REPORT ON VEGETATION AND LAND MANAGEMENT IN THE MAGUIRES CREEK CATCHMENT

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Helping Communities Helping Australia
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EXECUTIVE SUMMARY

This report has been prepared for Richmond Landcare Inc (RLI), Ballina Shire Council (BSC) and landcare groups in the Maguires Creek catchment to facilitate community involvement in natural resource management. The Australian Government Envirofund provided the funding for the project.

The document will broadly assess the state of existing vegetation, identify relevant land managers and determine priority zones for restoration projects to establish corridor connections. Connections will enhance the longer-term health and viability of remnant vegetation and dependent fauna communities by increasing vegetated area and connectivity. This report will be a beneficial resource to encourage a community-directed commitment to vegetation management and assist in bringing interested parties together to develop an integrated strategic approach to restoration works throughout the catchment.

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1. INTRODUCTION

This report has been prepared for Richmond Landcare Inc. and Ballina Shire Council, in conjunction with Landcare groups in the Maguires Creek catchment, to provide information relating to the current land use, existing native vegetation and environmental restoration projects being undertaken within the catchment. While many valuable projects are being carried out in the area, these are mainly ad hoc and it is felt that a comprehensive review of the current situation will help to promote a systematic, cooperative approach by all land managers. This approach will improve sourcing and allocation of funding and develop skills of landcare workers, leading to improved environmental outcomes.

The study found the catchment is subject to increasing stresses from a wide variety of sources. The catchment contains two villages, an industrial area and a sewerage treatment plant; in addition the catchment supports intensive horticulture and agricultural industries. Previous land clearing activities and the current land use have resulted in fragmentation of the ecosystems, erosion and siltation issues and weed invasion in native vegetation communities.

The original vegetation in the catchment was sub tropical rainforest, being part of the Big Scrub rainforest that once covered over 75,000 hectares. Of this less than 1% or 300 hectares remains. Three primary remnants and a number of smaller remnants of rainforest exist within the catchment. Nine vulnerable or threatened plant species have been identified in management plans for these sites. The Maguires Creek catchment also supports a wide range of fauna including species classified as ‘threatened’.

Many weed species have invaded these sites and pose a significant threat to the regeneration capacity within remnant vegetation. Madeira Vine is the most invasive and destructive weed within the catchment and may be found along most of the creek and its tributaries in varying degrees of severity, ranging from scattered individuals to some extremely heavy infestations. Woody weeds, which dominate previously cleared areas, include Camphor Laurel and both Large Leaf and Small Leaf Privet.

The process of establishing corridors of native vegetation in the catchment can provide some compensatory habitat and functioning of the original vegetation community. This would involve a long term commitment to extensive weed control, fencing to exclude cattle from riparian areas and planting to link and expand remnants. A systematic, integrated approach to planning restoration projects within the catchment is required to ensure sites are not reinfested by weed propagules from upstream sources.

This report provides a range of recommendations for implementation by various management bodies in the catchment, together with information on weed control techniques, species selection and planting guidelines. The report also reveals a pressing need for a community-driven approach to vegetation management. Vegetation management needs to involve reliable scientific knowledge and expertise, in combination with local knowledge and a sense of ownership.

Figure 1: Aerial Photo Maguires Creek Catchment

2. AIMS AND OBJECTIVES

The report aims to:

- Assist the development of a strategy for the restoration and improved management of the sub-tropical rainforest community that originally occurred in the catchment.
- Facilitate the development of viable corridors of flora and fauna habitat within the Alstonville district.
- Encourage an integrated scheme of work programs throughout the entire catchment, to reduce the possibility of weed reinfestation of sites by propagules from the upper catchment.

The objectives of this report include the:

- Assessment of the current condition of native vegetation in the catchment.
- Provision of relevant information on weed species recorded in the catchment.
- Formulation of a strategy for the planting of appropriate species in areas where natural regeneration is least likely to occur with a view to expanding and linking existing areas of vegetation.
- Promotion of best practice techniques for the gradual and systematic removal of weed species so as to facilitate their replacement with native species.

Provision of a resource to assist with the sub tropical rainforest community conservation planning processes.

3. BACKGROUND

3.1 Location

The Maguires Creek catchment is located on the Alstonville plateau between Ballina and Lismore. The catchment lies wholly within the Ballina Shire and covers an area of 3840 hectares **(Figure 2).**The southern boundary of the catchment extends between the villages of Alstonville and Wollongbar, and includes an area to the south-west of the Bruxner Highway This section contains the headwaters of the creek in open, undulating farmland near Whites Lane. The north-west boundary of the catchment is bordered by Sneaths Road. The Teven Road escarpment leading down to Houghlahans Creek and the ridge to the east of Eltham Road make up the north-eastern corner. The eastern section of the catchment includes the Panorama Estate, Alstonville Quarry and the western end of Leadbeatters Lane.

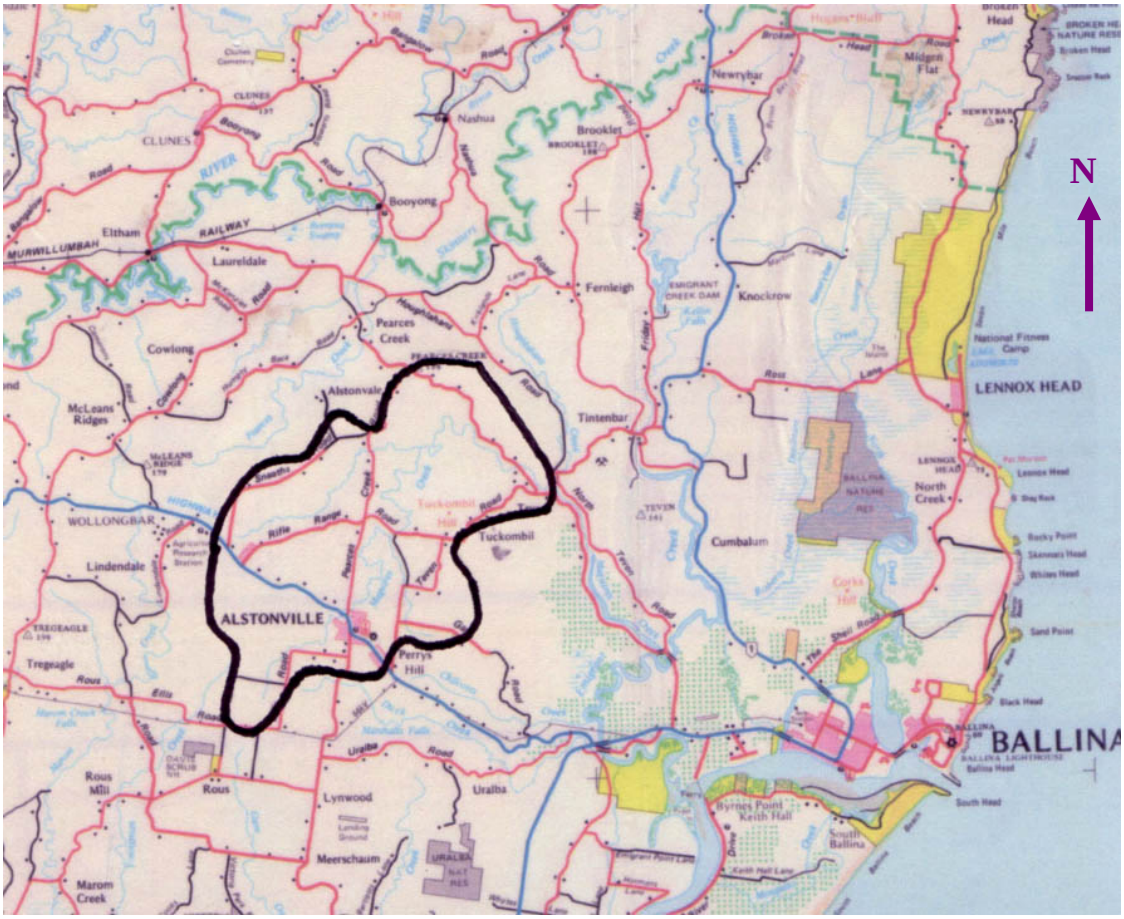

Figure 2: Map of Ballina Shire showing the Maguires catchment boundary in black. (Source: Casino State Forests Map NSW, 1985).

3.2 Land Zoning

The Maguires Creek Catchment consists of a number of zones. The watercourse passes though the following Ballina Shire Zones (see **Appendix 1**):

- 1(b) Rural – Secondary Agricultural Land
- 1(a1) Rural – Plateau Lands Agriculture
- 7(i) Environmental Protection – Urban Buffers
- 6(a) Open Space

3.3 Climate, Soils, and Topography

North Eastern NSW experiences a warm temperate to sub-tropic climatic regime, with a warm, moist summer and autumn period between December and May. Winter from June to August is dry and mild while spring, between September and November experiences warm, dry conditions. The region experiences an average rainfall for the year of 1300-2000mm/yr.

Nicholls and Tucker (1956) have recorded a geological component made up of basalt parent material produced by the activity in the Mt. Warning volcano, some 20 million years ago. Weathering of this material has resulted in the formation of a deep, well-structured, red clay-loam soil known as Krasnozem (Ferrosols) that is common to the Alstonville plateau. The soil in the upper areas of the catchment is typically deep and free draining, while the soils of the steeper slopes and lower catchment become shallower and rockier, often interspersed with heavier clays and podzols. The lower catchment areas contain fewer horticultural activities, with the land supporting either cattle grazing or secondary regrowth forest. Generally, the aspect of the catchment slopes gently to the north-east. Elevation at Wollongbar ranges between 140 and 200 metres (Morand, 1994).

4. CATCHMENT DESCRIPTION

4.1 Methods

This report has been developed using:

- Aerial mapping.
- Liaison with property owners and other land managers.
- On ground site assessments.
- Research of relevant literature and other reference materials (published and unpublished).

The catchment was assessed in a systematic manner. This process involved mapping the catchment boundaries, identifying native and exotic vegetation and observation of current landuse practices. Site visits were made to all zones within the catchment over a two-week period during July 2003. Research literature, such as management plans for Maguires Creek and Willowbank prepared by Hank Bower, provided a source of considerable information in regard to fauna within the catchment.

4.2 Study Site Zoning

For descriptive purposes, Maguires Creek catchment can be divided into the main creek and the five main tributaries that join the creek along its length **(Appendix 12).** These are:

- the Wollongbar tributary
- Branch Creek
- Willowbank Creek
- The tributary to the east of Eltham Road.
- Barlows Creek

4.2.1 The Main Creek

The upper zone of the main creek contains the headwaters near Whites Lane, where a series of small depressions or rivulets join to form the main creek, south of the Russelton Industrial area. Much of the gently undulating plateau land has been cleared for agriculture, with cattle and macadamia production the main land use. Only a few small scattered rainforest remnants remain and notably, a stand of Paperbarks *(Melaleuca quinquinervia***)** in a wet, boggy area that may be seen from Ellis Road.

Maguires Creek defines the western edge of the village of Alstonville. The creek crosses the area earmarked for bypass construction near Ellis road, before flowing past Alstonville High School and Bulwinkle Park. Here it passes the Police paddock before crossing the Bruxner Hwy at Lumley Park, continuing down toward Tosha Falls (see Plate 1), the Sewerage Treatment Plant (STP) and Maguires Creek Scrub. From here the creek flows into a long stretch of open farmland, where most native vegetation has been cleared to the creek edge (see Plate 2). Camphor Laurel dominates vegetation along the creek edge in this area. This zone ends at the Tuckombil Bridge, where Branch Creek joins the main stream.

Plate 1: Tosha Falls on the main watercourse of Maguires Creek.

Plate 2: Cleared land between Maguires Creek and Rifle Range Road.

After the Tuckombil Bridge the lower zone of Maguires Creek initially flows through open agricultural land, but soon enters the most heavily wooded and steepest sections of the catchment. It passes the rural subdivisions of Willowbank, Tuckombil Heights and Alcheringa, before continuing down through steep terrain to meet Houghlahans Creek at the junction of Teven Road and Tintenbar Road near Teven Golf Course.

4.2.2 Wollongbar Tributary

The first tributary to meet Maguires Creek originates near Hillpark Oval Wollongbar and crosses open urban space and the rainforest remnant in Dalmacia Drive. It passes macadamia plantations and crosses Pearces Creek Road near the Seventh Day Adventist retirement village, before meeting the main creek near the STP.

4.2.3 Branch Creek

The Branch Creek tributary begins as two separate streams flowing through from Alstonville. The main tributary takes water from the area around Panorama Estate and the Alstonville quarry (see Plate 3). The second stream, known as Alstonville Creek, originates from drainage outlets in Crawford Park. Due to concentrated flows from the paved surfaces in urban areas, this area fills quickly after rain and water flows out of town past Geoff Watt Oval. The watercourse crosses open urban space on the northern edge of town and continues through an urban buffer zone to meet the main creek near Clondale Park on Teven Road. Another minor tributary that carries water from farmland to the east of Teven Road joins Branch Creek before the Tuckombil Bridge.

Plate 3: **Disused quarry near Lumley Park, Alstonville.**

4.2.4 Willowbank Creek

Willowbank Creek originates from the Wollongbar TAFE and follows the northern edge of Wollongbar, joining with a number of minor tributaries along its course. The creek passes through steep, open farmland and the Willowbank rainforest remnant before joining the main creek near the end of Byrnes Lane.

4.2.5 Eltham Road tributary

Two streams meet the main creek in the lower catchment. One originates near Tyumba Avenue, on the eastern boundary of the catchment and drains the area to the north-east of Eltham Road. This is a steep, hilly area, containing cleared farmland producing macadamias and coffee. There is secondary regrowth forest dominated by Camphor Laurel. Large rainforest trees are scattered throughout this area.

4.2.6 Barlows Creek

The final tributary to join with Maguires Creek is Barlows Creek that drains from Shaws Lane, Tuckombil. The creek begins as a series of small rivulets in open farmland passing through macadamia plantations before draining into a large dam. The watercourse flows through a wet area supporting a stand of mature Bangalow Palms (*Archontophoenix cunninghamiana*) in the Shaws Lane remnant before falling steeply down the escarpment and through the golf course to join Maguires Creek near the Teven Memorial Park.

4.3 Native Vegetation

Maguires Creek catchment covers an area that was once part of the vast Big Scrub, approximately 75,000 hectares of lowland subtropical rainforest associated with the Mount Warning volcanic soils. The original Big Scrub area was located between East Lismore, Alstonville, St Helena and Dunoon**.** (Figure 2).

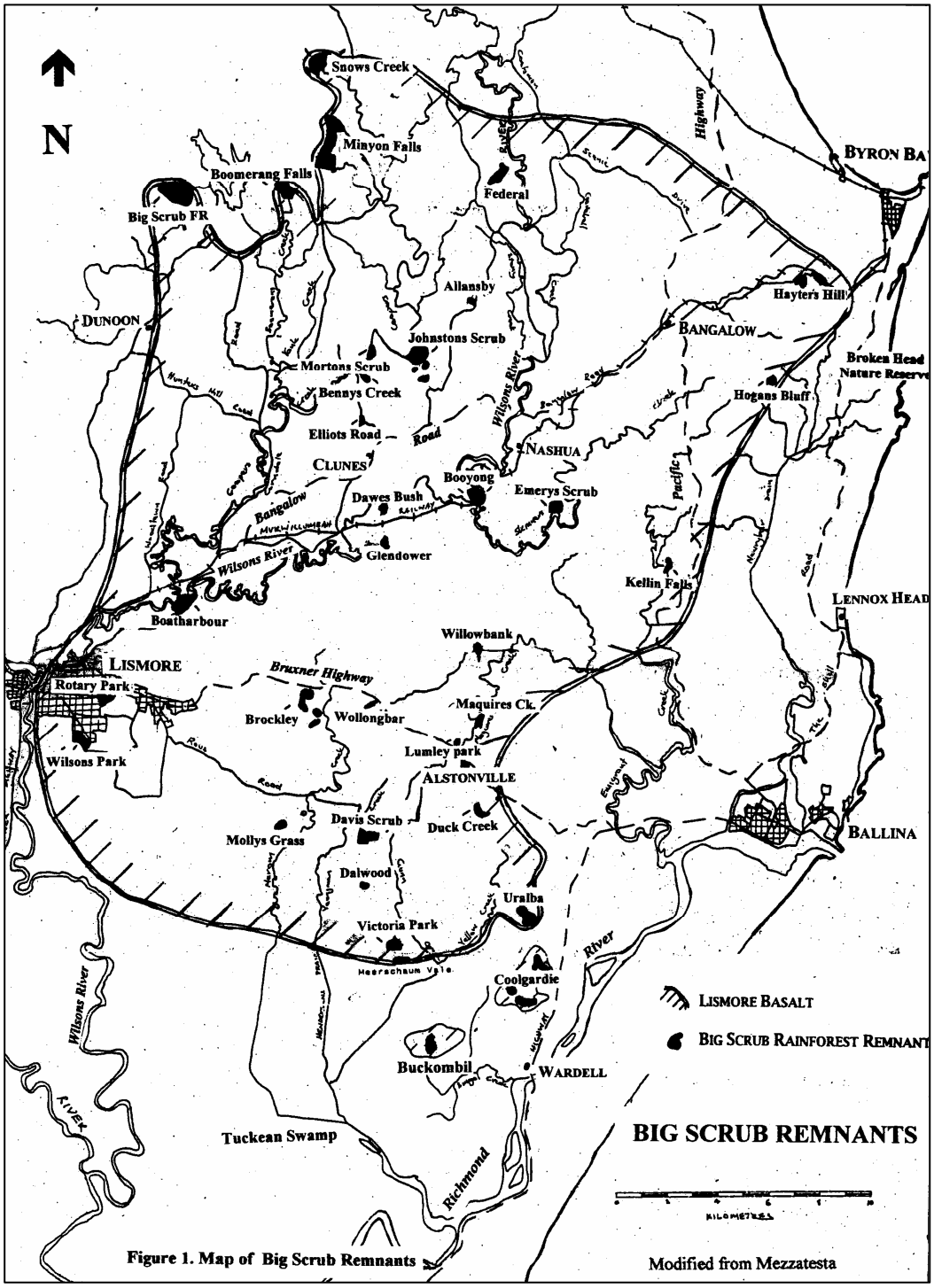

Figure 3: Big Scrub Remnants

Subtropical rainforest occupies warm sheltered, lowland sites in areas of high rainfall in Eastern Australia. The dominant vegetation is typically tall, 30-45 metres and multi-layered with a dense, billowing main canopy and occasional emergent trees. Features such as strangling figs, buttressed roots, large epiphytes and woody vines are common (Kooyman, 1996).

The major remnants of Big Scrub vegetation in the Maguires Creek catchment may be found at Lumley Park (see Plate 4), Alstonville; Maguires Creek Scrub (1.4 km north of Lumley Park on private land) and at the Willowbank remnant (4.3 km north of Lumley Park at the intersection of Sneaths Road and Pearces Creek Road). Smaller remnants on public land include Shaws Lane, Tuckombil, (4 km north east of Lumley Park) and the Wollongbar remnant (1.5 km North West of Lumley Park). Many other private holdings within the catchment contain significant stands of native vegetation.

Plate 4: Lumley Park, Alstonville.

Significant remnants of similar vegetation found nearby, but not in the catchment, include Davis Scrub Nature Reserve, Victoria Park Nature Reserve, Uralba Nature Reserve, Wollongbar TAFE remnant, Chilcotts Creek NSW Agriculture remnant, Wollongbar NSW Agriculture remnant, Duck Creek remnants, Nestlebrae 1 remnant and Brockley remnant Wollongbar. Fragmentation of remnants decreases the genetic diversity within the community.

Elevated wetlands occur occasionally throughout the catchment in areas of impeded water drainage. These areas could have been typical of swamp sclerophyll forest and now support small stands of Broad-Leaved Paperbark *(Melaleuca quinquinervia)*. Most notable examples are near Whites Lane and between the Panorama estate and Gap Road.

