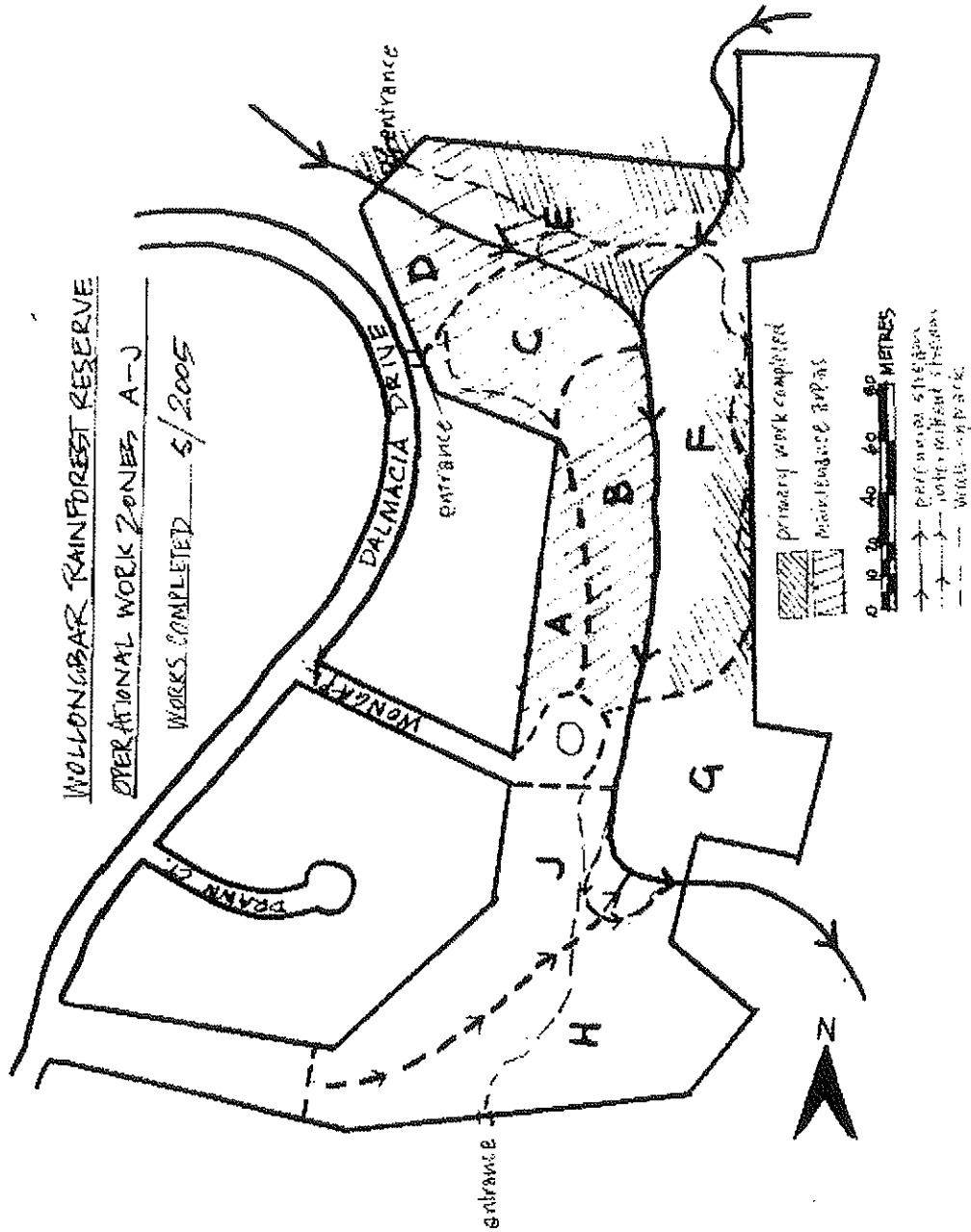


Figure 4. Weed Distribution 1

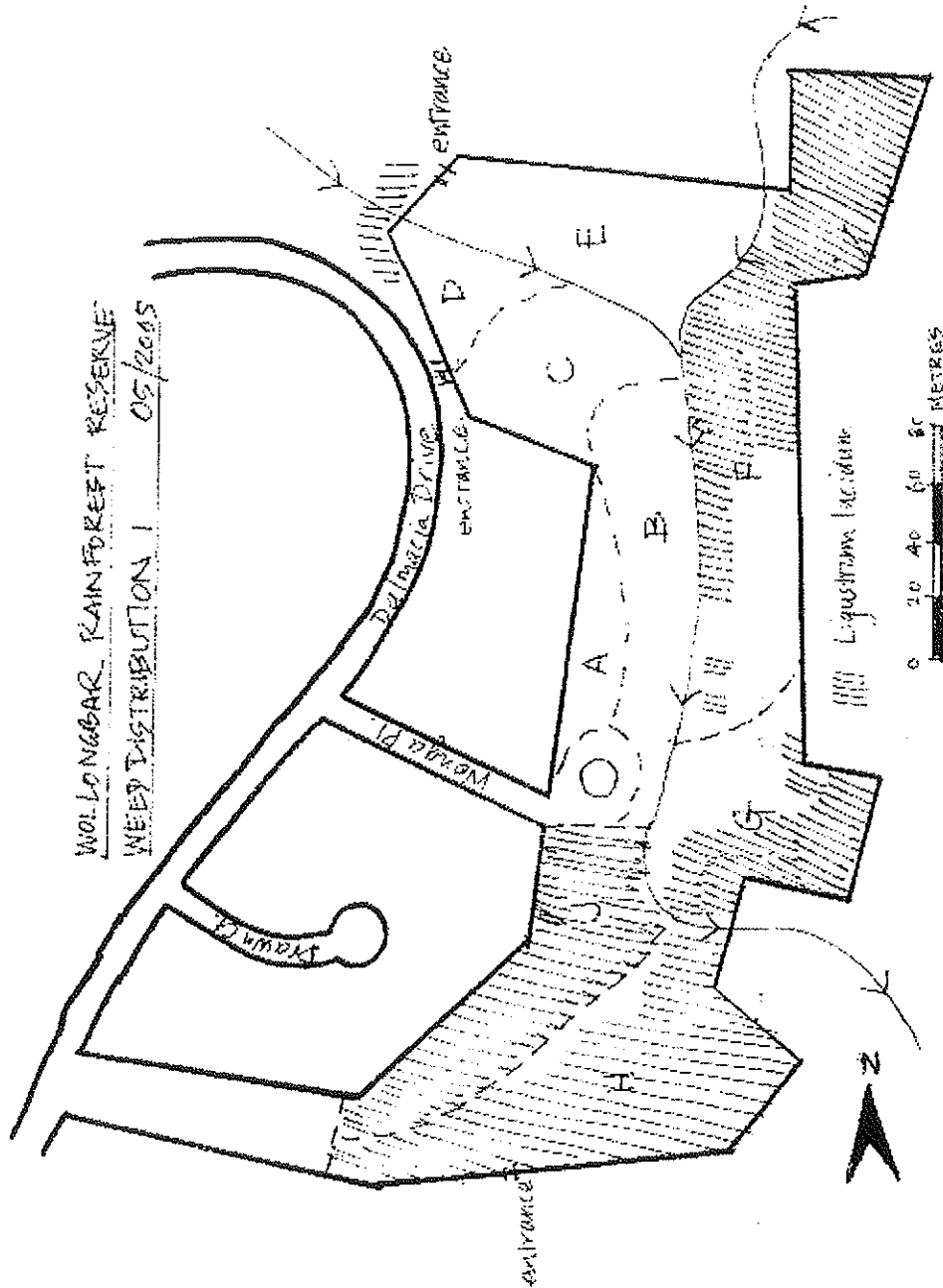
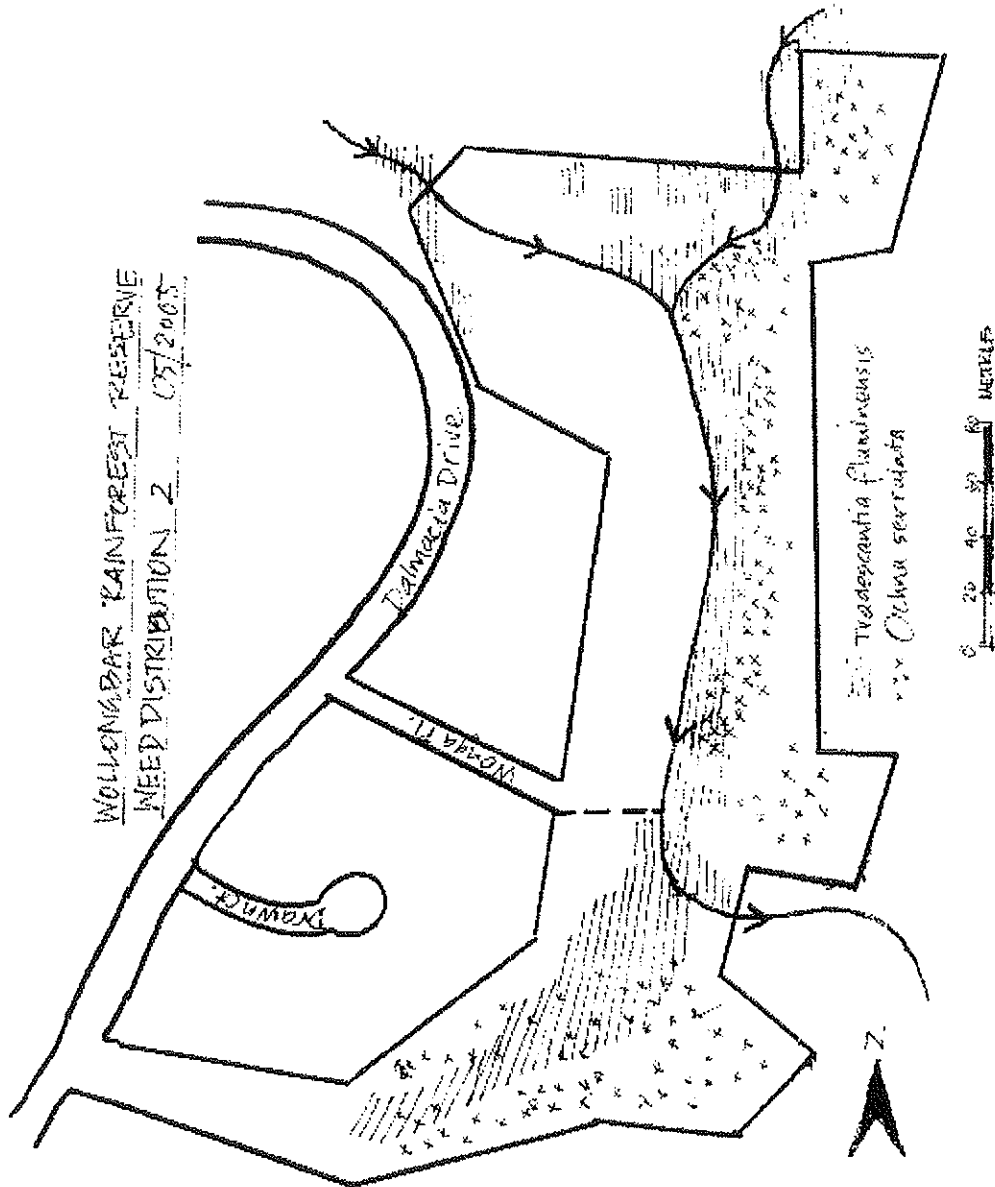


Figure 5. Weed Distribution 2



Appendix 9: Wollongbar Rainforest Reserve Weed Species Profile

Areaceae

Syagrus romanzoffianum

Cocos Palm

Native of Brazil. A tall palm growing to 12 metres. Its fleshy fruit is dispersed by birds, rodents and water. Fruit is also eaten and dispersed by flying foxes (Eby and Palmer, 1988, 53). It is becoming a serious pest in Currie Park and Rotary Park, Lismore, NSW.