A species list compiled for the Maguires Creek Scrub remnant can be found in Appendix 3. This species list includes those found in other Maguires Creek catchment remnants that were recorded in previous surveys Broadly, the vegetation in the catchment belongs to the White Booyong *(Heritiera trifoliata)* Alliance (Floyd, 1990), with representative vegetation from at least three suballiances with varying topography and soil conditions: *Heritiera trifoliata* (Suballiance 1), *Castanospermum australe - Dysoxylum mollissimum* (Suballiance 5) and *Elaeocarpus grandis* (Suballiance 4).

4.4 Threatened species

The original vegetation remaining in the area exhibits a wide range of species. Bower & Bower (1998) suggest the area has the potential to include over 40 threatened fauna and 35 flora species listed under the Threatened Species Conservation Act 1995. Nine plant species listed as Rare or Threatened Australian Plants (ROTAP) have been identified at the Willowbank and Maguires Creek Scrub remnants (Bower & Bower, 1998). Species include Veiny Laceflower *(Archidendron muellerianum)*, Smooth Scrub Turpentine *(Rhodamnia maideniana*), Red Lilly Pilly, (*Syzygium hodgkinsoniae)*, Arrow Head Vine, *(Tinospora tinosporoides)*, Silky Cucumber (*Trichosanthes subvelutina)*, Quassia (*Quassia sp)* Ball Nut (*Floydia praealta*t), Southern Ochrosia (*Ochrosia moorei*) and Byron Bay Achronychia (*Acronychia baeuerlenii*).

Remnant native vegetation provides important protection for flora and fauna, forming not only continuation in a fragmented ecosystem but also an indicator in regard to the original species that occurred throughout the region. Other areas of ‘weedy’ or regrowth vegetation within the catchment may also contain some ROTAP species. An example is a single Quassia found growing in an area with a heavy Privet cover upstream from Bulwinkle Park.

4.5 Regional Context and Conservation Significance

Remnants of the original Big Scrub are often small, isolated and heavily weed infested. They are of high conservation value with the ecological significance of the Big Scrub Remnants recognised by the listing of thirty-four major remnants on The Register of the National Estate (Bower & Bower, 1998). The authors go on to explain that although small and fragmented, these remnants are of extreme importance to the remaining fauna and flora within the catchment (Bower & Bower, 1998). While many components of the rainforest habitat remain, most remnants may be too small and disturbed to sustain viable populations in perpetuity. Remnants in the lower reaches of the catchment, if restored and linked, would represent an area of regionally significant vegetation, offering an important refuge for flora and fauna. This area could act as a substantial stepping-stone along regional and sub-regional wildlife corridors. For further information regarding key habitat and wildlife corridors, visit www.canri.nsw.gov.au a web site operated by NPWS to provide community access to natural resource information.

4.6 Fauna and Habitat Types in the Catchment

Although fauna surveys were not carried out in the preparation of this report, other studies, which have assessed fauna, can provide some background. Bower and Bower (1998) suggest data from similar areas within the Big Scrub zone indicate the Maguires Creek catchment may provide important habitat for a diversity of frog, reptile, bird and mammal species, particularly mobile species such as birds and bats.

Fauna may generally be classed as either sedentary or nomadic. Sedentary species rely on a particular site all year round while nomadic species use various sites for feeding and breeding when suitable resources are available (Bower & Bower, 1998). Isolated remnants of vegetation provide important links for nomadic fauna that disperse seeds and pollen essential for the natural regeneration of native vegetation.

The existing fragmented landscape has a major impact on the fauna of the catchment. The majority of the animals found at this study site are open habitat generalist species (eg Artamidae family). Species dependant on vegetative links (eg Rose-crowned Fruit-dove) are disadvantaged by the isolation of some stands of remnant vegetation from surrounding flora, limited habitat requirements, the small size of remnants and by competition from aggressive generalist species.

According to Bower and Bower (1998), the Maguires Creek catchment contains three broad vegetation types that provide a variety of environmental niches for local fauna. These are:

- Rainforest habitat which is important for rainforest specialist species (eg. Marbled Frogmouth (*Podargus ocellatus)* and also provides important foraging and breeding habitat for many open habitat species.
- Open agricultural habitat favours generalist species that are common throughout many disturbed environments in eastern Australia. These include native species such as the Magpie (*Gymnorhina tibicen*), Pied Butcherbird (*Cracticus nigrogularis*), Noisy Minor (*Manorina melanocephala*), Crow (*Corvus sp*), Eastern Brown Snake (*Pseudonaja textiles*) and Lace Monitor (*Varanus varius*). Feral animals such as the Rabbit (*Oryctolagus cuniculus*) Black Rat (*Rattus rattus)*, Fox (Canis vulpes), Cane Toad (*Bufo marinus*) and ranging domestic animals such as Cats and Dogs may also be found here.
- Secondary regrowth forests dominated by woody weeds such as Camphor Laurel and Privet and often mixed with native species such as Guioa (*Guioa semiglauca*), Red Bean (*Dysoxylum mollissimum*), Foam Bark (*Jagera pseudorus*), Sally Watlle (*Acacia melanoxylon*) and Red Kamala (*Mallotus phillipensis*). These are similar to regrowth rainforest canopy in height and cover but often lack structural and species diversity in the lower stratum. Regrowth areas provide a seasonal food source for frugivorous birds as well as important nesting habitat.

4.7 Weeds

A serious weed is considered as a plant that can cause a major modification to species richness or abundance or ecosystem function (Fox & Adamson, 1990 cited Bower & Bower, 1998). The riparian areas of the Maguires Creek catchment are impacted upon by several weeds common to Big Scrub remnants. Many factors affect the ability of a remnant to resist the invasion of exotic species and to sustain a viable native population in the long term. These include remnant shape and size that influence edge effect ,

aspect, period since isolation, the distance to neighbouring remnants and their connectivity and competition for and availability of resources in remnant vegetation. High light levels around the edges and gaps in the canopy provide suitable growing conditions for weed species. Weed densities are reduced where a thick, intact canopy provides shady conditions in the lower levels. (Bower & Bower, 1998). The main dispersal mechanisms for environmental weeds in the Maguires Creek catchment are bird or bat droppings and by flood waters that transport vegetative propagules.

Madeira vine (*Anredera cordifolia*) and Lantana (*Lantana camara*) are the two most common climbing weeds found in the catchment. Dunphy (1991) describes Madeira vine as potentially the most destructive weed in north coast rainforests, with the ability to cover the canopy (see Plate 5) and degrade whole ecosystems by reducing photosynthesis and pulling branches down by its weight. While Madeira vine can be found in varying amounts along the entire creek, the most serious infestations are found in the lower reaches near Teven Golf Course (see Plate 6) and the junction with Houghlahans Creek. The area between Bulwinkle Park and Tosha Falls is another area affected by this weed. Control in the upper areas of the creek should see reduced levels throughout the catchment.

Plate 5: **Madeira vine infestation upstream from Lumley Park.**

Plate 6: Madeira Vine near Teven Golf Course

Lantana has the potential to change conditions to its own benefit by restricting germination of native seedlings, smothering and deflecting the growth of natives and by altering leaf litter and leachates, which alter soil structure and nutrient levels (Lamb, 1995). Before removal of large thickets of Lantana, consideration should be given to the habitat and food source it provides.

In many previously cleared areas of the catchment, woody weeds have established and where left unchecked, may form secondary regrowth forests consisting mainly of Camphor Laurel *(Cinnamomum camphora*), Large-leaved Privet *(Ligustrum lucidum*) or Small-leaved Privet *(L. sinense*). These are often, in turn, invaded by climbing weeds such as Lantana or Madeira vine, creating a situation typical of many areas of the catchment.

Camphor Laurel is a significant weed in the catchment, competing vigorously with native trees for nutrient, moisture and light. Large specimens may produce up to 50,000 seeds each year, altering the diet of many native bird species. The birds disperse the seed throughout their range.

Both Privet species compete to dominate the creek edge upstream from the Bruxner Highway bridge and other sites within the catchment. Here they form a dense canopy, reducing light levels and restricting the growth of other species. Juvenile Privet plants have adapted to low light levels and dominate the understorey, while the sunny edges support a heavy veil of Madeira vine and Lantana.

Plate 7: Privet overhanging Maguires Creek

Plate 8: Privet thicket dominates the vegetation in the creek at Howards Road.

Other environmental weeds commonly found along the study site include (Mist Flower (*Ageratina riparia)*, Crofton Weed *(A. adenophora)* and Blue Billy Goat Weed (*Ageratum houstonianum)*. These plants are found mainly in the moist, shaded areas along the watercourse where, in some situations, they can form a dense cover that may restrict germination of native seedlings or compete with the native ground covers that naturally occurred in the wetter areas.

Many exotic species are commonly introduced to the catchment as garden escapees from domestic dwellings. These may be moved throughout the catchment by way of natural vectors such as birds, bats and rodents that consume the brightly coloured fruits, or by the dumping of garden refuse that contains propagules such as fruits or stems. These propagules are capable of taking root and establishing in their new setting. This may be the most likely form of spread where confined, heavy outbreaks of weeds such as Madeira vine (*Anredera cordifolia)* or Japanese Honey Suckle (*Lonicera japonica)* are found. Whatever the method of introduction, many exotic species proliferate in the catchment. This catchment area provides plant needs similar to those of their country of origin and no natural pathogens. It may be expected that as urban expansion continues on the plateau, an increasing range of exotic species will be observed in natural areas.

Plate 9: A proliferation of weeds, specifically vines dominating riparian vegetation.

Recommended weed removal and control techniques are outlined in Appendix 4. Profiles of many of the weeds found in the Maguires Creek catchment can be found in Appendix 5.

A complete list of weeds recorded in a nearby remnant by Darren Bailey (for EnviTE) (cited in Ford, 2003) can be seen in the following Table 1.

Table 1: Weed species list recorded in representative remnants within the study site.

Trees and Shrubs

FAMILY	Botanical name	Common Name
ARALIACEAE	*Schefflera actinophylla*	Umbrella Tree
ARALIACEAE	*Jacaranda mimosifolia*	Jacaranda
ARECACEAE	*Syagrus romanziffianum*	Cocos Palm
ASTERACEAE	*Baccharis halimifolia*	Groundsel Bush
ASTERACEAE	*Tithonia diversifolia*	Japanese Sunflower
ASTERACEAE	*Delairea odorata*	Cape Ivy
BIGNONIACEAE	*Tabebuia chrysantha*	Tabebuia
CAESALPINIACEAE	*Senna pendula var. glabrata*	Winter Senna
CAESALPINIACEAE	*Senna septemtrionalis*	Smooth Senna
EUPHORBIACEAE	*Ricinus communis*	Castor Oil Plant
FABACEAE	*Erythrina X sykesii*	Coral Tree
LAURACEAE	*Cinnamomum camphora*	Camphor Laurel
MYRTACEAE	*Eugenia uniflora*	Brazilian Cherry
MYRTACEAE	*Psidium guajava*	Guava
OCHNACEAE	*Ochna serrulata*	Ochna
OLEACEAE	*Ligustrum lucidum*	Large-leaved Privet
OLEACEAE	*Ligustrum sinense*	Small-leaved Privet
PINACEAE	*Pinus elliottii*	Slash Pine
RUBIACEAE	*Coffea arabica*	Coffee
RUTACEAE	*Murraya paniculata*	Orange Jessamine
SOLANACEAE	*Cestrum nocturnum*	Night Flowering Cestrum
SOLANACEAE	*Cestrum parqui*	Green Cestrum

FAMILY	Botanical name	Common Name
SOLANACEA	*Solanum seaforthianum*	Climbing Nightshade
SOLANACEAE	*Solanum mauritianum*	Tobacco Bush
ULMACEAE	*Celtis occidentalis*	Chinese Elm, Hackberry
VERBENACEAE	*Lantana camara*	Lantana

Vines and Climbers

FAMILY	Botanical name	Common Name
ASCLEPIADACEAE	*Araujia sericifera*	Moth Vine
ASPARAGACEAE	*Protasparagus plumosus*	Climbing Asparagus
BASELLACEAE	*Anredera cordifolia*	Madeira Vine
BIGNONIACEAE	*Macfadyena anguis-cati*	Cat's Claw Creeper
CONVOLVULACEAE	*Ipomea indica*	Morning-Glory Vine
FABACEAE	*Macroptilium atropurpureum*	Siratro
OLEACEAE	*Jasminum polyanthum*	Jasmine
PASSIFLORACEAE	*Passiflora edulis*	Edible Passionfruit
PASSIFLORACEAE	*Passiflora suberosa*	Corky Passionfruit
PASSIFLORACEAE	*Passiflora subpeltata*	White Passionflower
SOLANACEAE	*Solanum seaforthianum*	Climbing Nightshade

Ferns, Grasses and Groundcovers

FAMILY	Botanical name	Common Name
ASPARAGACEAE	*Asparagus aethiopicus*	Ground Asparagus
ASTERACEAE	*Ageratina adenophora*	Crofton Weed
ASTERACEAE	*Ageratina riparia*	Mistflower
ASTERACEAE	*Ageratum houstonianum*	Blue Billygoat Weed
ASTERACEAE	*Ambrosia artemisiifolia*	Annual Ragweed
ASTERACEAE	*Bidens pilosa*	Cobbler's Pegs
ASTERACEAE	*Conyza albida*	Tall Fleabane
ASTERACEAE	*Senecio madagascariensis*	Fireweed
ASTERACEAE	*Tagetes minuta*	Stinking Roger
CANNACEAE	*Canna indica*	Canna Lily
CARYOPHYLLACEAE	*Stellaria media*	Chickweed
COMMELINACEAE	*Tradescantia albiflora*	Wandering Jew, Trad
COMMELINACEAE	*Tradescantia fluminensis*	Wandering Creeper
COMMELINACEAE	*Tradescantia zebrina*	Variagated Wandering Jew
DAVAILLIACEAE	*Nephrolepsis cordifolia*	Fish Bone Fern
EUPHORBIACEAE	*Euphorbia peplus*	Petty Spurge
EUPHORBIACEAE	*Euphorbia cyathophora*	Painted Spurge
MALVACEAE	*Sida rhombifolia*	Paddy's Lucerne
PHYTOLACCACEAE	*Rivena humilis*	Coral Berry
PLANTAGINACEAE	*Plantago lanceolata*	Plantain
POACEAE	*Chloris gayana*	Rhodes Grass
POACEAE	*Melinus repens*	Red Natal Grass
POACEAE	*Paspalum dilatatum*	Paspalum
POACEAE	*Paspalum urvillei*	Vasey Grass
POACEAE	*Paspalum wettsteinii*	Broad-leaved Paspalum
POACEAE	*Pennisetum clandestinum*	Kikuyu Grass
POACEAE	*Setaria palmifolia*	Palm Grass
POACEAE	*Setaria sphacelata*	Setaria
POACEAE	*Sporobolis indicus var. capensis*	Parramatta Grass
POLYGONACEAE	*Acetosa sagittata*	Turkey Rhubarb
SOLANACEAE	*Solanum nigrum*	Black-berry Nightshade
VERBENACEAE	*Verbena bonariensis*	Purpletop
VERBENACEA	*Drymaria cordata*	Tropical Chickweed

Aquatic and Wetland Plants

Recorded at Duck Creek a remnant located outside of the Maguires Creek Catchemnt but in close proximity.

FAMILY	Botanical name	Common Name
ARACEAE	*Xanthosoma violaceum*	Blue Taro
BRASSICACEAE	*Cardamine hirsuta*	Common Bittercress
CALLITRICHACEAE	*Callitriche stagnalis*	Common Starwort
HALORAGACEAE	*Myriophyllum aquaticum*	Parrots Feather
HYDROCHARITACEAE	*Egeria densa*	Dense Waterweed
NYMPHAEACEAE	*Nymphaea caerulea subsp. zanzibarensis*	Cape Waterlily
POACEAE	*Urochloa mutica*	Para Grass
POLYGONACEAE	*Persicaria maculosa*	Redshank

5. LAND MANAGEMENT

Land managers in the catchment fall into three categories:

- Private landholders
- Local government - Ballina Shire Council,
- State government agencies - NSW Agriculture, NSW Police Department., NSW Department of Education, NSW National Parks & Wildlife Service, Roads & Traffic Authority.

Many land managers within the catchment play no active role in the amelioration of human impacts on the natural environment. Problems such as loss of biodiversity, declining water quality and quantity and inappropriate land-use often go unnoticed.

Various Acts of Parliament control management activities on land in the catchment (see Appendix 6). Government regulations provide guidance for land managers and some protection for the broader environment. However, the specific needs of local areas are often not addressed in sufficient detail, nor with adequate attention to the needs of local species at a local landscape level.

Land within the catchment that is managed by the Ballina Shire Council can be seen in Appendix 7.

5.1 Landcare groups in the catchment

Eleven Landcare groups are active in the catchment as at July 2003 **(Figure 3)**, covering a total property area of 498 ha. (7.7 % of the catchment area, though the area of vegetation managed within this area is perhaps less than 1% of the catchment).

5.1.1 Landcare groups on agricultural land

Tuckombil Landcare Inc.

This group has 31 members, most land-holders properties drain to Maguire's Creek. Members have been involved in the restoration of remnant and regrowth vegetation as well as buffering, extension and corridor plantings on a number of properties. Areas of this vegetation type have been assessed by the Department of Infrastructure Planning and Natural Resources (DIPNR) as having High Conservation Value (HCV) vegetation and some of these have protected status. Restoration work has also been carried out on the Shaw's Lane Remnant, which contains several threatened plant species. The group's current projects involve wildlife corridors, revegetation and research. Future projects

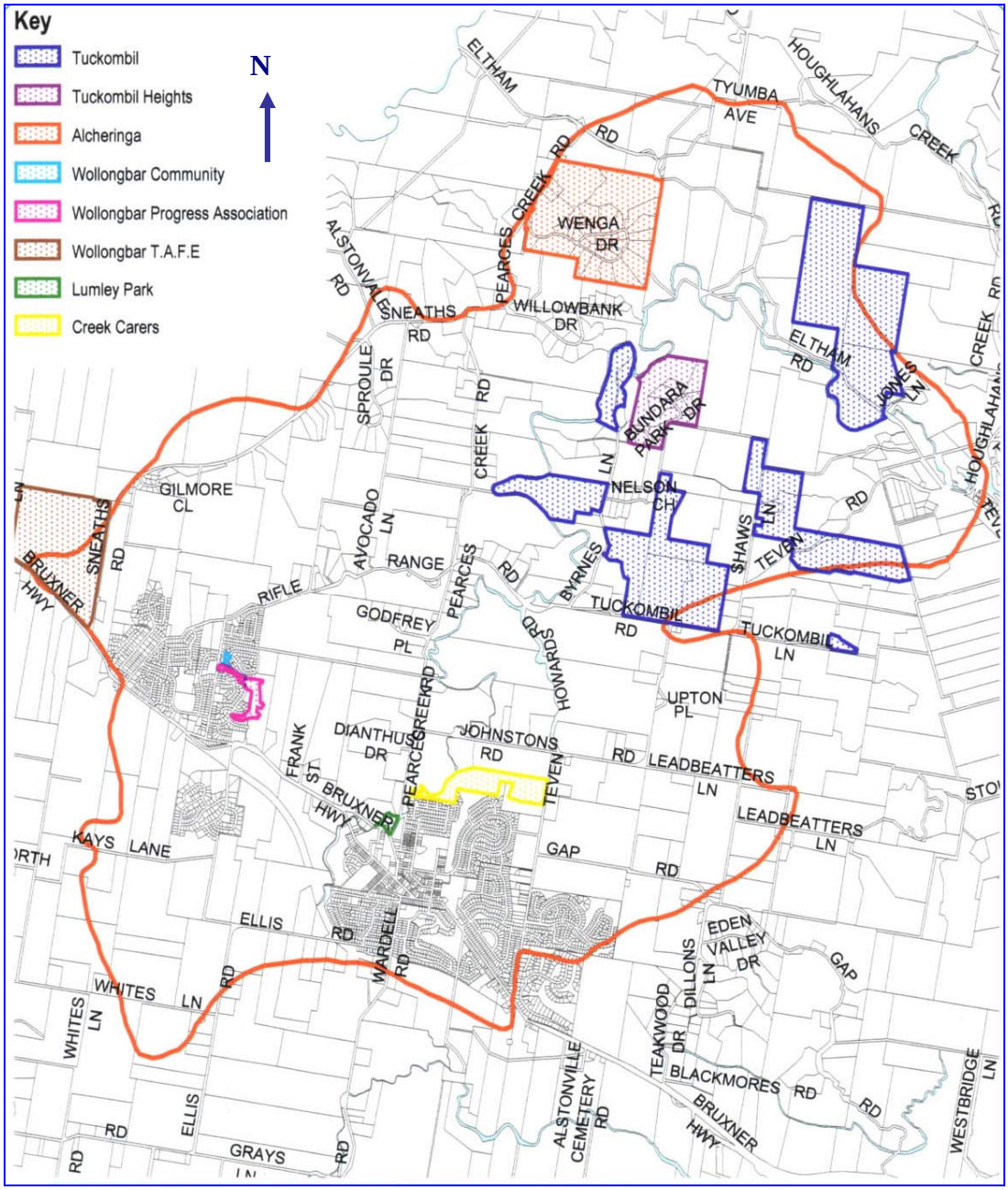

Figure 4: Properties whose owners belong to Landcare groups in the Maguires Creek Catchment (Source: F.A.King, Ballina Shire Council, Land Information Centre- disclaimer can be seen in Appendix 1)

5.1.2 Landcare groups in rural-residential subdivisions

There are at least six examples of rural-residential subdivisions within the catchment. Only two have established active landcare groups:

Tuckombil Heights Landcare Group

This community group has 26 members and operates as a management body for an area of communally owned land within the subdivision. This 14.4 ha area of restored and partially restored regrowth rainforest hosts a number of threatened species and offers a significant wildlife refuge area bordering Maguires Creek. The group continues to improve the health and integrity of their management area through weed control and planting.

Alcheringa Estate Landcare Group

Alcheringa has 15-20 members who have been active in regenerating areas of DLWC (now DIPNR) assessed HCV vegetation. This has involved riparian zone weed control and some planting. Collectively, the property holders manage an area of roughly 18 ha, which offers significant wildlife refuge area. Future projects involve continuing weed control and some revegetation.

5.1.3 Landcare groups in urban areas

Wollongbar Community Landcare Group

This group has three to five members and has been managing approximately 1 ha of the Wollongbar drainage reserve. Their work has involved weed control and plantings to restore the vegetation and to ameliorate the effects of stormwater in the reserve. The group would like more dialogue with local government regarding management of the site. Future projects involve the linking of native vegetation downstream and, ideally, better weed control upstream of their management area. Several threatened species occur on the work site.

Wollongbar Progress Association Landcare Group

A small group with five members has undertaken fencing, viewing platform construction, tree planting and weed control in an area of the Wollongbar drainage reserve.

Wollongbar TAFE Landcare Group

The TAFE Landcare group was formed to manage the rainforest remnant on the grounds of Wollongbar TAFE.

Lumley Park Landcare Group

This group has four members and has achieved significant restoration of the 1.7 ha Lumley Park reserve. The group actively maintains this valuable reserve vegetation to control incoming weed species, augment native vegetation and control stream-bank erosion along Maguires Creek. The group have identified the need for better management of weed species upstream of their work area, and the use of more bushland-friendly urban landscaping species in the Alstonville area. The group would also like to see linking of the remnant both upstream and downstream with other native vegetation.

Alstonville Creek Carers Landcare Group

This carers group has eight members and has been active in weed control and revegetation along Maguire's Creek and Alstonville Creek, which runs into Branch Creek. Alstonville Creek carries the majority of the run-off from the urban areas of

Alstonville. The group has no current project at the time of writing. The members have concerns regarding the stormwater sediment loads and transportation of pollutants from urban areas upstream of their site, including the effects of the proposed Alstonville Bypass **(Appendix 1 Zone (9a)).**

General Landcare Group Requirements
The majority of these groups have expressed a need for ongoing labour assistance and material resources. Some have expressed a need for further training in regeneration techniques and plant identification, others a need for better-coordinated weed control programs in their area, and some a need for better information regarding the effectiveness of their work.

5.1.4 Cross-Catchment Groups

Big Scrub Landcare Group
A high profile group active in promoting the restoration of the 'Big Scrub' and land restoration education. The group has been active in remnant areas in the catchment with tree plantings and management funding.

Ballina Shire Roadside Vegetation Landcare Group
This group was established to investigate the role of Ballina Shire's 1028 km of roadside reserves. Their aim is to ensure conservation and habitat value is maintained in reserves and to promote better management.

Richmond Landcare Inc (RLI)
This organisation is an incorporated community not for profit organisation made up of Landcare, Dunecare, Coastcare and Rivercare groups from the Richmond Catchment. An umbrella organisation that works to assist individual land holders and care groups with organisational support, networking and facilitates liaison with government bodies.

All of these active landcare groups are a valuable asset to the community, and should be actively supported. If a replacement cost value for these groups was calculated, it would require very costly capacity building programs and a long period of time to achieve the same level of commitment, enthusiasm and action.

5.1.5 Rural land holders not involved in Landcare

There are a proportion of land holders in the catchment that are undertaking some form of natural resource management (NRM) on their properties - tree planting, weed control, habitat protection and conservation. Appendix 8 highlights properties undertaking their own NRM activities or who have expressed an interest in becoming involved in improving their NRM. These land holders may or may not have access to adequate information regarding techniques in NRM. It is important to provide them with relevant resources to undertake work. It is understood that there may be further land holders not accounted for in this report.

5.2 Local Government

Local Government plays an important role in catchment management, being responsible for the provision of infrastructure for the community. Ballina Shire Council is responsible for managing many areas of community land, reserves and open spaces **(Appendix 7).** The council has been involved in several ways to promote better management of native vegetation in the Ballina Shire, including the Maguire's Creek Catchment. Some of the projects are:

- National Tree Day, 1300 trees were distributed to community groups and schools for planting.
- The Bushland Friendly Nursery Scheme is actively promoted to better inform the nursery industry and the public about environmental weed species and their suggested native alternatives. This enables a more informed choice to be made by gardeners and landscapers in the shire.
- NPWS incentive to encourage participation in the Backyard Buddies scheme. This scheme is targeting urban landholders, particularly those bordering nature reserves. The scheme seeks to raise awareness of weed species and promote appropriate native species with emphasis on the importance of vegetation diversity to enhance habitat values.
- The Land for Wildlife scheme has been actively supported by the council. The scheme provides educational support to participating landholders who seek to manage their lands to optimise wildlife habitat.
- Regular (monthly) weed alerts are published in the local press, highlighting a focus weed species and why it is a problem, identification guidelines and control methods. This information is also circulated to council staff.
- A partnership with the Ballina Shire Roadside Vegetation Landcare Group project that seeks funding to create a comprehensive vegetation management plan, educational brochure and field guides for outdoor council staff.
- Plans are currently being developed to improve the quality of water draining to Alstonville Creek.
- The Council is a partner in the Maguire's Creek Wildlife Landscapes Project.

In the past, the council has been responsible for planting environmental weed species in urban areas of the catchment. Council have taken the initiative to remove all environmental weed species from the council plant nursery and will only be propagating locally occurring species, and a few 'non-invasive' exotic species for urban landscaping. Council is also participating in the Bushland Friendly Nursery Scheme, and plans to double its area and provide some growing space for community groups.

5.3 State Agencies

The Alstonville Police Paddock –

This area of land is owned by the NSW Police Department, and has been the site of some rainforest restoration under an agreement with the department and the (now dissolved) *Alstonville Ratepayers' Landcare Group*. This site is an important link between Lumley Park and Bulwinkle Park, and acts as a gateway to the town of Alstonville. Plantings at the site are in need of follow up maintenance.

Alstonville High School

Council-managed land acting as a buffer between the school and surrounding lands (rural properties and the proposed Alstonville bypass – (Appendix 1) presents a valuable corridor with which to link Bulwinkle Park and the upper areas of the catchment. To

date, some school planting activities have been carried out, but some guidance may be necessary to educate those involved about the indigenous plant community ecology, weeds and geneflow. There is significant weed control work required in this area, and opportunities for vegetation reconstruction through planting of endemic tree species.

6. THREATS AND OPPORTUNITIES

With every threat there comes opportunities, and whilst there are significant threats to native vegetation and wildlife, there are many opportunities for improved and augmented management, awareness and appreciation of the natural environment in the catchment.

6.1 Human Land Use

Human land-use is seen to present the most significant threat to the health and viability of native vegetation in the catchment. As has been discussed, extensive land clearing in the recent past has resulted in a severe loss of habitat and unknown loss of biodiversity. Changing land use and awareness over the past 20 years has allowed some of the original vegetation or vegetation structure of the area to regenerate, however the pressures of human settlement continue to pose a threat without adequate planning, knowledge and management.

The estimated population of the Maguire's Creek catchment is 7282 (based on 2001 census data) and the Alstonville plateau at 9403 (D, Kitson 2002). A plan for the extension of Wollongbar village by 600-700 lots (only a proposal at the time of writing) equates to a population increase of around 1600 people. Appendix 12 includes a cadastral map of the catchment giving an indication of the intricacies and extent of properties within the catchment. The 2003 Northern Rivers Catchment Blueprint identifies high rates of population growth and associated urban and tourist development as two major pressures on our natural environment (DLWC, 2003)

Urban expansion impacts upon the natural environment in several ways:

- High biodiversity habitat area is converted to a much less biodiverse environment
- Weed plant species are often introduced to an area from urban landscapes
- Domestic animals impact upon remaining fauna and flora in the area
- Hard surfaced roads, roofs and drains associated with urban areas increase the speed and load of stormwater entering surrounding creeks and streams, often bringing with them pollutants associated with human activities
- Roads and housing also restrict the passage of wildlife across the landscape, compromising fauna and flora geneflow and foraging
- Wastes that require treatment are generated in urban areas (residential and industrial), of concern are sewerage wastes.

Previous Local Government settlement policy has allowed for rural-residential subdivisions to be made in the catchment. Maguire's Creek catchment has at least six such subdivisions. These subdivisions have the potential to introduce weed species from domestic gardens into areas of the catchment where these species would not otherwise occur. Those subdivisions without caveats covering the presence or control of domestic animals have the potential to introduce wildlife predators and compromise the biodiversity and integrity of the native ecology. Many of the rural-residential subdivisions within the catchment have been sited on land with marginal agricultural use (classified as Rural – secondary agricultural land by Ballina Shire Council) (Appendix 1),

but are of high natural and scenic values. While these subdivisions have the potential to create conflict in rural areas (due to surrounding agricultural activities) and alienate productive land, they can also offer relatively large, contiguous areas of land suitable for wildlife habitat conservation.

Current and predicted population pressures could mean that further development will need very careful attention to the trade-offs necessary to maintain ecological health and services within the catchment.

The other significant human land use affecting the natural environment occurs in the rural area. Rural lands and associated agricultural and horticultural pursuits account for the majority of the area of the catchment. These areas have been heavily cleared of native vegetation, with only very small remnants surviving.

This rural zone impacts upon the natural environment in several ways:

- Land clearing reduces habitat, alters ecological and environmental processes and simplifies the biodiversity of the area
- Weed species can be introduced as domestic plants or commercial crops
- Hard-hoofed grazing animals can damage vegetation, prevent regeneration of vegetation and damage stream banks, increasing erosion and siltation
- The potential introduction of pollutants from fertilisers, insecticides, fungicides and herbicides into waterways
- Decline in water quality by increased sediment loads. This could be the result of erosion due to roads and creek crossing construction, and agricultural practices
- Altered hydrology due to earthworks and/or irrigation practices and infrastructure.

Land clearing for agriculture and horticulture can often be undertaken without adequate planning and awareness of the requirements of native flora and fauna. A system of whole farm planning and conservation principles, if applied to farm development and management, can significantly contribute to conservation outcomes without significant economic constraints on the farm, and often contribute to the longer-term sustainability of the enterprise. Best Management Practice (BMP) guidelines for agriculture and horticultural industries can include production and planning methods, which minimise threats and/or enhance the health of native vegetation. Ways of integrating native vegetation into production, such as filter or buffer strips, IPM refuges and corridors, pollinator refuges and wind breaks, can trap the by-products of farm production and minimise their impacts on the surrounding environment.

Plate 10: Changes in landuse have brought about changes in riparian vegetation structure.

6.2 Biological threats in the catchment

There are other processes at work, which affect native vegetation health, though these are sometimes exacerbated by human activity.

6.2.1 Weeds

Weed issues have been covered elsewhere in this report (see 4.6). Weeds are a powerful force acting to change the structure and function of native vegetation communities, and represent significant cost in present management budgets.

The Far North Coast Weeds management plan 2002/2003 seeks to declare a number of weed species as W4(g) noxious weeds - not to be sold, propagated or knowingly distributed (Table 2). The plan cites these species as having the greatest impact on the environment, though being so widespread they cannot realistically be classified W2.

Table 2: Weed list for weed species nominated for classification as noxious weeds.

Anredera cordifolia	Madeira Vine
Asparagus aethiopicus	Ground Asparagus
Asparagus africanus	Climbing Asparagus
Asparagus plumosus	Asparagus Fern
Cardiospermum grandiflorum	Balloon Vine
Eucalyptus torelliana	Cadaghi
Gloriosa superba	Glory Lily
Ipomoea cairica	Mile-a-minute
I. indica	Blue Morning Glory
Ligustrum lucidum	Large-leaved Privet
L. sinense	Small-leaved Privet
Macfadyena ungus-cati	Cat's Claw creeper
Senna pendula var glabrata	Winter Senna
Tradescantia fluminensis	Trad or Wandering Jew

6.3 Funding and Project Planning

Self-funding of environmental restoration on farmland is often not possible and labour requirements may fall beyond the capacity of the farming business. The continuing development of Ecosystem Credit systems, where royalties, concessions or allowances can be obtained by land holders for their stewardship of farm areas managed for conservation and/or sustainable production may provide some capital towards this.

Transient restoration events, with no regular follow-up maintenance can lead to wasted time, money and effort. This can also be demoralising for those involved and lead to apathy toward further projects. Long term funding for environmental management is a necessary element of success. Often the funding available to community groups is of a short term nature due to the type of economic planning and bureaucratic processes required. This makes it difficult to achieve long term management objectives.

Poor planning decisions for environmental requirements at government, local area and individual property levels threaten the health of native ecosystems. Decisions made

about landuse clearly have significant impacts upon the future of the natural environment. A combination of reliable scientific information with local knowledge and expertise, with support and endorsement from relevant stakeholders is needed for effective planning. The greatest challenge is for the local community and relevant government sectors to develop an agreed plan for managing vegetation. Plans need to account for other management actions at a local or regional level, and to outline management actions at catchment and property levels. A good planning process will allow local issues to be analysed and effective management strategies developed which then provide locally relevant solutions.

There are publications available that outline stages, strategies and pitfalls to assist community groups in this process.

Plate 11 Views of the Maguires catchment.

7. REVEGETATION AND REGENERATION STRATEGY

Clearing native vegetation results in alteration of the natural environment. Such changes may:

- result in changes of microclimate,
- increase in wind penetration and turbulence,
- increase solar radiation, temperature and light,
- alter the hydrology and water quality,
- alter soil stability and nutrient balance,
- change vegetation structure or composition, and
- remove or alter food and habitat resources of faunal communities.

(Start, 1991; cited Bower & Bower, 1998)

When managing vegetation for conservation purposes, it is important to retain and protect existing native vegetation, aiming to consolidate smaller areas into a more substantial size to improve habitat values. Small remnants are subject to edge effects that reduce ecological functions and can lead to a decline of both flora and fauna. Comprehensive weed control work in remnants may be necessary to arrest decline caused by exotic species.

Plantings of suitable species link and expand remnants, creating buffers against harsh edge effects and improving the wildlife corridor potential. An integrated system of regeneration and revegetation projects will improve conservation and habitat values within the Maguires Creek catchment.

7.1 Bush Regeneration and Planting Strategy

To achieve effective and sustainable restoration of native vegetation communities, it is necessary to consider the complex ecological interactions that occur within these communities. Bush regeneration work should focus on systematically working an area to promote conditions allowing the re-establishment of native species to the disadvantage of exotic species.

In most cases, weed control should not target particular weed species, but should focus on gradual and systematic removal of all weed species. Removal of a particular weed can lead to replacement with other weeds or juveniles of the discarded species and a further decline in the health of the vegetation community. For example, if all Camphor Laurels in a site are stem injected simultaneously and other weeds are left untreated the canopy of Camphors will be destroyed. This will serve to increase the availability of light, nutrients, space and water to be utilised by those weeds that remain. An increase in the growth of juvenile Camphor Laurel seedlings and other weeds may well occur. Target weeding however, may be necessary where early control of a serious weed such as Madiera Vine, will prevent a serious infestation occurring.

Planning for conservation

A plan is the first stage of a project. The physical processes of bushland regeneration projects typically proceed through three main stages. The initial stage or primary work is the most labour intensive where the bulk of the **weeds are controlled**. It is recommended that professional bush regenerators be involved in the implementation of weed control works, species selection and lay out for replanting. This is the stage where some hard work and a good sense of humour may be required by those involved. Although it may appear as though progress is slow, the establishment of manageable areas, free of weeds, is important for the regeneration processes to begin.

The second stage is **follow up work** throughout these areas. This stage may be frustrating, as the urge to press on and open up new areas may be strong, however a pattern of "two steps forward, one step back" will remove weeds missed during the primary stage and also control seedlings that have germinated in the ensuing period. Often during this period hand removal of shrubby weeds is replaced by spraying out ground covers, which may have invaded the disturbed soil. Ensure work is carried out with great care to avoid destroying emerging native seedlings. This stage requires less of the vigorous labour and offers some rewards as the beginning of the regeneration processes are observed.

The final, and on going, stage is regular **maintenance of the site**. This stage offers the most reward with the lowest labour input. With the work area divided into manageable zones, weeds can be kept under control by hand removal of small seedlings or by spot spraying. While it is unrealistic to assume that small remnants will remain weed free as a result of the weed control work carried out, weeds returning at this stage are easily managed and regular attention from land managers should result in strong regeneration of native vegetation.

When carrying out restoration works it is particularly important not to jump ahead or move off course from the planned strategies. Small areas of work in a number of locations are prone to rapid reinfestation from surrounding weeds. Using a systematic approach, a weed free area can be maintained and enlarged.

In order to successfully manage native vegetation in this catchment it must be seen that a long-term commitment the project needs to be adopted by Ballina Shire Council, land managers and local residents. Strengthening and expanding the local Landcare network will continue provide financial and technical assistance to projects and allow the necessary tools, herbicide and trees to be made available for the use of group members.

Further assistance for projects may be gained by approaching managers of programs such as 'Work For The Dole' or 'Green Corps'. By developing a well-organised approach to vegetation restoration projects within the catchment and adherence to a systematic plan for the whole catchment, successful results may be achieved. Ad hoc work by individuals may result in less beneficial results, disappointment in the outcomes and abandonment of worthwhile projects.

7.2 Tree Selection Guidelines

In areas which have low potential for natural regeneration and in designated corridor areas, it may be necessary to plant. It is important when selecting plants for this catchment that the species chosen are those that either occur or would have occurred naturally in the area (see Appendix 3). It is important to plant a high diversity of species, particularly as riparian land supports a high diversity of plants. Appropriate selections would also include native shrub and understorey species.

> "The maintenance of genetic integrity should also be considered when selecting plants. Although a species such as Common Lilly-Pilly may have a very broad geographic range, it will exhibit obvious or subtle differences in its physiology and adaptation over this range. A plant grown from the local gene pool has adapted to that area". (Delaney, 2000).

Delaney (2000) goes onto explain that this does not mean that plants will need to be sourced from seed only from the immediate area but should be from within the Big Scrub zone or Richmond catchment. It is also worth noting that seed collected from planted specimens of an unknown origin should be discouraged. This includes street trees, parks or other revegetation sites.