Asparagaceae

Asparagus plumosus

Climbing Asparagus

Perennial vine with wiry stem. It is a serious bushland weed once established. Difficult to eradicate; occurs on rainforest margins and tolerates low light conditions; tolerates various soils. Flowers are greenish white; solitary or paired; which flower in spring and summer. Fruit/seeds are black berries which fruit in June, and are dispersed by birds, ants, water, and rubbish dumping. Seeds are germinated readily. Broken rhizomes regrow, and are found underground, roots are fibrous (The Big Scrub Rainforest Landcare Group, 2000).

Balsaminaceae

Impatiens graveolens

Balsam, Busy Lizzie, Impatiens

Annual or perennial succulent herb, to 1 metre high. Flowers mostly pink to red or white. Leaves alternate, margins crenate to deeply toothed. Flowers throughout the year. Often cultivated as an ornamental and garden escapees now found in many areas.

Basellaceae

Anredera cordifolia

Madeira Vine

Native of S. America. A climber with stems up to 20 metres long, producing tubers on roots and at nodes on aerial stems. It is widely naturalized in coastal districts, and is an invasive weed on the margins of rainforest (Harden, 1990, 177). This vine is extremely prolific, growing over 1 metre per week in warm, humid conditions. It produces countless vegetative aerial tubers which drop to the ground and remain dormant if conditions are not suitable for their growth. These tubers are spread by water, downhill movement and possibly rodents. The vine will rapidly smother plants of all sizes, destroying them through weight and inhibition of photosynthesis, and can block secondary succession (Hopkins). It is extremely difficult to control and is considered to be the most serious and destructive plant pest species affecting the North Coast rainforest remnants.

Commelinaceae

Commelina benghalensis

Hairy Commelina

Perennial herb, stems prostrate or ascending, sparsely and shortly pubescent, sometimes producing subterranean runners. Leaves pale green, apex obtuse to acute, base rounded or abruptly narrowed, sheath bearing long reddish hairs. Native of tropical Africa and Asia. Grows as a weed north of Comboyne (Harden, 1993, p.259).

Commelinaceae

Tradescantia fluminensis (albiflora)

Wandering Jew

Native of S. America. A perennial succulent herb with fibrous roots and branching stems which readily take root at the nodes. It is naturalized on creek banks and in shaded places, especially rainforests (Harden, 1993, 257). Its resistance to herbicide and its growth habit make this plant difficult to eradicate. This dense groundcover suppresses the germination and growth of native species, thereby blocking secondary succession. It has been observed, however, that those species whose seed is large can penetrate and grow well e.g. Black Bean.

Commelinaceae

Tradescantia zebrina

Striped Wandering Jew

Native of Mexico and Central America. A creeping, succulent herb with branching stems which root at the nodes. It is occasionally naturalized in rainforest (Harden, 1993). It can form a dense groundcover which suppresses native germination and growth.

Fabaceae

Desmodium uncinatum

Silver-leaved Desmodium

Native of S. America. Introduced as a leguminous stock feed. A prostrate to ascending subshrub. Sometimes naturalized along roadsides and disturbed areas (Harden, 1991, 423) and is rarely seen within a forested area. Seed probably has a long viability.

Fabaceae

Sub family Faboideae

Senna septemtrionalis

Smooth Senna

Native of Mexico. A shrub 1-3 metres high. It does not produce root nodules and is frequently naturalized in moist sclerophyll forest and disturbed rainforest (Harden, 1991, 319). It produces a large number of seeds which appear to have a long viability, possibly for years.