Local fauna species may also be dependent on the local plant varieties. The introduction of species that would not naturally occur on this site is therefore not recommended. If the aim of the restoration project is to facilitate the recovery of a rainforest riparian community, then planting unsuitable trees will not achieve the desired outcome.

7.3 Monitoring and Evaluation

Accurate records should be kept of all on-site activities including written reports and photographs. Photographs should be taken before work begins on any site and after the completion of each stage. Marked photo points are useful for this purpose. Written reports should include:

- Site preparation, numbers and species planted, weather conditions at the time of planting
- Herbicide use and application rates, including timing, successes and failures.
- Weed control techniques
- Changes that have occurred on the site such as which species have germinated, performance of particular species and observation of fauna utilising the site.
- Details of follow up and maintenance works that have been carried out.

8. MANAGEMENT RECOMMENDATIONS for Maguires Creek

Management Strategy	Action Strategy	Performance Indicator
To ensure a source of revenue for ongoing environmental restoration works within the Ballina shire.	Recommend introduction of an environmental levy for ratepayers based on the Coffs Harbour City Council model. Funding can be made available to ratepayers for small and large environmental projects based on merit.	Increase in the number of projects being undertaken. This will result in a reduction in weed species and increase in local native species and positive environmental outcomes.
Form of a steering committee to coordinate environmental projects and monitor issues affecting the environmental values of the catchment.	Facilitate regular communication between Ballina Shire Council, Richmond Landcare Inc. and other interested parties to ensure prioritisation of projects and to assist with funding allocation. Members drawn from the whole community, industry groups, Landcare groups and private landowners. Regular publication of newsletters and press release to highlight issues of sustainability in the local area.	Increases in successful funding applications from a range of sources to ensure high priority projects are addressed. Provision of information and guidance to a range of stakeholders. Better awareness and greater advocacy for sustainability in all areas of the community. Better vegetation management outcomes will be a part of this
To carry out maintainance and monitoring work on existing bush regeneration projects	Employ professional bush regenerators for follow up work on projects that have been undertaken by labour market teams and Landcare volunteers. Consideration could be given to training apprentices in Conservation and Land Management.	Objectives of the bush regeneration project are reached specifically maintenance and monitoring.
Initiate a comprehensive environmental weed control program on land under council control.	Weed control works already being carried out could continue. Roadside weed eradication to continue with ongoing maintenance.	A reduction in the weed species present on council land increasing scenic amentity and decreasing seed and propagule source.
Initiate a project to map and control major environmental weed species such as *Anredera cordifolia* and *Ligustrum spp* along Maguire's Creek.	Control of these major environmental weeds should commence in the upper catchment. If Madeira vine is left unchecked it will continue to reinfest previously treated areas.	Increase in the health of riparian vegetation as established trees flourish after the removal of the weed species and a decrease in weed species propagules within the catchment.
Carry out vegetation restoration work (bush regeneration to encourage natural regeneration and planting local native species in areas with low regeneration potential) in priority corridor areas.	Priority area (identified in Section 8.1) are the target for on-ground works. Potential work force to include profession bush regenerators, Landcare volunteers and Work for the Dole of Green Corps participants.	Gradual reduction in weeds and increase in native species. Corridors between remnants established and maintained.

Management Strategy	Action Strategy	Performance Indicator
Ballina Shire Council to propagate, or source, local native species for use in revegetation projects..	Collection of local seed and seed propagation with attention to the maintenance of provenance records. Establish a program of replacement of known weed species in urban landscapes.	An increase in scenic amenity. A reduction in potential weed species occurring in the Ballina Shire Council areas specifically urban areas.
Establish buffer plantings to protect riparian areas from the effects of urban runoff.	Plant vegetated buffer zones along waterways to stabilise creek banks, filter surface runoff and increase infiltration of surface water	Decrease in sedimentation of creek bed. Improved water quality resulting from the reduction in sediment and nutrient runoff.
Monitor water quality and quantity throughout the catchment. Monitoring over time may indicate the value of native riparian vegetation in protecting water quality.	Monitoring is essential to determine the impact of urban expansion within the catchment. Periodic testing should be undertaken to provide a benchmark for future decisions. Continue with regular testing from the sewage treatment plant.	A comprehensive, seasonal and up-to-date record of water quality and quantity to be available when development decisions are to be made.
Educate catchment residents by promoting the Bush Friendly Nursery Scheme (BFNS).	Ensure residents have access to the correct information relating to garden planting or bush regeneration works by promoting the BFNS and making available suitable plant species lists.	An increase in scenic amenity. A reduction in potential weed species occurring in the Ballina Shire Council area.
Encourage land owners to install sediment controls and buffer plantings around orchards. Make available information relating to better farm management.	Community education through the media, information brochures and other sources. Information to include methods to reduce soil loss, impacts on waterways of surface erosion and decline in productivity resulting from the loss of the fertile topsoil. Changes to legislation could be included eg. Water Management Act 2000, 2002 amendments to the Rivers and Foreshores Improvement Act 1948**.**	Increased community awareness in the catchment and council area generally. Improved water quality.
Carry out fauna surveys in the catchment.	Professional personnel could undertake surveys. Surveys would be used as a bio-indicator to monitor and determine the health of the catchment.	The provision of a benchmark by which to gauge the impacts (positive and negative) on the catchment as a result of increased development and a resource to determine areas of high habitat significance.
Promote Landcare and the formation of new Landcare groups.	Work in co-operation with existing Landcare networks to support the establishment and work of new groups	Increase in the number of active Landcare groups in the catchment and in the membership of existing groups.

8.1 Priority zones

Prioritisation of projects should be undertaken using the following principles:

For on-ground works priority is given relative to the degree an area:

- contains high biodiversity or retains intact ecological values
- has been or is currently actively managed
- contains contiguous corridors and can be easily and economically developed to enhance existing ecological values
- presents a significant threat to other areas of high priority

While much of the catchment requires restoration work to enhance conservation values, two main areas needing consideration have been identified. These were selected upon consideration of existing vegetation, current Landcare and council works and the potential to establish corridor links between different sites in each zone.

The zone between Ellis Road near Alstonville High School and Maguires Creek Scrub contains two of the major rainforest remnants in the catchment. Extensive primary regeneration works have been carried out in Lumley Park and Maguires Creek Scrub to remove serious weed infestations, however, continued maintenance will need to be carried out to ensure the remnants are protected against reinfestation.

The area upstream from Lumley Park provides a potential source of Madiera Vine and Privet, that will continue to threaten these remnants and other restoration sites on the creek if not controlled.

Integrated weed control, fencing and planting projects by the Roads & Traffic Authority, Alstonville High School, NSW Police Dept, Ballina Shire Council and private landowners would help to reduce the level of weed infestation and restrict the dispersal of weed propagules, along the entire catchment.

Downstream from Lumley Park, Landcare activity and council works are evident. Further development of these projects will contribute to the establishment of a corridor of native vegetation from Ellis Road to the Maguires Creek Scrub. Effective weed control in the upper reaches will help to reduce levels of weed infestation downstream.

The second area of priority identified was the zone between properties to the west of Byrnes Lane and the Willowbank estate. This zone includes the junction with Willowbank Creek and extends up the side creek to the remnant on Pearces Creek Road. Landcare groups are active in the three rural residential subdivisions in this zone and the increase of smaller, lifestyle lots offers potential for the establishment of an effective wildlife corridor within the zone. Exclusion of cattle from the watercourse in conjunction with suitable riparian plantings and weed control work would result in a link between Willowbank remnant and the corridor.

Other sites considered priority areas for revegetation and restoration work are:

<u>Public Lands</u>

- The public reserve along the riparian zone adjoining Alstonville High School.
- The ‘Old Quarry’ opposite Lumley park (Plate 3).
- The riparian zone at the Alstonville Sewerage Treatment Plant.

<u>Private Lands</u>

- Any land along Maguires Creek or other minor tributaries that would provide connectivity and expansion of remnants.

9. CONCLUSION

This report was written to assess the condition of vegetation in the Maguires Creek catchment with a view to establishing effective corridors of native vegetation. The original subtropical rainforest and the habitat it provided has been disturbed by land clearing and substantially changed by subsequent land use practices. Today only small, scattered remnants of native vegetation and patches of regrowth provide pockets for the remaining flora and fauna. Weed invasion and water quality decline increasingly threaten the ecosystem within the catchment.

Restoration works have been carried out along sections of the creek and while each site is important in its own right, projects have largely been carried out independently of one another. Working in this fragmented manner may leave sites vulnerable to reinfestation from nearby locations that contain weed populations. Two priority areas, Ellis Road and Maguires Creek Scrub, have been identified in the catchment and it is felt that with an integrated approach by a range of land managers, each may be expanded and linked to nearby stands of vegetation to provide larger areas of contiguous forest for the benefit of native species.

With a long-term view to identifying projects, improving communication between all stakeholders and whole catchment planning, it is felt that effective corridors may be established throughout the entire Maguires Creek catchment. This outcome will provide improved habitat for wildlife and a more aesthetically pleasing environment for the community. Good management will result in a worthwhile legacy for the future. Vegetation management needs to involve reliable scientific knowledge and expertise, in combination with local knowledge and a sense of ownership.

10. REFERENCES

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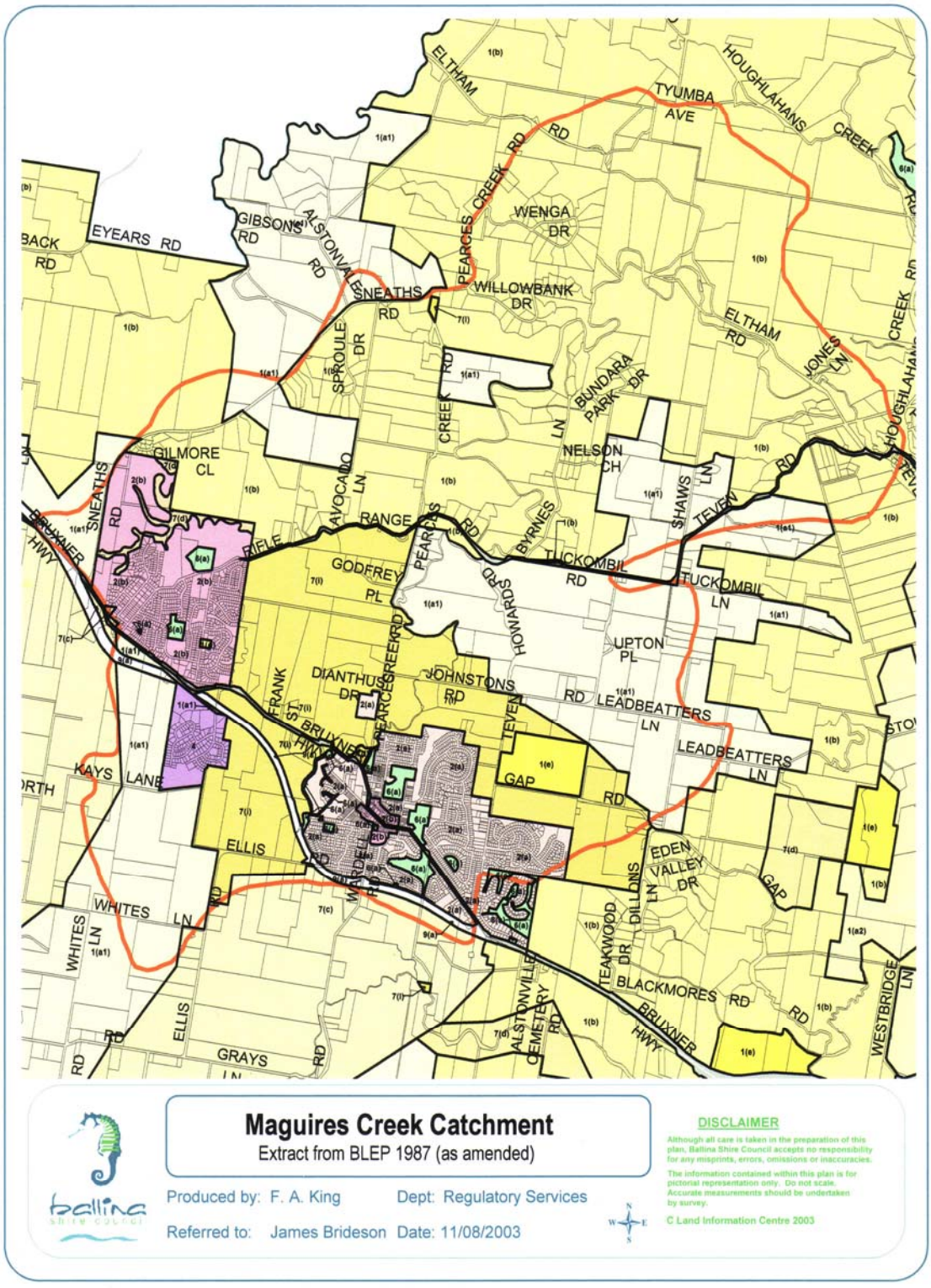
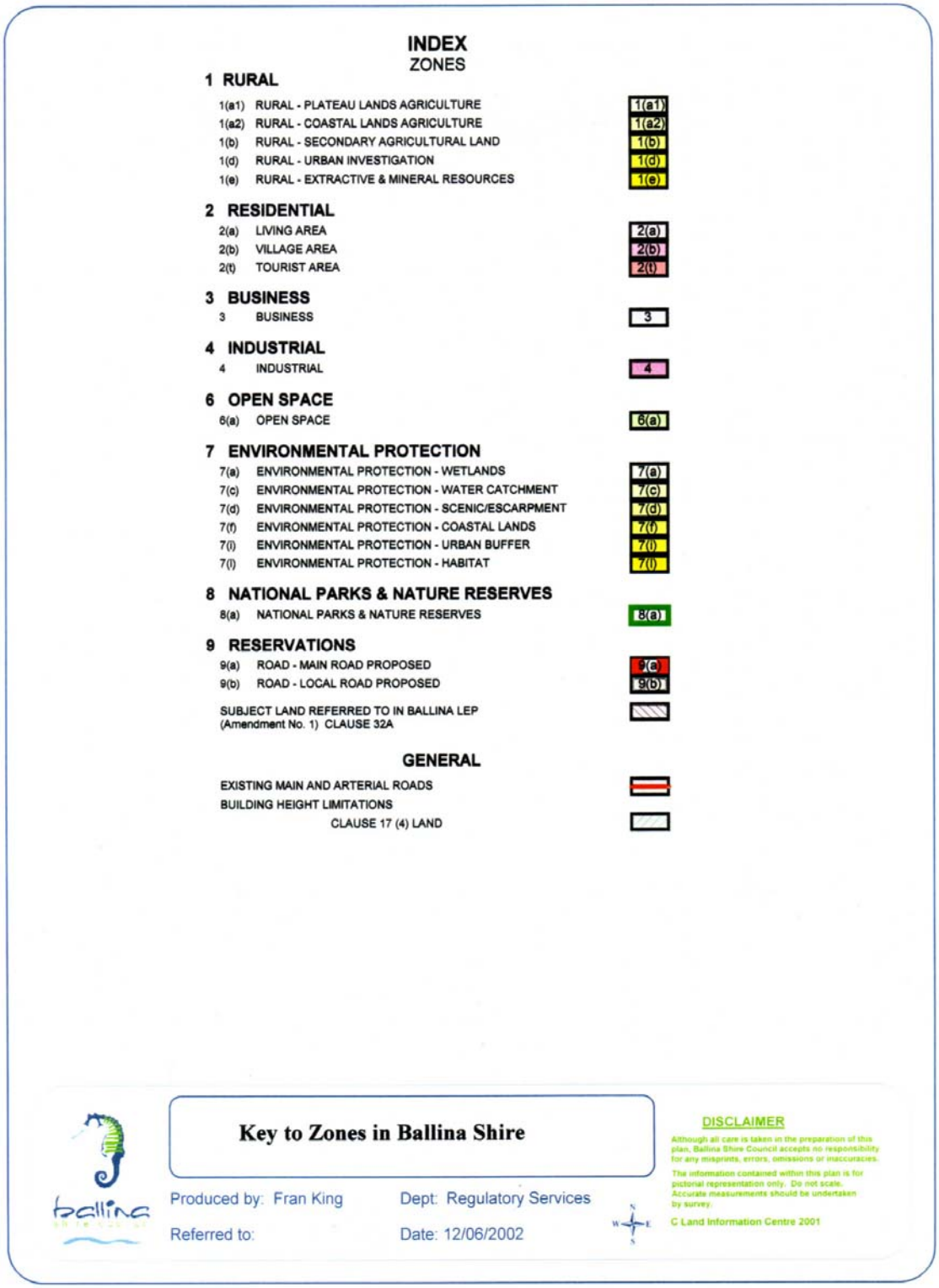
Appendix 1. Maguires Creek Catchment Zoning

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CLAUSE 17 (4) LAND
Key to Zones in Ballina Shire
Produced by: Fran King
Dept: Regulatory Services
Referred to:
Date: 12/06/2002
DISCLAIMER
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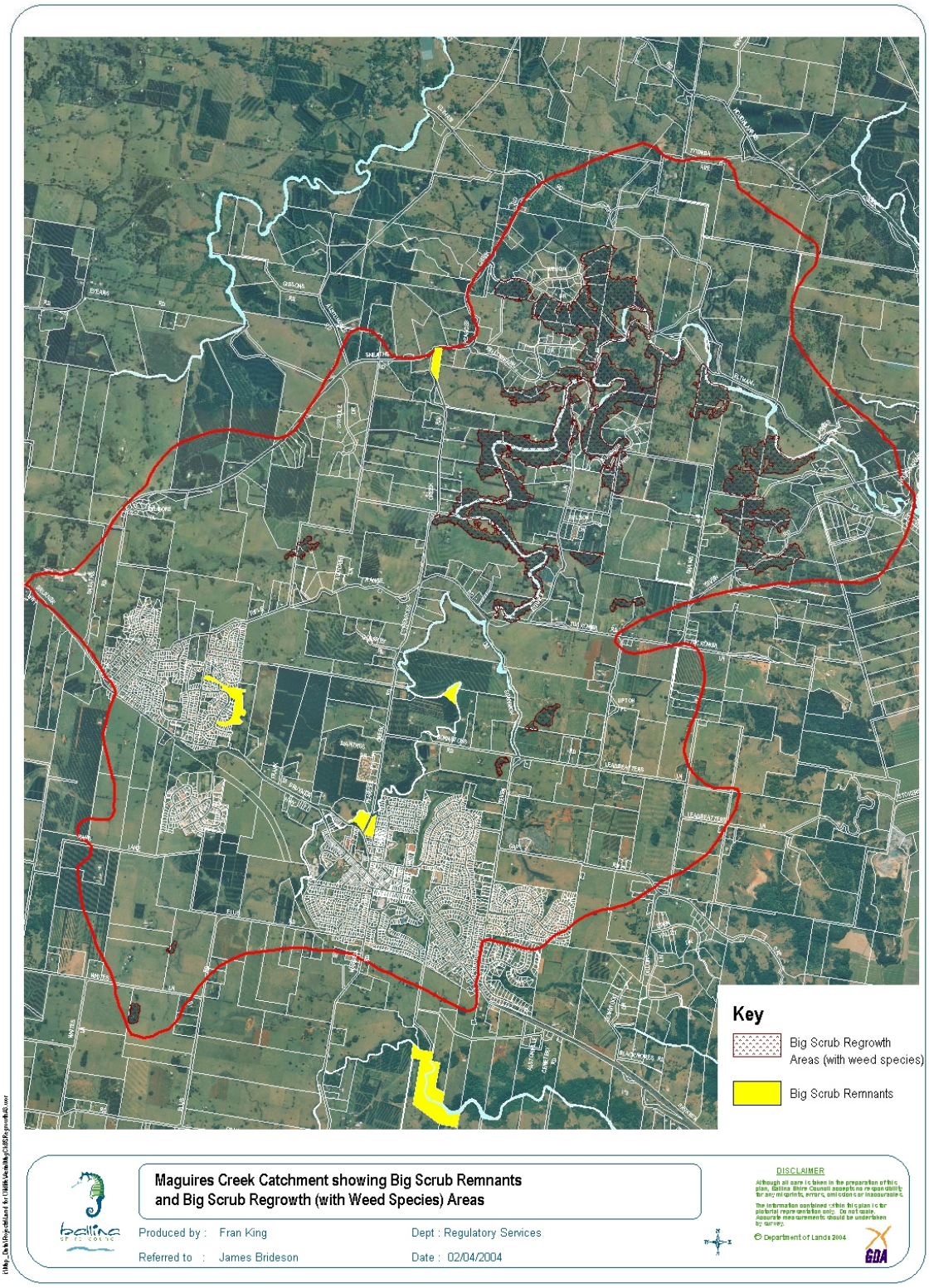
Appendix 2. Big Scrub Remnants Maguires Creek



Appendix 3. Native Vegetation List for Maguires Creek

This species list was compiled using data from previous surveys of sites within the catchment:

KEY

LP *Lumley Park Draft Management Plan* (2000) – Stephanie Lymburner
MC *Maguires Creek* Scrub. Alstonville Management Plan (1997), Hank and Sue Bower
NB *Nestle Brae Remnants 1 & 2 Rainforest Restoration Management Plan* (2000) – Bower Bush Works
WCC *Western Chillcotts Creek Vegetation Management Plan* (2002) – Stuart Hanna
Will *Willowbank Rainforest Restoration Management Plan* (1998) –Hank & Sue Bower

Trees and Shrubs

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
AGAVACEAE	*Cordyline rubra*	Red-fruited Palm Lily	X	X	X		X
AGAVACEAE	*Cordyline stricta*	Narrow-leafed Palm Lily	X			X	
AGAVACEAE	*Cordyline petiolaris*	Broad-leafed Palm Lily	X			X	
ALANGIACEAE	*Alangium villosum subsp. polyosmoides*	Muskwood		X			
ANACARDIACEAE	*Euroschinus falcata var. falcata*	Ribbonwood	X		X		
APOCYNACEAE	*Alyxia ruscifolia*	Prickly Alyxia	X				
APOCYNACEAE	*Carissa ovata*	Current Bush					X
APOCYNACEAE	*Ochrosia moorei*	Southern Ochrosia			X		
APOCYNACEAE	*Tabenaemontana pandacaqui*	Banana Bush	X	X	X	X	
ARALIACEAE	*Polyscias elegans*	Celery Wood	X		X		
ARAUCARIACEAE	*Araucaria cunninghamiana*	Hoop Pine	X				
ARECACEAE	*Archontophoenix cunninghamiana*	Bangalow Palm	X		X	X	
ARECACEAE	*Livistona australkis*	Cabbage Tree Palm	X		X		
ARECACEAE	*Linospadix monostachya*	Walking Stick Palm	X	X	X		
ASCLEPIADACEAE	*Marsdenia suberosa*	Corky Marsdenia					X

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
ATHEROSPERMATACEAE	*Daphnandra tenuipes*	Red Flowered Socketwood	X				
ATHEROSPERMATACEAE	*Daphnandra sp.*	Common Socketwood				X	
CAPPARACEAE	*Capparis arborea*	Brush Caper Berry	X	X	X		X
CAPRIFOLIACEAE	*Sambucus australasica*	Native Elderberry	X	X	X		X
CELASTRACEAE	*Cassine australis var. australis*	Red-fruited Olive Plum			X		X
CELASTRACEAE	*Hedraianthera porphyropetala*	Hedraianthera			X		
CELASTRACEAE	*Siphonodon australe*	Ivorywood			X		
CUNONIACEAE	*Callicoma serratifolia*	Callicoma	X			X	
CUNONIACEAE	*Geissois benthamii*	Red Carabeen	X	X			
DAVIDSONIACEAE	*Davidsonia jerseyana*	Davidson's Plum	X		X		X
EBENACEAE	*Diospyros pentamera*	Myrtle Ebony	X	X	X		X
EHRETIACEAE	*Ehretia acuminata*	Koda	X	X			
ELAEOCARPACEAE	*Elaeocarpus angustifolius*	Blue Quandong	X			X	
ELAEOCARPACEAE	*Elaeocarpus kirtonii*	Silver Quandong					X
ELAEOCARPACEAE	*Elaeocarpus obovatus*	Hard Quandong	X	X	X	X	X
ELAEOCARPACEAE	*Sloanea australis*	Maiden's Blush		X	X	X	X
ELAEOCARPACEAE	*Sloanea woollsii*	Yellow Carabeen	X	X			
ESCALLONIACEAE	*Anopterus macleayanus*	Macleay Laurel	X				
ESCALLONIACEAE	*Polyosma cunninghamii*	Featherwood		X	X		X
EUPHORBIACEAE	*Acalypha sp. aff. eremorum*	Acalypha		X			
EUPHORBIACEAE	*Actephila lindleyi*	Actephila	X	X	X		X
EUPHORBIACEAE	*Alchornea ilicifolia*	Native Holly	X				
EUPHORBIACEAE	*Baloghia inophylla*	Scrub Bloodwood	X		X		X
EUPHORBIACEAE	*Breynia oblongifolia*	Breynia		X	X	X	X
EUPHORBIACEAE	*Briedelia exaltata*	Scrub Ironbark	X		X		X
EUPHORBIACEAE	*Claoxylon australe*	Brittlewood	X	X	X		X
EUPHORBIACEAE	*Cleistanthus cunninghamii*	Cleistanthus		X	X		X
EUPHORBIACEAE	*Croton verreauxii*	Native Cascarilla			X		

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
EUPHORBIACEAE	*Drypetes deplanchei*	Yellow Tulip					X
EUPHORBIACEAE	*Glochidion ferdinandi*	Cheese Tree		X	X		
EUPHORBIACEAE	*Glochidion sumatranum*	Umbrella Cheese Tree				X	
EUPHORBIACEAE	*Mallotus discolor*	Yellow Kamala		X	X	X	X
EUPHORBIACEAE	*Mallotus philippensis*	Red Kamala			X		X
EUPHORBIACEAE	*Omalanthus populifolius*	Bleeding Heart		X	X	X	
EUPOMATIACEAE	*Eupomatia bennettii*	Small Bolwarra	X	X	X		X
EUPOMATIACEAE	*Eupomatia laurina*	Bolwarra	X				
FABACEAE	*Castanospermum australe*	Black Bean	X	X	X	X	X
FLACOURTIACEAE	*Scolopia braunii*	Flintwood					X
ICACINACEAE	*Citronella moorei*	Churnwood	X				
LAURACEAE	*Beilschmedia elliptica*	Grey Walnut	X		X		
LAURACEAE	*Beilschmedia obtusifolia*	Blush walnut					X
LAURACEAE	*Cinnamomum oliveri*	Oliver's Sassafras	X	X	X		X
LAURACEAE	*Cinnamomum virens*	Red-barked Sassafras	X	X	X		X
LAURACEAE	*Cryptocarya glaucescens*	Jackwood			X		
LAURACEAE	*Cryptocarya laevigata*	Glossy Laurel	X	X			
LAURACEAE	*Cryptocarya micronuera*	Murrogun			X		X
LAURACEAE	*Cryptocarya obovata*	Pepperberry	X	X	X	X	
LAURACEAE	*Cryptocarya triplinervis var. pubens*	Three-veined Laurel		X		X	
LAURACEAE	*Endiandra muelleri subsp. muelleri*	Green-leaved Rose Walnut	X				X
LAURACEAE	*Endiandra pubens*	Hairy Walnut	X		X		X
LAURACEAE	*Litsea australis*	Brown Bolly Gum	X	X	X		X
LAURACEAE	*Neolitsea australiensis*	Green Bolly Gum	X	X	X	X	X
LAURACEAE	*Neolitsea dealbata*	White Bolly Gum	X	X	X	X	X
MELIACEAE	*Anthocarapa nitidula*	Incense Cedar	X	X	X		X
MELIACEAE	*Dysoxylum fraserianum*	Rosewood	X	X	X	X	

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
MELIACEAE	*Dysoxylum mollisimum*	Red Bean	X	X	X	X	X
MELIACEAE	*Dysoxylum rufum*	Hairy Rosewood	X	X	X	X	X
MELIACEAE	*Melia azedarach var. australasica*	White Cedar	X		X		
MELIACEAE	*Synoum glandulosum*	Scentless Rosewood				X	
MELIACEAE	*Toona ciliata*	Red Cedar	X	X	X	X	
MIMOSACEAE	*Acacia melanoxylon*	Sally Wattle		X		X	
MIMOSACEAE	*Archidendron grandiflorum*	Pink Laceflower	X				
MIMOSACEAE	*Archidendron muelleriannum*	Veiny Laceflower	X	X	X		X
MIMOSACEAE	*Pararchidendron pruinosum var. pruinosum*	Snow-wood	X	X	X	X	X
MONIMIACEAE	*Daphnandra sp. A*	Socketwood				X	
MONIMIACEAE	*Doryphora sassafras*	Sassafras			X		X
MONIMIACEAE	*Wilkiea austroqueenslandica*	Smooth Wilkiea	X	X	X		X
MONIMIACEAE	*Wilkiea huegeliana*	Veiny Wilkiea			X	X	X
MONIMIACEAE	*Wilkiea macrophylla*	Large-leaved Wilkiea	X	X			
MORACEAE	*Ficus coronata*	Creek Sandpaper Fig	X	X		X	X
MORACEAE	*Ficus fraseri*	White Sandpaper Fig	X	X	X		X
MORACEAE	*Ficus macrophylla*	Moreton Bay Fig	X	X		X	
MORACEAE	*Ficus obliqua*	Small-leaved Fig	X				X
MORACEAE	*Ficus rubiginosa*	Rusty Fig	X				
MORACEAE	*Ficus superba var. henneana*	Deciduous Fig			X		
MORACEAE	*Ficus watkinsiana*	Strangler Fig	X		X		
MORACEAE	*Steblus brunonianus*	Whalebone Tree			X		X
MYRTACEAE	*Acmena hemilampra*	Broad-leaved Lilly Pilly			X		X
MYRTACEAE	*Acmena ingens*	Red Apple	X	X	X		X
MYRTACEAE	*Acmena smithii*	Common Lilly Pilly	X	X	X	X	X
MYRTACEAE	*Austromyrtus acmenoides*	Scrub Ironbark	X				
MYRTACEAE	*Austromyrtus bidwillii*	Python Tree		X	X		X

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
MYRTACEAE	*Decaspermum humile*	Silky Myrtle			X		
MYRTACEAE	*Pilidiostigma glabrum*	Plum Myrtle		X	X	X	X
MYRTACEAE	*Rhodamnia argentea*	Malletwood					X
MYRTACEAE	*Rhodamnia maideniana*	Smooth Scrub Turpentine	X	X			X
MYRTACEAE	*Rhodamnia rubescens*	Scrub Turpentine	X			X	X
MYRTACEAE	*Syzygium australe*	Scrub Cherry	X				
MYRTACEAE	*Syzygium corynanthum*	Sour Cherry			X		
MYRTACEAE	*Syzygium crebrinerve*	Purple Cherry	X		X		
MYRTACEAE	*Syzygium francisii*	Giant Water Gum	X		X		
MYRTACEAE	*Syzygium hodgkinsoniae*	Red Lilly Pilly	X	X			X
MYRTACEAE	*Syzygium luehmannii*	Riberry					X
MYRTACEAE	*Syzygium oleosum*	Blue Lilly Pilly				X	
MYRTACEAE	*Syzygium paniculatum*	Magenta Lilly Pilly	X				
MYRTACEAE	*Tristaniopsis laurina*	Water Gum	X				
MYRTACEAE	*Uromyrtus australis*	Peach Myrtle	X				
MYRTACEAE	*Waterhousia floribunda*	Weeping Lilly Pilly	X				
OLEACEAE	*Jasminum suliflorum*	Soft Jasmine			X		
OLEACEAE	*Notelaea johnsonii*	Veinless Mock Olive		X	X		X
OLEACEAE	*Notelaea longifolia*	Large Mock Olive				X	
PITTOSPORACEAE	*Hymenospermum flavum*	Native Frangipani	X		X		X
PITTOSPORACEAE	*Pittosporum multiflorum*	Orange Thorn	X		X		X
PITTOSPORACEAE	*Pittosporum revolutum*	Hairy Pittosporum		X	X	X	X
PITTOSPORACEAE	*Pittosporum rhombifolium*	Holly Wood	X				X
PITTOSPORACEAE	*Pittosporum undulatum*	Sweet Pittosporum		X	X	X	X
PODOCARPACEAE	*Podocarpus elatus*	Plum Pine	X				
PROTEACEAE	*Alloxylon pinnutum*	Dorrigo Waratah	X				
PROTEACEAE	*Helicia glabriflora*	Smooth Helicia	X	X	X		X
PROTEACEAE	*Macadamia tetraphylla*	Macadamia Nut	X		X		

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
PROTEACEAE	*Stenocarpus sinuatus*	Fire Wheel Tree	X	X			
PROTEACEAE	*Triunia youngiana*	Honeysuckle Bush	X	X	X		
RHAMNANCEAE	*Alphitonia excelsa*	Red Ash	X	X	X	X	X
RHAMNANCEAE	*Emmenosperma alphitonioides*	Yellow Ash	X				
RUBIACEAE	*Canthium coprosmoides*	Coast Canthium					
RUBIACEAE	*Randia chartacea*	Narrow-leaved Gardenia			X		
RUTACEAE	*Acronychia baeuerlenii*	Byron Bay Acronychia		X			
RUTACEAE	*Euodia micrococca*	White Euodia					X
RUTACEAE	*Flindersia australis*	Teak			X		X
RUTACEAE	*Flindersia bennettiana*	Bennett's Ash	X				
RUTACEAE	*Flindersia schottiana*	Cudgerie	X	X	X	X	X
RUTACEAE	*Flindersia xanthoxyla*	Yellowwood	X		X		X
RUTACEAE	*Geijera paniculata*	Axe-breaker	X				
RUTACEAE	*Geijera salicifolia var. salicifolia*	Narrow-leafed Brush Wilga	X				
RUTACEAE	*Melicope micrococca*	Hairy-leaved Doughwood	X		X		X
RUTACEAE	*Melicope octandra*	Doughwood	X				
RUTACEAE	*Microcitrus australasica var. australasica*	Finger Lime		X	X		
RUTACEAE	*Pentacerus australis*	Crows Ash		X	X	X	X
RUTACEAE	*Sarcomelicope simplicifolia subsp. simplicifolia*	Bauerella			X		X
RUTACEAE	*Zanthoxylum brachyacanthum*	Thorny Yellowwood			X		
SAMBUCACEAE	*Sambucus australasica*	Native Elderberry				X	
SAPINDACEAE	*Alectryon subcinerus*	Wild Quince	X				
SAPINDACEAE	*Alectryon tomentosus*	Hairy Alectryon				X	
SAPINDACEAE	*Arytera distylis*	Twin-leaved Coogera	X	X	X	X	X
SAPINDACEAE	*Arytera divaricata*	Coogera					X
SAPINDACEAE	*Castanospora alphandii*	Brown Tamarind		X			X

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
SAPINDACEAE	*Cupaniopsis flagelliformis var. australis*	Brown Tuckeroo	X	X			X
SAPINDACEAE	*Diploglottis australis*	Native Tamarind	X	X	X	X	X
SAPINDACEAE	*Diploglottis cambellii*	Small-leaved Tamarind	X				X
SAPINDACEAE	*Ellatostachys nervosa*	Green Tamarind	X	X	X		X
SAPINDACEAE	*Guioa semiglauca*	Guioa	X	X	X	X	X
SAPINDACEAE	*Harpullia alata*	Wing-leaved Tulip		X	X		X
SAPINDACEAE	*Harpullia pendula*	Tulipwood	X	X			
SAPINDACEAE	*Jagera pseudorhus var. pseudorhus*	Foambark Tree	X	X	X	X	X
SAPINDACEAE	*Mischocarpus australis*	Red Pear-fruit					X
SAPINDACEAE	*Mischocarpus pyriformis*	Yellow Pear-fruit		X			X
SAPINDACEAE	*Rhysotoechia bifoliolata*	Twin-leaf Tuckeroo		X			X
SAPINDACEAE	*Sarcopterix stipata*	Steelwood	X	X	X	X	X
SAPINDACEAE	*Toechime dasyrrhache*	Blunt-leaved Steelwood	X	X	X		X
SAPOTACEAE	*Pouteria australis*	Black Apple	X	X	X		X
SIMAROUBACEAE	*Ailanthus triphysa*	White Bean	X				
SIMAROUBACEAE	*Quassia sp. 'Mt Nardi'*	Quassia		X	X		X
SOLANACEAE	*Duboisia myoporoides*	Soft Corkwood				X	X
SOLANACEAE	*Solanum prinophyllum*	Foresat Nightshade			X		
STERCULIACEAE	*Brachychiton aceriflolius*	Flame Tree	X	X	X	X	X
STERCULIACEAE	*Brachychiton discolor*	Lacebark Tree	X				
STERCULIACEAE	*Commersonia batramia*	Brown Kurrajong	X	X	X	X	X
STERCULIACEAE	*Heritiera trifoliolata*	White Booyong	X	X	X	X	X
SYMPLOCACEAE	*Symplocus stawellii*	White Hazelwood			X		
SYMPLOCACEAE	*Symplocus thwaitesii*	Buff Hazelwood		X			
ULMACEAE	*Aphananthe philippinensis*	Native Elm			X	X	X
THYMELIACEAE	*Wikstroemia indica*	Wikstroemia				X	
ULMACEAE	*Trema aspera*	Native Lantana		X			X

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
ULMACEAE	*Trema tomentosa*	Native Peach				X	
URTICACEAE	*Dendrocnide excelsa*	Giant Stinging Tree		X	X	X	X
URTICACEAE	*Dendrocnide photinophylla*	Shining-leaved Stinging Tree			X		
VERBEBACEAE	*Clerodendrum floribundum*	Smooth Clerodendrum	X		X		X
VERBEBACEAE	*Clerodendrum tomentosum*	Hairy Clerodendrum		X		X	
VERBEBACEAE	*Gmelina leichhardtii*	White Beech	X	X	X		X
ZAMIACEAE	*Lepidozamia peroffskyana*	Shining Burrawang	X				

Vines and Climbers

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
AMARANTHACEAE	*Deeringia arborescens*	Climbing Deeringia			X		
ANNONACEAE	*Rauwenhoffia leichhardtii*	Zig-Zag Vine			X		X
APOCYNACEAE	*Melodinus australis*	Southern Melodinus			X		X
APOCYNACEAE	*Parsonia latifiolia*	Silkpod			X		
APOCYNACEAE	*Parsonsia notata*	Veinless Silkpod			X		
APOCYNACEAE	*Parsonsia straminea*	Common Silkpod			X		X
APOCYNACEAE	*Parsonsia velutina*	Hairy Silkpod					X
ARACEAE	*Pothos longipes*	Pothos	X	X			X
ARECACEAE	*Calamus muelleri*	Lawyer Vine	X	X	X		X
ARISTOLOCHIACEAE	*Pararistolochia praevenosa*	Aristolochia	X		X		
ASCLEPIADACEAE	*Hoya australis*	Native Hoya			X		
ASCLEPIADACEAE	*Marsdenia rostrata*	Common Milk Vine					
BIGNONIACEAE	*Pandorea baileyana*	Large-leaved Wonga Vine			X		
BIGNONIACEAE	*Pandorea jasminoides*	Bower Vine			X		X
BIGNONIACEAE	*Pandorea pandorana*	Wonga Vine	X	X	X		X
CAESALPINIACEAE	*Caesalpinia scortechinii*	Large Prickle Vine			X		
CAESALPINIACEAE	*Caesalpinia subtropica*	Corky Prickle Vine		X	X		X
CELASTRACEAE	*Celastrus subspicatus*	Large-leaf Staff Vine		X	X		X