Fabaceae

Sub family Faboideae

Senna pendula* var. *glabrata

Winter Senna

Native of S. America. A spreading shrub to 3 metres high, it does not produce root nodules and is widely naturalized in coastal areas (Harden, 1991, 319). It produces a large number of seeds which appear to have a long viability, possibly for years. Can regrow from cut material in moist conditions.

Lauraceae

Cinnamomum camphora

Camphor Laurel

Native of China and Japan. A large tree of spreading habit that can grow to approximately 25-30 metres. It has abundant seed production, effective dispersal mechanism, mainly by birds, and some seed dormancy. It is a hardy, long-living competitive tree which can also reproduce rapidly by suckering to form single species stands. Camphor Laurel prefers deep, well-drained red soil but will grow well on alluvial soil; it cannot, however, tolerate prolonged flooding (Firth, 1992, p.69). It is extensively naturalized in coastal areas on the North Coast of NSW (Harden, 1990, p.144). It is a declared W4(d) noxious weed (i.e. must not be sold, propagated or knowingly distributed and must be fully and continuously suppressed and destroyed).

Ochnaceae

Ochna serrulata

Mickey Mouse Bush

Shrub two to three metres high. Leaves oblong to narrow elliptic, margins toothed. Ovoid drupes, five to eight millimetres long, black and embedded on a swollen red receptacle. Often cultivated. Native of South Africa (Harden, 1990, p. 490).

Oleaceae

Ligustrum lucidum

Large-leaved Privet

Native of China and Japan. A shrub to small tree up to 10 metres high which is an invasive weed, especially of coastal rainforests (Harden, 1992, 473). It is adapted to low light levels, coppices readily when damaged and has a mass of fibrous roots near the surface of the ground, these roots efficiently utilize the available moisture and nutrients in the soil to the detriment of any nearby plant. Each mature plant can produce from 10,000 to 100,000.00 seeds, which have a 1-2 year viability and are effectively spread by birds (Buchanan, 1989, 67-68).

Oleaceae

Ligustrum. sinense

Small-leaved Privet

Native of China a shrub to about 3 metres high. An invasive weed, especially on the margins of rainforest (Harden, 1992, 471). It is adapted to low light levels, coppices and suckers readily and has a mass of fibrous roots near the surface of the ground. These roots efficiently utilize the available moisture and nutrients in the soil to the detriment of any nearby plant. It can form thickets within the forest. Each plant can produce approximately 600 seedlings per square metre and seeds are effectively dispersed by birds (Buchanan, 1989, 67).

Rutaceae

Murraya paniculata

Orange Jessamine

Native of India and Malesia. A bushy shrub or small tree to 4 metres high. The red shiny berries are dispersed by birds and this plant is already naturalising in dry and subtropical rainforest on alluvial soil. Closely related to Curry Plant (*Murraya koenigii*) both species have berries loved by birds.

Verbenaceae

Lantana camara

Lantana

Native of tropical South America. A scrambling shrub that often forms dense thickets (Harden, 1992, p.614) and can climb over 20 metres into trees. It grows best on well-drained, fertile soils including nutrient-enriched sands; roots also develop on branches that contact the ground, aiding its spread. It produces abundant seed, which is effectively dispersed by birds. According to Richard Lamb of Sydney University, when Lantana is present, particularly in sclerophyll communities, litter fall and nutrient turnover is altered, populations of native seeds are depleted, new seedlings are suppressed, soil structure is altered and micro-climate is changed, and some nutrients may be mobilized and lost to neighboring communities and others accumulated in unnatural amounts. These changed conditions seem to further favour Lantana and other weeds over native species (Buchanan, 1989, p.72) and in many forest areas can block secondary succession. It is a declared W3 noxious weed (i.e. must be prevented from spreading and its numbers reduced).