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
CUCURBITACEAE	*Diplocyclos palmatus*	Native Bryony		X		X	
CUCURBITACEAE	*Trichosanthes subvelutina*	Silky Cucumber		X	X		X
DILLENIACEAE	*Hibbertia scandens*	Twining Guinea Flower			X		
DIOSCOREACEAE	*Dioscorea transversa*	Native Yam		X	X		X
FABACEAE	*Austrosteenisia glabristyla*	Giant Blood Vine	X	X	X		X
FABACEAE	*Derris involuta*	Native Derris			X		
FABACEAE	*Milletia megasperma*	Native Wistaria		X			X
FABOIDEAE	*Milletia australis*	Blunt Wisteria			X		
FLAGELLARIACEAE	*Flagellaria indica*	Whip Vine	X	X	X		X
LAZURIAGACEAE	*Geitonoplesium cymosum*	Scrambling Lily			X	X	X
MENISPERMACEAE	*Carronia multisepalea*	Carronia	X		X		X
MENISPERMACEAE	*Sarcopetalum harveyanum*	Pearl Vine			X		
MENISPERMACEAE	*Stephania japonica var. discolor*	Snake Vine				X	
MENISPERMACEAE	*Tinospora tinosporoides*	Arrow-head Vine	X	X	X		X
MONIMIACEAE	*Palmeria scandens*	Anchor Vine			X		
MORACEAE	*Maclura cochinchinensis*	Cockspur Thorn	X		X	X	X
MORACEAE	*Trophis scandens*	Burny Vine	X		X	X	
MYRISINACEAE	*Embelia australiana*	Embelia			X		X
OLEACEAE	*Jasminum dallachii*	Soft Jasmine			X		
PETERMANNIACEAE	*Petermannia cirrosa*	Petermannia			X		
PIPERACEAE	*Piper nova-hollandiae*	Giant Pepper Vine				X	
RIPOGONACEAE	*Ripogonum album*	White Supplejack	X	X	X		X
RIPOGONACEAE	*Ripogonum discolor*	Prickly Supplejack	X	X	X		X
ROSACEAE	*Rubus hillii*	Native Raspberry		X		X	
ROSACEAE	*Rubus parvifolius*	Native Raspberry				X	
RUBIACEAE	*Orinda jasminoides*	Morinda			X		X
SIMAROUBACEAE	*Guilfoylia monostylis*	Guilfoylia					X

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
SMILACACEAE	*Smilax australis*	Austral Sarsaparilla		X	X	X	
SMILACACEAE	*Smilax glyciphllya*	Sweet Sarsparilla			X		
VITACEAE	*Cayratia clematidea*	Slender Grape	X		X	X	X
VITACEAE	*Cissus antartica*	Water Vine	X		X	X	X
VITACEAE	*Cissus hypogluaca*	Five-leaf Water Vine	X				
VITACEAE	*Cissus sterculifolia*	Long-leaf Water Vine	X				

Ferns, Grasses and Groundcovers

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
ACANTHACEAE	*Pseuderantherum variabile*	Pastel Flower	X	X	X	X	X
ADIANTACEAE	*Adiantum hispidulum*	Rough Maidenhair	X		X	X	
APIACEAE	*Centella asiatica*	A Pennywort				X	
ARACEAE	*Alocasia brisbanensis*	Cunjevoi	X	X	X	X	X
ARACEAE	*Pothos longipes*	Pothos			X		
ASPLENIACEAE	*Asplenium australasicum*	Bird's Nest Fern	X		X	X	X
ASPLENIACEAE	*Asplenium attenuatum*	Simple Spleenwort					
BLECHNACEAE	*Doodia aspera*	Rasp Fern				X	X
COMMELINACEAE	*Commelina cyanea*	Commelina		X			X
COMMELINACEAE	*Pollia crispata*	Pollia	X			X	
CONVOLVULACEAE	*Dichondra repens*	Kidney Weed				X	
CYATHEACEAE	*Cyathea cooperi*	Straw Tree Fern	X				
CYATHEACEAE	*Cyathea leichhardtiana*	Prickly Tree Fern	X				
CYPERACEAE	*Cyperus tetraphyllus*	A Sedge		X	X		X
DAVALLIACEAE	*Arthropteris tenella*	Climbing Fishbone Fern			X		X
DAVALLIACEAE	*Davallia solida var. pyxidata*	Hare's Foot Fern				X	
DENNSTAEDTIACEAE	*Hypolepis muelleri*	Harsh Ground Fern			X		
DENNSTAEDTIACEAE	*Pteridium esculentum*	Bracken				X	
DRYOPTERIDACEAE	*Lastreopsis marginans*	Bordered Shield Fern			X		

FAMILY	***Botanical name***	Common Name	LP	MC	NB	WCC	Will
DRYOPTERIDACEAE	*Lastreopsis microsora*	Creeping Shield Fern			X		
GERANIACEAE	*Geranium solanderi*	Native Geranium				X	
LILIACEAE	*Dianella caerulea*	Blue Flax Lily	X	X		X	
LOBELIACEAE	*Pratia purpuracens*	White Root				X	
LOMANDRACEAE	*Lomandra hystrix*	Mat Rush	X				
LOMANDRACEAE	*Lomandra longifolia*	Mat Rush	X				
ORCHIDACEAE	*Cheirostylis ovata*	Jewel Orchid	X				
ORCHIDACEAE	*Dendrobium tarberi*	King Orchid	X				
ORCHIDACEAE	*Dendrobium kingianum*	Rock Orchid	X				
ORCHIDACEAE	*Dendrobium mortii*		X				
ORCHIDACEAE	*Epipogium roseum*	Drooping Orchid	X				
ORCHIDACEAE	*Zeuxine oblonga*		X				
ORCHIDACEAE	*Pseudovanilla foliata*	Giant Climbing Orchid	X				
ORCHIDACEAE	*Spiranthes sinensis* subsp. *australis*	Ladies' Tresses	X				
PHILYDRACEAE	*Helmholtzia glaberrima*	Stream Lily	X				
POACEAE	*Oplismenus aemulus*	Basket Grass	X		X	X	X
POACEAE	*Oplismenus imbecillis*	Basket Grass	X		X	X	X
POACEAE	*Panicum pygmaeum*	Pygmy Panic			X		
POLYPODIACEAE	*Platycerium bifurcatum subsp. bifurcatum*	Elkhorn	X		X	X	
POLYPODIACEAE	*Platycerium superbum*	Staghorn	X			X	
POLYPODIACEAE	*Pyrrosia confluens*	Horseshoe Felt Fern			X		
POLYPODIACEAE	*Pyrrosia rupestris*	Rock Felt Fern			X		
PTERIDACEAE	*Pteris tremula*	Tender Brake	X				
VIOLACEAE	*Viola hereracea*	Native Violet	X		X		
ZINGIBERACEAE	*Alpinia caerulea*	Native Ginger	X	X		X	

Duck Creek Aquatic and Wetland Plants identified and recorded by Darren Bailey

FAMILY	***Botanical name***	**Common Name**
AMARANTHACEAE	*Alternanthera denticulata*	Lesser Joyweed
APIACEAE	*Hydrocotyle tripartita*	Pennywort
ASTERACEAE	*Eclipta prostrata*	Eclipta
CYPERACEAE	*Carex appressa*	Tall Sedge
CYPERACEAE	*Carex fascicularis*	Tassel Sedge
CYPERACEAE	*Carex lobolepis*	Carex
CYPERACEAE	*Carex maculata*	Carex
CYPERACEAE	*Cyperus exaltatus*	Tall Flat-sedge
CYPERACEAE	*Cyperus polystachyos*	Bunchy Flat-sedge
CYPERACEAE	*Cyperus sanguinolentus*	Cyperus
CYPERACEAE	*Cyperus sphaeroideus*	Cyperus
CYPERACEAE	*Fimbristylis velata*	A Fringe -rush
CYPERACEAE	*Isolepis inundata*	Swamp Club-rush
CYPERACEAE	*Eleocharis equisetina*	A Spike-rush
CYPERACEAE	*Schoenoplectus mucronatus*	A Club-rush
HALORAGACEAE	*Myriophyllum latifolium*	A Water-milfoil
JUNCACEAE	*Juncus continuus*	A Rush
JUNCACEAE	*Juncus polyanthemos*	A Rush
JUNCACEAE	*Juncus prismatocarpus*	A Rush
JUNCACEAE	*Juncus usitatus*	Common Rush
LEMNANCEAE	*Spirodela punctata*	Thin Duckweed
MENYANTHACEAE	*Nymphoides indica*	Water Snowflake
ONAGRACEAE	*Ludwigia octovalvis*	Willow Primrose
ONAGRACEAE	*Ludwigia peploides subsp. montevidensis*	Water Primrose
PHYLIDRACEAE	*Philydrum lanuginosum*	Frogsmouth
POACEAE	*Agrostis avenacea var. avenacea*	Blown Grass
POACEAE	*Arthraxon hispidus*	Arthraxon
POACEAE	*Isachne globosa*	Swamp Millet
POACEAE	*Leersia hexandra*	Swamp Rice Grass
POACEAE	*Sacciolepis indica*	Indian Cupscale Grass
POLYGONACEAE	*Persicaria decipiens*	Slender Knotweed
POLYGONACEAE	*Persicaria hydropiper*	Water Pepper
POLYGONACEAE	*Persicaria strigosa*	Prickly Smartweed
POLYGONACEAE	*Rumex brownii*	Swamp Dock
POTAMOGETONACEAE	*Potamogeton javanicus*	A Pondweed
RANUNCULACEAE	*Ranunculus inundatus*	Swamp Buttercup
TYPHACEAE	*Typha orientalis*	Broad-leaved Cumbungi

RECOMMENDED PLANT IDENTIFICATION GUIDES

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Appendix 4. Weed Removal & Control Techniques

[Adapted from R. Joseph, 1995]

1. **"Cut-scrape-paint"** method: this method applies to all woody shrubs, trees and some vines.

(a) Cut plant low to the ground at an angle.

(b) Apply glyphosate immediately at the rate of 1 glyphosate: 1.5 water with a paint brush approximately 1.5 cms. Wide.

(c) Scrape sides lightly to reveal green tissue and apply the herbicide to the scraped area.

(d) Take care that the brush is not contaminated with soil.

Note: All seed, which has high viability and longevity must be removed from the parent and either composted on site or removed from the site, *i.e. Senna* spp., and other members of the Fabaceae family, or plants with a high invasive potential such as *Polygala myrtifolia.*

2. **"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).

(a) Gouge out sections of the fleshy base with a knife (if using on Asparagus, first cut the stems at shoulder height and also at the base).

(b) Apply 1 part glyphosate : 1.5 parts of water with a paint brush approximately 1.5 centimetres wide.

3. **Tree Injection:** This method applies to all woody trees and shrubs with a diameter of about 6-10 centimetres or greater.

(a) With a tomahawk, make a cut the width of the blade, at a slight angle, into the trunk

Note: It is important not to make cuts too deep.

(b) Apply herbicide immediately into the cut using a tree injecting device (if using glyphosate, apply at the rate of 1 glyphosate : 1.5 water).

(c) 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.

Note: Two rows of cuts will be sufficient for trees with trunks of 6-10 centimetres; larger trunk diameters will need correspondingly more.

(d) Treat all visible lateral roots as per (a).

4. **"Scrape-ditch-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, *i.e. Delairia odorata* (cape Ivy).

(a) Scrape the stem tissue on one side of the stem only for at least 20-30 centimetres if possible

Note: On Madeira Vine, it is necessary to scrape heavily.

(b) Scrape as many sections of the stem as possible.

(c) Apply undiluted glyphosate with a paint brush.

(d) In the case of Madeira Vine it is essential that ground tubers are also treated by making a ditch into the tuber with a knife and applying herbicide. Any side roots must also be scraped and painted.

5. **Spraying:** This is carried out using a 15 litre back-pack spray unit with a modified spray nozzle that gives a solid spray pattern. Glyphosate is the main herbicide used with the addition of the white marker dye. Metasulfuron is also used where appropriate. For plants not optimal, an acidifying agent Protec® is added.

Note: Dilution rates for glyphosate are in accordance with the manufacturer's recommendations and any variation requires a permit from National Registration Authority.

Dilution Rates (glyphosate : water):

- Plants with more or less succulent leaves, *e.g. Tradescantia fluminensis, Anredera cordifolia* (autumn to winter is the suggested time for spraying these plants), *Chlorophytum* spp. *etc.*
- 1 glyphosate : 50 water + Protec® 0.5%
- *Lantana camara*
- 1 glyphosate : 100 water
- Other soft-leaved plants, annuals and grasses
- 1 glyphosate : 100 water
- *Chrysanthemoides monilifera* ssp. *Rotundata*
- 1 glyphosate : 150 water to 1 glyphosate : 400 water.

6. Overspray: This method is applicable to large, dense infestations of such plants as *Chrysanthemoides monilifera* ssp. *Rotundata* (Bitou Bush) and *Lantana camara* (Lantana) where it is desirable to leave the 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.

(a) 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.

(b) Leave the sprayed plants intact so that native seedlings can establish under the shelter provided.

Note*:* Lantana – 1 glyphosate : 100 water;
Bitou Bush – 1 glyphosate : 150 water to 1 glyphosate : 4000 water.

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

Note: In many cases it is preferable to overspray wherever practicable as this will cause less erosion and trampling of suppressed native plants such as ferns and seedlings. However, hand work will be necessary to "cut-scrape-paint" any unsprayed Bitou Bush or Lantana that surround native plants.

7. **Crowning:** This method is applicable to weeds that have their growing points below the surface of the ground (corms, bulbs, rhizomes, clumped or fibrous root systems, etc. *E.g. Protasparagus* spp., *Chlorophytum comosum* and grasses).

(a) Grasp the leaves or stems and hold them tightly so that the base of the plant is visible. Plants with sharp leaves or stems should be cut back first.
(b) Insert the knife close to the base of the plant at a slight angle, with the tip well under the root system.
(c) 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.
(d) Remove the plant. Make sure that the base of the plant where the roots begin, is completely removed [Wright (ed.), 1999].

Note: Where both glyphosate and metasulfuron are recommended in an area, it may be possible to use a commercially available compound of these two herbicides. This approach is currently being trialed and is not suitable for operators unskilled in precision spraying [R. Joseph, 1998, pers comm.].

Appendix 5. Weed Profiles (significant weeds)

TREES & SHRUBS

Asteraceae
Baccharis halimifolia
Groundsel Bush
Native of E. North America. Perennial shrub 1-6 metres high, grows in swampy areas near the sea, often behind mangroves (Harden, 1992). It has the ability to form impenetrable thickets (Auld & Medd, 1992). A declared W2 noxious weed for the Far North Coast of N.S.W. (W2 weeds must be continuously suppressed and destroyed).

Araliaceae
Schefflera actinophylla
Umbrella Tree
Native of North Queensland and naturalized in coastal districts of Far North Coast of N.S.W. A tree to 10 metres high, often multi-stemmed and sometimes epiphytic on rainforest trees (Harden, 1992) making removal difficult. Its red fruit is dispersed by birds. Adventitious roots form readily from stem segments that remain in contact with the ground.

Arecaceae
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 (Reid, 2004 pers comm.). It is becoming a serious pest in Currie Park and Rotary Park, Lismore, NSW.

Euphorbiacceae
Ricinus communis
Castor Oil Plant
Native of Asia and Africa. A large perennial shrub up to 3 metres high. It has burr-like fruits containing 3 seeds that are dispersed by the exploding fruit as it ripens. Its seeds are toxic to stock and humans. It is abundant along creek banks and creek beds (Auld and Medd 1992).

Fabaceae
Erythrina x sykseii
Coral Tree
A hybrid, probably from New Zealand. A tree to 15 metres high which does not set fruit. It readily grows from old stumps and cuttings (Harden, 1991). Its bulk displaces native vegetation. Often found on stream banks where it is spread through floating fallen branches.

Fabaceae
Senna x floribunda
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). It produces a large number of seeds that appear to have a long viability, possibly for years.

Fabaceae
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). It produces a large number of seeds that 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 that 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 (D. Firth, 1992). It is extensively naturalized in coastal areas or the North Coast of N.S.W. (Harden, 1990).

Myrtaceae
Eugenia uniflora
Brazilian Cherry
Native of Brazil. A broad, compact shrub with deep green, glossy foliage with rich wine-coloured new growth. Crushed leaves have a pungent, agreeable odour. Fruit is 2.5 cm. in diameter, deep crimson, fleshy and readily dispersed by birds (Popenoe, 1974).

Myrtaceae
Psidium guajava
Guava
A shrub or small tree up to 6 metres high (Harden, 1991). Its fleshy berries are attractive to birds that disperse the seed. It is resistant to glyphosate.

Ochnaceae
Ochna serrulata
Ochna
Native of S. Africa. A shrub up to 2 metres high that can tolerate low light conditions. It usually occurs as isolated individuals in relatively undisturbed situations, although it can form thickets. It is resistant to herbicide, and its long tap root makes manual removal difficult. Its fruit is bird dispersed.

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). 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 utilise the available moisture and nutrients in the soil to the detriment of any nearby plant. Mature plants can produce 10,000 to 100,000.00 seeds, which have a 1-2 year viability and are effectively spread by birds (Buchanan, 1989).

Oleaceae
L. 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). 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 utilise 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).

Solanaceae
Solanum mauritianum
Wild Tobacco
A shrub or small tree up to 4 metres high, widely naturalized in rainforest regrowth (Harden, 1992, 359). Its fruit are dispersed by birds. In areas of higher light levels it can form thick stands displacing native species by competing for water, space and nutrients.

VINES & SCRAMBLERS

Asclepidiaceae
Araujia sericiflora
Moth Vine
Native of Peru. A climber with twining stems to 5 metres high. It is widely naturalized and often grows in disturbed areas (Harden, 1992). Each fruit contains many seeds that are wind dispersed, making this plant difficult to contain.

Asparageaceae
Protasparagus africanus
Asparagus Fern
Native of S. Africa. A perennial subshrub or climber with stems up to 8-12 metres high arising from a rhizome and fruiting most of the year (Harden, 1993). It has been observed to form a vine curtain over the edge species in remnants, causing damage mainly by inhibiting photosynthesis. Although generally considered to be an edge species, seeds will germinate under the canopy and grow if light levels are adequate. Seeds are effectively dispersed by birds.

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). This vine is extremely prolific, growing over 1 metre per week in warm, humid conditions. It produces countless vegetative aerial tubers that 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.

Convolvulaceae
Ipomea indica
Blue Morning Glory
Native of tropical regions. A vine that can smother trees and whose stolons can penetrate and establish several metres into native vegetation it is widely naturalized in coastal districts of Northern N.S.W. (Harden, 1992). Although Harden, 1992, states that seed is not set in Australia, fruit and seedlings have been observed at Rotary Park, Lismore, N.S.W. It is a vigorous vine that will form curtains over support plants thereby reducing photosynthesis and causing limb damage by its foliage weight.

Convolvulaceae
Ipomoea cairica
Coastal Morning Glory
Native of tropical Africa and Asia. A vine that can smother trees and whose stolons can penetrate and establish several metres into native vegetation. It also produces viable seed and is observed to be adaptable to a range of soils, from sand to swampy areas, and can establish in relatively undisturbed rainforest and rainforest ecotones.

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, 1990) and is rarely seen within a forested area. Seed probably has a long viability.

Fabaceae
Macroptilium atropurpureum
Siratro
Native of C. and N. America. A decumbent or twining perennial flowering most of the year. It is naturalized mainly along roadsides (Harden, 1990) and is rarely seen within a forested area. Seed probably has a long viability.

Passifloraceae
Passiflora edulis
Common Passionfruit
Native of America. A climber that is often naturalized on the edge of rainforest and moist gullies (Harden, 1990). This plant bears heavy fruit whose seeds are readily dispersed by birds and animals. Its foliage cover inhibits photosynthesis of supporting plants, which can also be damaged by its weight.

Passifloraceae
P. foetida var. hispidula
Stinking Passionfruit
Native of America. A climber that is naturalized on the margins of rainforests and roadsides (Harden, 1990). Its seeds are dispersed by birds and its foliage cover inhibits photosynthesis of supporting plants, which can also be damaged by its weight.

Passifloraceae
P. suberosa
Corky Passionfruit
Native of S. America. A slender vine with corky stems occasionally naturalized in disturbed rainforest in warmer areas (Harden, 1990). Its foliage cover inhibits photosynthesis of supporting plants, which can also be damaged by its weight. Its seed is dispersed by birds and animals.

Passifloraceae
P. subpeltata
White Passionflower
Native of Brazil. A climber that is a widespread weed along the coast on margins of rainforest and moist gullies (Harden, 1990). Its foliage cover inhibits photosynthesis of supporting plants, which can also be damaged by its weight. Its seed is dispersed by birds and animals.

Solanaceae
Solanum seaforthianum
Climbing Nightshade
Native of S. America. Sprawling perennial shrub or climber, naturalized in moister sites (Harden, 1992). Like other vines, it causes stress on the support plant by its smothering action and weight. Its red berries are dispersed by birds.

Verbenaceae
Lantana camara
Lantana
Native of tropical S. America. A scrambling shrub that often forms dense thickets (Harden, 1992, 614) and can climb over 20 metres into trees. It grows best on well-drained, fertile soils including nutrient-enriched sands. Roots developing on branches that contact the ground aid its spread. It produces abundant seed that 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; some nutrients may be mobilised and lost to neighbouring communities and others accumulated in unnatural amounts. These changed conditions seem to further favour Lantana and other weeds over native species (Buchanan, 1989) and in many forest areas can block secondary succession.

HERBS AND GROUNDCOVERS

Asparagaceae
Protasparagus aethiopicus
Ground Asparagus
Native of S. Africa. A shrub with sprawling stems up to 2 metres long, it is extensively naturalized in coastal districts and is a serious weed of bushland (Harden, 1993). It will form a total ground cover thereby preventing any germination of native species and inhibiting those, which are present. It is a prolific seeder, making eradication difficult.

Asteraceae
Ageratina riparia
Mistflower
Native of Mexico. Erect, perennial, sometimes decumbent herb, 0.3-1 metres high. Grows in disturbed damp sites, often in or near rainforests (Harden, 1992). Its seeds are dispersed mainly by wind, and vegetative fragments can carry downstream. It can form a dense cover, inhibiting and sometimes preventing natural native regeneration. A declared Category 3 noxious weed in the Far North Coast of N.S.W. (see *a. adenophora*).

Asteraceae
Ageratina adenophora
Crofton Weed
Native of Mexico. Erect, perennial, branched herb up to 1-2 metres high, growing in disturbed moist sites on fertile soils (Harden, 1992). Its seeds are dispersed mainly by wind, it can form a dense cover inhibiting and sometimes preventing natural native regeneration. A declared Category 3 noxious weed in the Far North Coast of N.S.W. (W3 - weed must be prevented from spreading and its numbers and distribution reduced).

Asteraceae
Ambrosia artemisiifolia
Ragweed
Native of N. America. An annual herb to 2 metres high, a weed of roadsides and wastelands (Harden, 1992).

Commelinaceae
Commelina benghalensis
Hairy Commelina
Native of tropical Africa and Asia. A perennial herb with prostrate or ascending stems forming adventitious roots at the nodes (Harden, 1993). Prefers disturbed, moist areas forming a dense ground cover effectively suppressing native regeneration.

Commelinaceae
Tradescantia fluminensis (albiflora)
Wandering Jew
Native of S. America. A perennial succulent herb with fibrous roots and branching stems that readily take root at the nodes. It is naturalized on creek banks and in shaded places, especially rainforests (Harden, 1993). 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
T. 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). It can form a dense groundcover that suppresses native germination and growth.

Cannaceae
Canna indica
Indian Shot
Native of S. America. An erect, glabrous herb that is naturalized in disturbed land and along creeks, mostly near habitation (Harden, 1993). It is spreads by seed and vegetative means. Its rhizomatous nature and its apparent resistance to glyphosate make this difficult to eradicate.

Euphorbiaceae
Euphorbia cyathophora
Painted Spurge
Native of tropical America. An annual, erect herb flowering most of the year. It is naturalized on coastal sands (Harden, 1990). It can form dense thickets up to 1.5 metres high (Cribb and Cribb, 1985) inhibiting native regeneration.

Phytolaccaceae
Rivina humilis
Coral Berry
Native of S. America. A shrub or perennial herb up to 1 metre high, growing chiefly on the coast in or on the margins or rainforest, often common in lowland subtropical rainforest (Harden, 1990). It is moderately shade-tolerant, forming a dense understorey and can thereby suppress secondary succession. It bears numerous red berries almost all year round, making it difficult to control.

Poaceae
Chloris gayana
Rhodes Grass
Native of Africa. An erect perennial grass up to 1.2 metres high (Harden, 1993).

Poaceae
Cynodon dactylon
Couch
A rhizomatous and/or stoloniferous mat-forming perennial cosmopolitan grass, to 0.3 metres high, rooting at the nodes. It is widespread and very common (Harden, 1993). It forms a thick carpet that severely inhibits native regeneration.

Poaceae
Melinus minutiflora
Molasses Grass
A native of Africa. A stoloniferous perennial grass up to 1.2 metres high (Harden, 1993).

Poaceae
Paspalum wettsteinii
Broad-leaf Paspalum
Native of America. A naturalized, tufted perennial grass (Harden, 1993).

Poaceae
Pennisetum clandestinum
Kikuyu
A native of Africa. A creeping perennial grass with very long, robust stolons and rhizomes forming a mat. Kikuyu is used widely as a lawn grass and is a common pasture grass in coastal subtropical Australia.

Poaceae
Setaria sphacelata
Setaria
An introduced summer-flowering grass. A densely to compactly tufted perennial to 2 metres high. It is naturalized in areas of the North Coast (Harden, 1993).

Polygonaceae
Acetosa sagittata
Turkey Rhubarb
Native of South Africa. A prostate ascending or climbing perennial herb that produces tubers. Leaves have spreading auricles. Flowers in a large, branched terminal panicle, perianth purplish with 3 broad, papery wings. (Auld & Medd 1992). Resistant to Alyphorate.

Solanaceae
Solanum nigrum
Blackberry Nightshade
Native of Europe. A herb or short-lived perennial which flowers mainly in spring and produces numerous dull black or purple-black berries (Harden, 1992) which are bird-dispersed.

FERNS

Davalliaceae
Nephrolepis cordifolia
Fishbone Fern
A fern with rhizomes, and stolons that bear reproductive tubers (Harden, 1990, 63). Although a native of N.S.W., it is often cultivated and has naturalized near habitation. It is considered a weed in this area (Floyd, pers. comm.).

Weed References:

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Cribb, A. and Cribb, J., 1985. *Plant Life of the Great Barrier Reef and Adjacent Shores*. University of Queensland Press, Brisbane.

Firth, D., 1992. *Camphor Laurel Control. in NSW* Department of Agriculture, undated. *Trees for the New South Wales North Coast*. NSW Department of Agriculture, Alstonville.

Harden, G. (ed.), 1990–1993. *Flora of New South Wales. Vols. 1-4*. NSW University Press, Sydney.

Reid, J. 2004 Project Officer, EnviTE NSW, Lismore

Appendix 6. Weed Control Techniques for Significant Weeds at Maguires Creek.

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, scrap 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 ® are 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.
For more detail on control method techniques refer to Weed Removal and Control Techniques (Appendix 4)

WEED SPECIES CONTROL METHODS
Trees and Shrubs

Scientific Name	Common Name	Control Method
Baccharis halimfolia	Groundsel Bush	Cut, scrape & paint **1:1.5**, spray small seedlings/regrowth *glyphosate* **1:150 + Protec**®
Cinnamonum camphora	Camphor Laurel	Stem inject **1:15** larger trees, cut scrape and paint **1:1.5** small plants. Spray seedlings *glyphosate* **1:50 + Protec** ®
Eugenia uniflora	Brazilian Cherry	Cut, scrape and paint **1:1.5**; frill, spear or drill **1:1.5**; spray *glyphosate* **1:100 + Protec**®. Best time to spray – early autumn.
Lantana camara	Lantana	Lopper and cut, scrape and paint base **1:1.5.**. Spray regrowth *glyphosate* **1:100 + Protec**®
Schefflera actinophylla	Umbrella Tree	Hand pull seedlings and bag. Cut, scrape and paint or stem inject **1:1.5**. Cut sections, can regrow if left on the ground
Senna pendula var. glabrata	Winter Senna	Hand pull young plants or spray seedlings *glyphosate* **1:50 + Protec**. ® Cut, scrape and paint **1:1.5**. Stem inject large specimens **1:1.5**, bag seeds
Senna X floribunda	Smooth Senna	Hand pull young plants, cut, scrape and paint **1:1.5**. Spray seedlings *glyphosate* **1:100 + Protec**®, bag seeds
Syagrus romanzoffianum	Cocos Palm	Hand pull or crown seedlings, cut larger plants below growing point, spray resistant
Psidium guajava	Guava	Cut and paint **1:1.5**
Solanum mauritianum	Tobacco Bush	Stem inject **1:1.5** larger trees. Cut, scrape and paint **1:1.5**. Spray seedlings *glyphosate* **1:100 + Protec**®
Ficus benjamina	Weeping Fig	Stem inject **1:1.5** larger trees. Cut, scrape and paint **1:15** smaller plants
Ochna serrulata	Ochna	Cut, scrape and paint **1:1.5**. Spray seedlings *glyphosate* **1:50 + Protec**® Difficult to pull will regrow from broken root. Paint stem on larger specimens with neat *glyphosate* to a height of 50 cm
Euphorbia pulcherrima	Poinsettia	Cut, scrape and paint **1:1.5**
Jacaranda mimosifolia	Jacaranda	Stem inject **1:15**. Remove when dead
Ligustrum lucidium	Large-Leaved Privet	Stem inject **1:1.5** larger trees. Cut, scrape and paint **1:1.5** small plants. Spray seedlings *glyphosate* **1:50 + Protec**®
Ligustrum sinsense	Small-Leaved Privet	Stem inject **1:1.5** larger trees. Cut, scrape and paint **1:1.5** small plants. Spray seedlings *glyphosate* **1:50 + LI700**. For multi-stemmed specimens chainsaw and cut, scrape and paint **1:15**
Morus nigra	Black Mullberry	Stem inject **1:1.5**
Murraya paniculata	Murraya	Stem inject **1:1.5** larger trees. Cut, scrape and paint small plants **1:1.5**. Spray seedlings *glyphosate* **1:100 + Protec**®
Erythina X skyesii	Coral Tree	Stem inject **1:1.5**. Do not leave cut pieces on the ground

Vines and Scramblers

Scientific Name	Common Name	Control Method
Anredera cordifolia	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.
Asparagus plumosus	Climbing Asparagus Fern	Crowning, cut stems at chest height, then at ground level, spray regrowth *glyphosate* **1:50 + Protec**®
Desmodium umcinatum	Silver-Leaved Desmodium	Bag seed heads, spray **1:50 + Protec**®
Lonicera japonica	Japanese Honeysuckle	Cut, scrape and paint main stem and where each node roots 1:1.5. Spray regrowth *glyphosate* **1:100 + Protec**®, bag fruit
Passiflora edulis	Edible Passionfruit	Usually hand pull, but if necessary cut, scrape and paint **1:1.5**. Roll up vines, spray regrowth *glyphosate* **1:100 + Protec**®. Bag fruit
Passiflora suberosa	Corky Passionfruit	Smaller vines can be pulled and regrowh sprayed. Spray vines scrambling on the ground *glyphosate* **1:50 + Protec**®. Follow large vines carefully to all roots. Cut, scrape and paint **1:1.5**
Passiflora subpeltata	White Passionfruit	Hand pull smaller vines, cut, scrape and paint **1:1.5**. Spray regrowth *glyphosate* **1:50 + Protec**®

Herbs, Ferns and Grasses

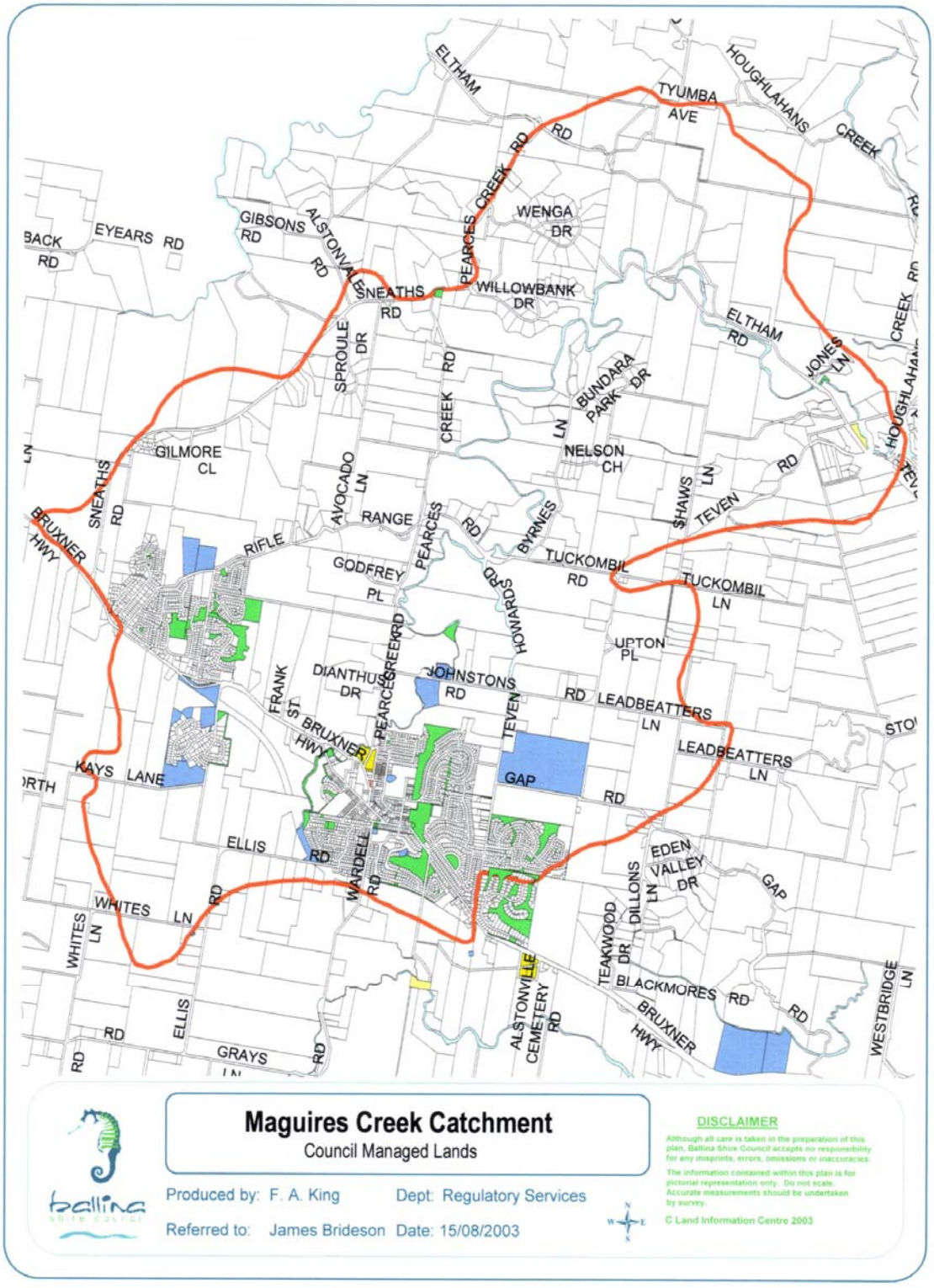
Scientific Name	Common Name	Control Method
Asparagus aethiopicus	Ground Asparagus	Hand remove (crowning of rhizome). Spray Metsulfuron **1.5g/10L** and **Protec**® **20ml/10L**.
Ageratina adenophora	Crofton Weed	Spray *glyphosate* **1:100 + Protec**®. Hand pull and hang up
Ageratina riparia	Mist Weed	Spray *glyphosate* **1:100 + Protec**®. Hand pull and hang up
Ageratum houstonianum	Billygoat Weed	Spray *glyphosate* **1:100 + Protec**®. Hand pull and hang up
Chloris gayana	Rhodes Grass	Spray *glyphosate* **1:100 + Protec**
Chlorophytun comosum	Ribbon Grass	Handpull, crown or trial Metsulfuron **1g per 10L + Protec®**
Commelina benghalensis	Hairy Commelina	Spray *glyphosate* **1:50 + Protec**®
Drymaria cordata	Tropical Chick Weed	Spray *glyphosate* **1:100 + Protec**®. Hand pull
Euphorbia cyathorphora	Painted Spurge	Spray *glyphosate* **1:100 + Protec**®. Hand pull
Nephrolepis cordifolia	Fishbone Fern	Spray *glyphosate* **1:50** with Metsulfuron **1.5g/10L** and **Protec**®
Pennisetum clandestinum	Kikuyu Grass	Spray *glyphosate* **1:100**
Rivina humulis	Coral Berry	Bag fruit or whole plants including fruit. Spray **1:50 + Protec**®. Hand pull where possible
Senecio madagascariensis	Fireweed	Hand pull
Tradescantia fluminensis	Wandering Jew	Spray *glyphosate* **1:50 + Protec**®. In small areas carefully remove
Tradescantia zebrina	Zebrina	Spray *glyphosate* **1:50 + Protec**®
Salvia sp	Salvia	Hand pull

A permit will be required for off label usage of these chemicals. Protec should be used as per manufacturer's instructions.

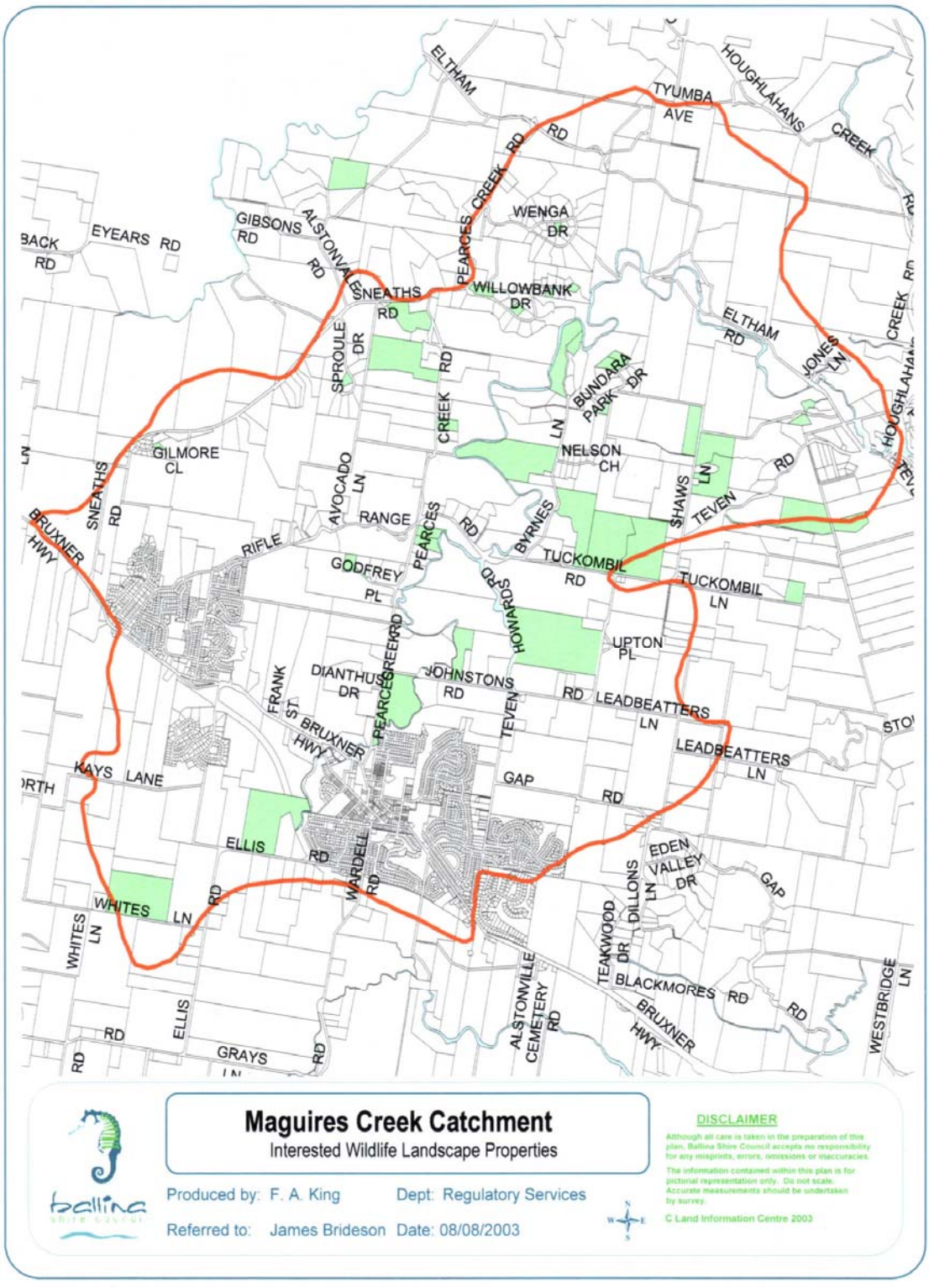
Appendix 7. Legislation relevant to catchment management

- Environmental Protection and Biodiversity Conservation Act 1999,
- Native Vegetation Conservation Act 1997,
- National Parks and Wildlife Act 1974,
- Threatened Species Conservation Act 1995,
- Environmental Planning and Assessment Act 1979,
- Local Government Act 1993,
- Soil Conservation Act 1938
- Rivers and Foreshores Improvement Act 1948
- Water Management Act 2002
- Fisheries Management Act 1994
- Protection of the Environment Operations Act 1999
- Total Catchment Management Act 1989.

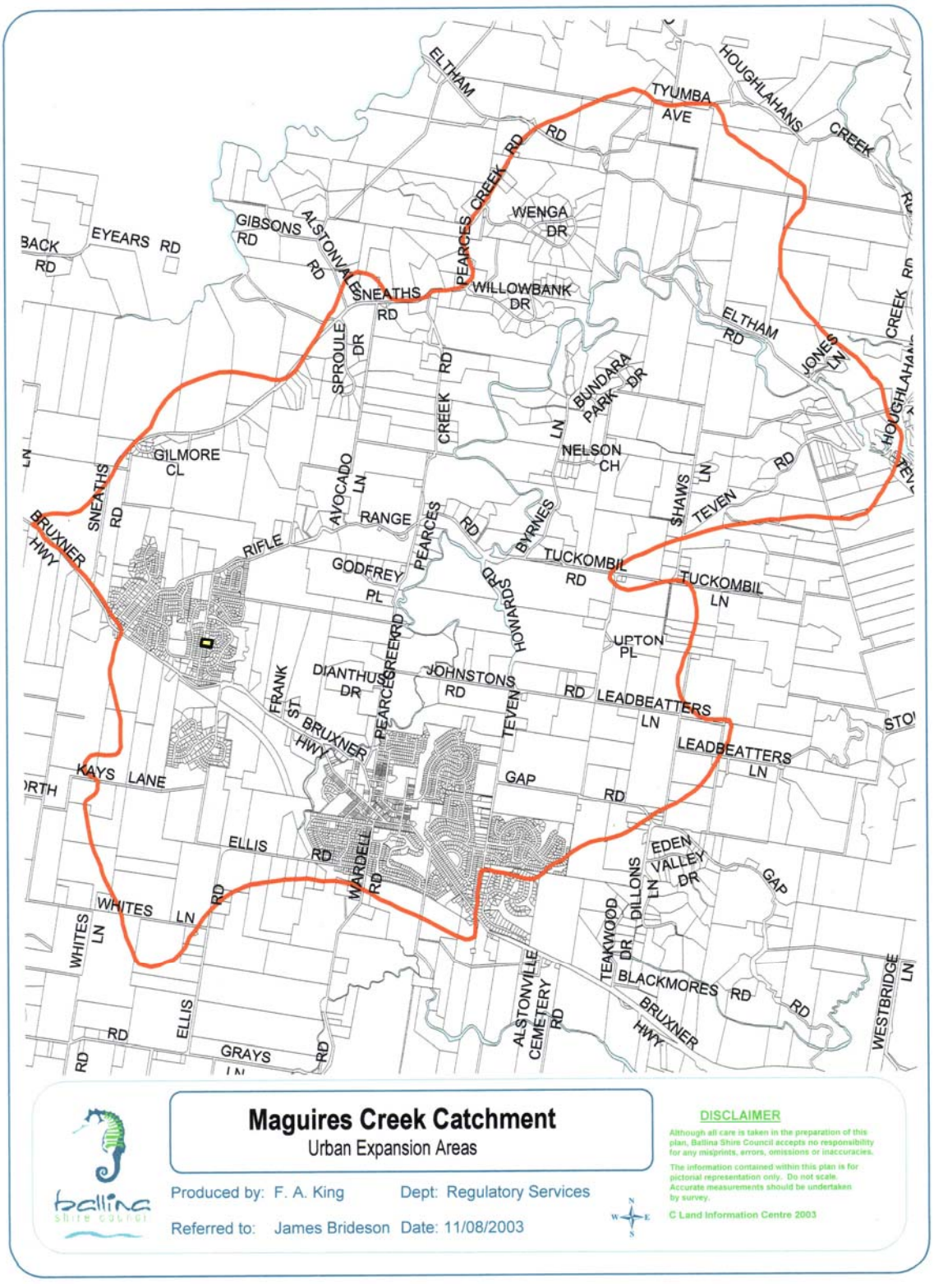
Appendix 8. Council Managed Land in the Maguires Creek Catchment



Appendix 9. Participants in the Wildlife Landscapes Workshops 2003.



Appendix 10. Urban expansion areas in the Maguires Creek Catchment



Appendix 11. Fauna of Maguires Creek Catchment

Species List, NSW National Parks and Wildlife Service. Protected Fauna on Alstonville Plateau

(Wollongbar to Tintenbar) and (Brooklet to Uralba)

Mammals

Antechinus stuartii	Brown Antechinus
Hydromys chrysogaster	Water-rat
Isoodon macrourus	Northern Brown Bandicoot
Macropus rufogriseus	Red-necked Wallaby
Nyctophilus gouldi	Gould's Long-eared Bat
Nyctophilus sp.	Long-eared bat
Ornithorhynchus anatinus	Platypus
Perameles nasuta	Long-nosed Bandicoot
Pseudocheirus peregrinus	Common Ringtail Possum
Rattus fuscipes	Bush Rat
Rattus lutreolus	Swamp Rat
Tachyglossus aculeatus	Short-beaked Echidna
Thylogale thetis	Red-necked Pademelon
Trichosurus caninus	Mountain Brushtail Possum
Trichosurus vulpecula	Common Brushtail Possum
Vespadelus sp.	Unidentified Eptesicus
Wallabia bicolor	Swamp Wallaby

Amphibians

Adelotus brevis	Tusked Frog
Crinia signifera	Common Eastern Froglet
Limnodynastes peronii	Brown-striped Frog
Limnodynastes peronii	Brown-striped Frog
Litoria dentata	Bleating Tree Frog
Litoria fallax	Eastern Dwarf Tree Frog
Litoria pearsoniana	
Litoria peronii	Peron's Tree Frog
Litoria tyleri	

Reptiles

Cacophis krefftii	Krefft's Dwarf Snake
Cacophis squamulosus	Golden Crowned Snake
Calyptotis scutirostrum	
Cryptoblepharus virgatus	Wall Lizard
Ctenotus robustus	Striped Skink
Demansia psammophis	Yellow-faced Whip Snake
Dendrelaphis punctulata	Green Tree Snake
Egernia major	Land Mullet
Elseya latisternum	Saw-shelled Tortoise
Eulamprus murrayi	
Hemiaspis signata	Black-bellied Swamp Snake
Hemisphaeriodon gerrardii	Pink-tongued Lizard
Hypsilurus spinipes=	Southern Angle-Headed Dragon
Lampropholis delicata	Grass Skink
Morelia spilota	Carpet or Diamond Python
Morelia spilota variegata	Carpet Python
Ophioscincus truncatus	
Physignathus lesueurii	Eastern Water Dragon
Pseudonaja textilis	Eastern Brown Snake
Ramphotyphlops nigrescens	
Ramphotyphlops sp.	blind snake
Rhinoplocephalus nigrescens	Eastern Small-eyed Snake
Saproscincus challengeri	
Varanus varius	Lace Monitor
Vermicella annulata	Bandy Bandy

Birds

Acanthiza chrysorrhoa	Yellow-rumped Thornbill
Acanthiza pusilla	Brown Thornbill
Acanthorhynchus tenuirostris	Eastern Spinebill
Accipiter fasciatus	Brown Goshawk
Accipiter novaehollandiae	Grey Goshawk
Aegotheles cristatus	Australian Owlet-nightjar
Ailuroedus crassirostris	Green Catbird
Alcedo azurea	Azure Kingfisher
Alisterus scapularis	Australian King-Parrot
Anas superciliosa	Pacific Black Duck
Anthochaera carunculata	Red Wattlebird
Anthochaera chrysoptera	Little Wattlebird
Anthus novaeseelandiae	Richard's Pipit
Aquila audax	Wedge-tailed Eagle
Ardea alba	Great Egret
Ardea ibis	Cattle Egret
Ardea intermedia	Intermediate Egret
Ardea pacifica	White-necked Heron
Artamus cyanopterus	Dusky Woodswallow
Artamus leucorhynchus	White-breasted Woodswallow
Aviceda subcristata	Pacific Baza
Cacatua galerita	Sulphur-crested Cockatoo
Cacatua roseicapilla	Galah
Cacatua sanguinea	Little Corella
Cacomantis flabelliformis	Fan-tailed Cuckoo
Cacomantis variolosus	Brush Cuckoo
Centropus phasianinus	Pheasant Coucal
Chalcophaps indica	Emerald Dove
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo
Chrysococcyx lucidus	Shining Bronze-Cuckoo
Circus assimilis	Spotted Harrier
Cisticola exilis	Golden-headed Cisticola
Colluricincla harmonica	Grey Shrike-thrush
Colluricincla megarhyncha	Little Shrike-thrush
Columba leucomela	White-headed Pigeon
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Coracina tenuirostris	Cicadabird
Corvus orru	Torresian Crow
Coturnix ypsilophora	Brown Quail
Cracticus nigrogularis	Pied Butcherbird
Cracticus torquatus	Grey Butcherbird
Cuculus pallidus	Pallid Cuckoo
Cuculus saturatus	Oriental Cuckoo
Dacelo novaeguineae	Laughing Kookaburra
Dicaeum hirundinaceum	Mistletoebird
Dicrurus bracteatus	Spangled Drongo
Egretta novaehollandiae	White-faced Heron
Elanus axillaris	Black-shouldered Kite
Entomyzon cyanotis	Blue-faced Honeyeater
Eopsaltria australis	Eastern Yellow Robin
Eudynamys scolopacea	Common Koel
Eurystomus orientalis	Dollarbird
Falco berigora	Brown Falcon
Falco cenchroides	Nankeen Kestrel
Falco peregrinus	Peregrine Falcon
Geopelia humeralis	Bar-shouldered Dove
Gerygone mouki	Brown Gerygone
Gerygone olivacea	White-throated Gerygone
Glossopsitta concinna	Musk Lorikeet
Grallina cyanoleuca	Magpie-lark
Gymnorhina tibicen	Australian Magpie
Haliaeetus leucogaster	White-bellied Sea-Eagle
Haliastur sphenurus	Whistling Kite
Hieraaetus morphnoides	Little Eagle
Hirundapus caudacutus	White-throated Needletail
Hirundo ariel	Fairy Martin
Hirundo neoxena	Welcome Swallow
Hirundo nigricans	Tree Martin
Lalage leucomela	Varied Triller
Lalage sueurii	White-winged Triller
Leucosarcia melanoleuca	Wonga Pigeon
Lichenostomus chrysops	Yellow-faced Honeyeater
Lichmera indistincta	Brown Honeyeater
Lonchura castaneothorax	Chestnut-breasted Mannikin
Lopholaimus antarcticus	Topknot Pigeon
Macropygia amboinensis	Brown Cuckoo-Dove
Malurus cyaneus	Superb Fairy-wren
Malurus lamberti	Variegated Fairy-wren
Malurus melanocephalus	Red-backed Fairy-wren
Manorina melanocephala	Noisy Miner
Meliphaga lewinii	Lewin's Honeyeater
Melithreptus lunatus	White-naped Honeyeater
Melomys cervinipes	Fawn-footed Melomys
Merops ornatus	Rainbow Bee-eater
Monarcha melanopsis	Black-faced Monarch
Monarcha trivirgatus	Spectacled Monarch
Myiagra inquieta	Restless Flycatcher
Myiagra rubecula	Leaden Flycatcher

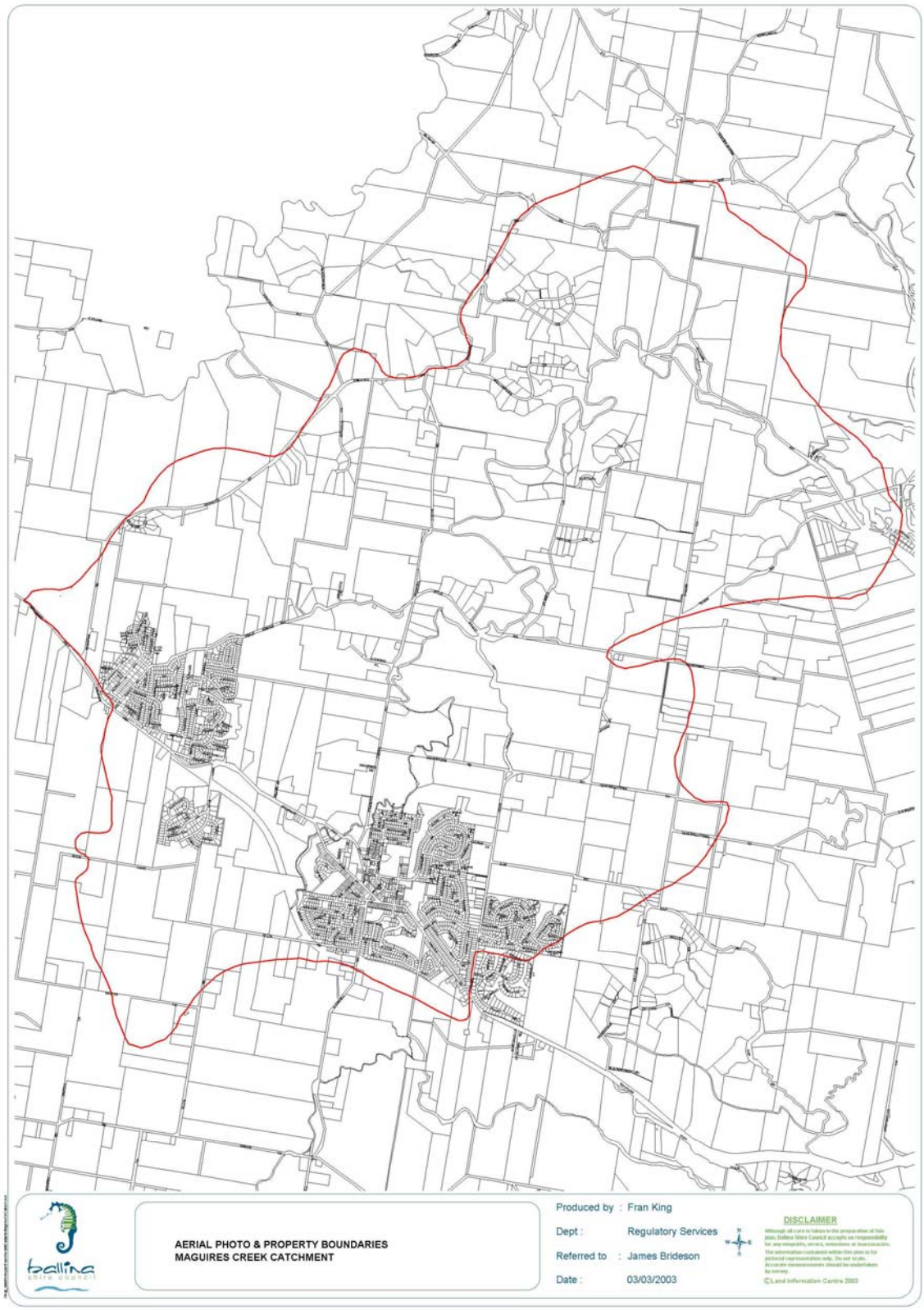
Birds cont.

Myzomela sanguinolenta	Scarlet Honeyeater	*Ptilonorhynchus violaceus*	Satin Bowerbird
Neochmia temporalis	Red-browed Finch	*Rhipidura fuliginosa*	Grey Fantail
Ninox novaeseelandiae	Southern Boobook	*Rhipidura leucophrys*	Willie Wagtail
Nymphicus hollandicus	Cockatiel	*Rhipidura rufifrons*	Rufous Fantail
Ocyphaps lophotes	Crested Pigeon	*Scythrops novaehollandiae*	Channel-billed Cuckoo
Oriolus sagittatus	Olive-backed Oriole	*Sericornis citreogularis*	Yellow-throated Scrubwren
Pachycephala pectoralis	Golden Whistler	*Sericornis frontalis*	White-browed Scrubwren
Pachycephala rufiventris	Rufous Whistler	*Sericornis magnirostris*	Large-billed Scrubwren
Pardalotus punctatus	Spotted Pardalote	*Sericulus chrysocephalus*	Regent Bowerbird
Pardalotus striatus	Striated Pardalote	*Sphecotheres viridis*	Figbird
Petroica rosea	Rose Robin	*Strepera graculina*	Pied Currawong
Phalacrocorax carbo	Great Cormorant	*Threskiornis molucca*	Australian White Ibis
Phalacrocorax melanoleucos	Little Pied Cormorant	*Threskiornis spinicollis*	Straw-necked Ibis
Phaps chalcoptera	Common Bronzewing	*Todiramphus macleayii*	Forest Kingfisher
Philemon citreogularis	Little Friarbird	*Todiramphus sanctus*	Sacred Kingfisher
Philemon corniculatus	Noisy Friarbird	*Tregellasia capito*	Pale-yellow Robin
Phylidonyris nigra	White-cheeked Honeyeater	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet
Pitta versicolor	Noisy Pitta	*Trichoglossus haematodus*	Rainbow Lorikeet
Platalea regia	Royal Spoonbill	*Vanellus miles*	Masked Lapwing
Platycercus elegans	Crimson Rosella	*Zoothera dauma*	Unindentified Ground Thrush
Platycercus eximius	Eastern Rosella	*Zoothera heinei*	Russet-tailed Thrush
Podargus strigoides	Tawny Frogmouth	*Zoothera sp.*	unidentified ground thrush
Porzana pusilla	Baillon's Crake	*Zosterops lateralis*	Silvereye
Psophodes olivaceus	Eastern Whipbird		

Fish species found in the waterway of the Catchment (Pat Dwyer, Fisheries Dept. 2003)

Common Jollytail	Herring
Striped Gudgeons	Mullet
Cox's Gudgeon	Australian Bass
Empire Gudgeon	Bullrout
Duboulays Rainbowfish	Flatheaded Gudgeon
Softspined (Ornate) Rainbowfish	Pacific Blue-eye
Undescribed Australian Smelt	Glass Fish
Catfish	Firetails
Eel	

Appendix 12. Cadastral Map showing property boundaries in the Maguires Creek Catchment



Appendix 13. Maguires Creek Catchment showing drainage pattern